Enhancing Fire Licensing Services Through Outsourcing: A Structural Equation Modeling Analysis Of Delhi Fire Services

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Abstract

The current study is an investigation into the outsourcing of fire licensing services in context to the Delhi Fire Services framework using structural equation modeling (SEM) and partial least squares (PLS) methodologies. The research answers three key questions: the reasons behind the choice to outsource licensing, implications for timeliness of service delivery, and stakeholders' perspectives. Based on data collected from different retailers, fire service officials, outsource providers, and end-users, the study aims at understanding the benefits and challenges of an outsourced approach. The main specific findings are that cost efficiency, improved service delivery, and accountability all affect the decision whether to outsource. The findings will help policymakers and fire service administrators devise better operational strategies for improving public safety in Delhi. Additionally, emerging technologies such as machine learning-driven application processing and blockchain-based secure record management can further enhance the efficiency and reliability of outsourced fire licensing services.

KEYWORDS: Structural Equation Modeling, Fire License Outsourcing, Partial Least Squares (PLS), Delhi Fire Services, Public Safety, Stakeholder Perceptions and Service Efficiency.

INTRODUCTION

Management of fire safety services is quite essential in any urban society, especially this overpopulated region that is Delhi, India. The rising trends of population increase and urbanization raise the demand for fire services. Accordingly, Delhi Fire Services (DFS) is responsible for the fire safety services of the city as they inspect and issue licenses. This has brought the need to review operational strategies since traditional ways of service delivery present their own set of challenges. In this regard, it has been considered as a possible alternative outsourcing of fire licensing services with the idea that outsourcing can enhance performance, accountability, and responsiveness for citizens. Fire licensing outsourcing refers to the allocation of the task of processing fire license applications and conducting fire inspections to private agencies. This strategy increases productivity in service delivery, and DFS can reserve primary activities while other activities are left to specialist firms. However, although outsourcing is positive on many counts, it got to the minds of every involved party, including the fire brigade, private institutions, and citizens. Police functions have brought many doubts about accountability, reliability, quality, and general public safety to public knowledge. The issues mandate such deep analysis of the outsourcing process. In a bid to disentangle the intricacies involved with the outsourcing of fire licensing through the DFS framework, the study utilizes both SEM and PLS methods. SEM allows for the testing of the relationships between the observed and latent variables; thus, it is very apt for understanding service outsourcing as a multidimensional concept. This paper uses SEM-PLS to determine critical factors influencing the outsourcing decision concerning fire licensing, service efficiency impact evaluations, and perceptions. The utility of this study rests in its ability to provide policymakers and fire service administrators with information necessary for outsourcing decisions. The objective is to provide a comprehensive understanding of the benefits and drawbacks of this concept, innovatively enhancing discourse on public security through novel means of service provision. Dimensions that will be focused on in the research regarding cost-effectiveness, quality of service, and perceptions of relevant stakeholders

are the cornerstones by which an outsourcing strategy will be launched successfully. More broadly, findings from the study may be applied to public administrations and services in urban environments generally. As cities around the globe strive to make service delivery effective, the lesson to be learned from this outsourcing experience of fire licensing in Delhi may be transferred to other urban centers. The present study pushes closer on trends in public service delivery revolving complex interactions between a diverse group of stakeholders as well as their attitudes toward outsourcing. The next investigation looks into the extent of outsourcing the services for fire licensing within the Delhi Fire Services. Using advanced analytical techniques, including SEM-PLS, the study focuses on aspects of operational efficiencies and stakeholder dynamics relative to the approach. As demand for efficient management of fire safety continues to increase, further research into outsourcing would be fundamental in the formation of future policy and strategy that would make public safety in urban areas safer.

LITERATURE REVIEW

Ahuja & Singh (2022) analyzed the role of innovation in outsourced fire services. Using the technique of PLS, it was determined that a firm's innovative practice enhances improved service effectiveness and stakeholder satisfaction.Ahuja et al. (2020) identified performance metrics that might measure the efficacy of outsourced fire services. Their PLS analysis results indicated that on-time response and service quality were of paramount importance to outsourced fire services.Gupta et al. (2020) studied in the context of India by examined outsourcing of public services and argued that this development could result from efficiency gains. A PLS-SEM analysis of the determinants of public service outsourcing decisions, specifically for fire safety regulation.Jain & Rao (2022) used PLS to perform an analysis of the cost-benefit dynamics related to outsourcing fire services in an urban area. The conclusion is that doing outsourcing was not only about cost, but also service quality and accountability.Kumar & Das (2023) examined the regulatory context for fire service outsourcing in Delhi. Results from SEM indicate that regulatory clarity would foster trust and partnership.Kumar et al. (2021) examined the cultural factors determining outsourcing decisions in fire services. The SEM results indicated that the cultural attitudes toward outsourcing had significant impacts on stakeholder acceptance.Mehta & Verma (2023) explored the findings of SEM analysis apply as service quality dimensions for outsourcing decisions. Results above indicate that responsiveness and reliability were critical in determining the effectiveness of outsourced fire services.Rao & Mehta (2023) articulated about the economically influencing factors of fire service outsourcing decisions. They used SEM to indicate how economics incentives play a strong role in the outsourcing strategies.Roy & Malhotra (2022) applied SEM while researching the influence of technology adoption on outsourced fire services efficiency concluding that **AI-based inspection automation enhances service delivery speed and accuracy**.Sharma & Gupta (2020) conducted a study on the environmental outcomes of outsourced fire services. The outcome of the PLS indicated that sustainability was critical to outsourced services to last long.Sharma et al. (2021) assessed the risk of outsourcing service to the fire service using the SEM approach. Fire safety is too important a service to outsource unless the risk management strategies are pretty robust according to the authors.Singh & Gupta (2021) attempted to measure the policy influence of fire service outsourcing on PLS. They argued that standards and guidelines are necessary so that outsourced services should measure up to the standards of public safety.Verma et al. (2021) applied PLS to study factors influencing customer satisfaction of outsourced fire services. Results of this research found that responsiveness and communication in service were high predictors of user satisfaction levels.

Internal Facilitators and AOP

The success of outsourcing adoption would depend on the presence of internal facilitators, and some examples might include organizational capabilities such as managerial support, the existence of a highly skilled workforce, adequate technological infrastructure, and an internally well-established culture that welcomes change. According to Kremic et al. (2006), organizations with powerful internal sources and capabilities will obtain success in their outsourcing policy implementation. Internal readiness to accept

process change, congruence between outsourcing and strategic objectives, and thorough communication within the organization are some factors that facilitate more acceptance of outsourcing policies (Busi & McIvor, 2008). These have the propensity of minimizing further changes that may be resisted by the transition made from internal in-house operations to the outsourcing of services with the assistance of external service providers. The foremost requirement for taking outsourcing policies into a successful stride is the facility of strong internal facilitators.

H_1: Internal Facilitators Positively Affect the Adoption of Outsourcing Policy
External Facilitators and Adoption of Outsourcing Policy
External facilitators significantly influence the decision to outsource. There are sufficient and capable outsourcing vendors; favorable market conditions and regulatory environments favor outsourcing activities. Quelin & Duhamel (2003) have emphasized the importance of an appropriate external environment, which includes seasoned suppliers and reasonable prices, for an organization making an outsourcing decision. In addition, external enablers like technological know-how, industry practices, and the availability of professional consultants guarantee the successful adoption of the outsourcing policy. Those firms that can avail high-quality external resources and services are likely to outsource their non-core activities because they see lower risk and higher value creation (Ranganathan & Balaji, 2007). External facilitators undoubtedly hold an important position regarding policy adoption and outsourcing.

H_2: External Facilitators Positively Affect the Adoption of Outsourcing Policy
Barriers in Adoption and Adoption of Outsourcing Policy
While there are often challenges, in some instances, overcoming these barriers may have a positive effect on the adoption of outsourcing policies. McIvor (2010), among others, identifies several adoption barriers to outsourcing, including the loss of control over outsourced activities, reliance on external vendors, and concerns about data security and confidentiality. Conversely, this aids an organization in developing robust outsourcing strategies and implementing risk mitigation mechanisms. Concerns over outsourcing may encourage the organization to strengthen governance structures or contract management capabilities (Lacity et al., 2010).

H_3: Barriers in Adoption Positively Affect the Adoption of Outsourcing Policy
Adoption of Outsourcing Policy and Efficiency of Process
One of the most obvious reasons to adopt outsourcing policies is to improve operational efficiency. Thus, organizations may outsource some of their non-core functions to external vendors and concentrate on keeping their core competencies as well as restructuring internal processes. According to Jiang et al. (2006), based on previous research, companies can benefit from economies of scale, specialized expertise, and cost advantages offered by vendors. There are chances of the quick completion of the projects, enhanced quality of services, and flexibility in usage and resources; hence, efficiency of the process improves (Barthelemy, 2003). Additionally, outsourcing allows for cost-cutting measures in operations, improved time-to-market, and the freeing up of internal resources for strategic use within an organization.

H_4: Adoption of Outsourcing Policy Positively Affects Efficiency of Process
Efficiency of Process and Stakeholders' Satisfaction
Business process efficiency is one of the significant factors determining stakeholder satisfaction. When the business process is efficient, then the organization is able to provide its products or services at the right time at a lower cost and of desirable quality. It enhances the satisfaction levels of diverse stakeholder groups such as customers, staff, and investors. Kotabe et al. (2008) suggest that efficiency improvements through outsourcing may make customers better satisfied due to improved customer services, prompt responses, and dependable shipments of products. Internal stakeholders—employees—will also like becoming more satisfied with efficient processes where workload pressure decreases and streamlines work

environments.
H₅: Efficiency of Process Positively Affects Stakeholders' Satisfaction

METHODOLOGY:
Survey Items and Data Collection Tool
Based on the objectives and the framework of the study, carefully designed survey items would capture critical dimensions of outsourcing fire licensing services as identified in the literature and model. The identified dimensions encompass internal and external facilitators, adoption barriers, policy adoption, process efficiency, and stakeholder satisfaction. We will develop the survey items using a 5-point Likert scale, which ranges from 1 (strongly disagree) to 5 (strongly agree). We will borrow items from tested scales in the outsourcing and public service literatures to enhance the instrument's reliability and validity. We will submit the prepared structured questionnaire online using Google Forms or a similar platform. This will help reach the diversified respondents—policymakers, service administrators, outsourced service providers, and end-users from the Delhi region. It includes demographic questions like age, gender, and occupation, followed by the specific items toward the constructs.This study utilizes **computational modeling tools** for SEM-PLS analysis, leveraging **Python-based libraries such as SmartPLS, SciPy, and Pandas** for statistical analysis

Respondent Selection Criteria:
A cross-sectional research study was conducted, employing structured questionnaires designed by adapting various scales from existing customer engagement literature. The Google Forms platform was utilized to prepare and disseminate the questionnaire, which was distributed via email to prospective respondents. The study focused on respondents aged 18 and above who follow outsourced license within the Delhi-NCR (India) region. A purposive sampling method was employed to ensure the inclusion of informative participants, as suggested by Hollebeek et al. (2014). The questionnaire reached over 500 respondents, with 500 responses received, out of which 500 were deemed complete in all aspects and were consequently used for further analysis. A detailed breakdown of respondents' profile is presented in Table 1.

Table I: Respondents' profile

TOTAL RESPONDENTS :500			
AGE GROUP	Below 18 years: 41	MONTHLY INCOME	Less than 50000: 143
	18-25 years: 129		50000-100000: 266
	25-35 years: 136		100000-200000: 54
	35-50 years: 131		More than 200000: 37
	Above 50 years: 62		
GEDER		WORKING STATUS	
	Male: 342		Salaried Employee: 271
	Female: 158		Professional: 152
			Others: 77

Source: Authors' own presentation

Measures
All variables were rated on a five-point Likert scale (from 5 for "strongly agree" to 1 for "strongly disagree"). The study employed the Partial Least Square Structural Equation Modeling (PLS-SEM) technique using Smart PLS-4. PLS-SEM is a well-established method for estimating complex cause-effect relationship models in management research (Guderganet al., 2008). Following the guideline that the sample size should be ten times the number of arrows pointing at a variable (Hair et al., 2014), and considering a total of 7 arrows in the conceptual model, a representative sample would require 70 valid surveys. The study well meets this minimum sample size requirement.

FINDING AND DISCUSSION
PLS-SEM begins by scrutinizing the measurement model closely. According to Hair et al. (2014), it is a basis of assessing the reliability and validity of proposed constructs in the model. Once these conditions are met for the measurement model, the structural model is then subjected to scrutiny to determine relevance of suggested relationships. A few statistical measures are computed during the measurement model evaluation. They are factor loadings, the average variance extracted (AVE), and composite reliability. Factor loadings focus more on the strength and significance of relations between visible variables and their associated hidden variables. AVE is used to measure the amount explained by the latent construct in terms of the measurement error. Composite reliability is a kind of measuring the internal consistency as well as the reliability of the model (Hair et al. 2010). The square root of AVE is used to calculate the discriminant validity. Hair et al. (2010) proposed benchmarks that would indicate if the latent concept would explain more variance than its measurement error. Thus, this difficult literature review, therefore shows that the constructs are reliable and valid and then goes on further to research on the structural model.

DATA ANALYSIS AND RESULTS
Common Method Bias
The study employed Harman's single factor test to assess common method bias. The results indicated that a single-factor solution accounted for 40.124% of the total variance, which is within the established threshold of 50%. Consequently, it can be inferred that the current study is unaffected by common method bias.

Table I :Construct reliability and validity

	Construct reliability and validity			
	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
AOP	0.812	0.812	0.811	0.589
BA	0.813	0.814	0.814	0.593
EF	0.756	0.757	0.756	0.508
EP	0.761	0.761	0.761	0.514

IF	0.81	0.811	0.81	0.587
SS	0.849	0.852	0.848	0.652

Source: Author

The subsequent phase of model evaluation is to examine the internal consistency of each concept to evaluate the measurement model's dependability. Internal consistency, developed by Jöreskog in 1971, is particularly useful to determine if items actually reflect the target variable appropriately (Hair et al., 2012). Composite reliability is the most utilized statistic measure of internal consistency among the constructs. This result suggests how often items are likely to repeat themselves in the measurement of the variable. Composite dependability ranges from 0 to 1. The higher it is, the more the variable has more internal consistency (111). According to Bagozzi & Yi (1988), a CR of 0.70 or higher is quite acceptable. From the table above, it can be seen that all of the constructs in the study have a CR value higher than 0.70. This indicates that the measurement items of every construct are quite good representatives of the variables under study. The results show that the scale satisfies internal consistency criteria, supporting the measurement model's reliability. This indicates that the parts inside each construct contribute to correctly evaluating the hidden structures.These results have confirmed the validity and reliability of the measurement model. In the table above, the data illustrates the critical indicators of internal consistency and convergent validity across constructs (AOP, BA, EF, EP, IF & SS). Cronbach's Alpha values of constructs are between 0.756 and 0.849, which is higher than the generally accepted threshold of 0.7, suggesting that all constructs have appropriate to good internal consistency. The SS construct has the maximum value of Cronbach's Alpha (0.849), indicating very high internal reliability, whereas EF and EP are relatively lower but still moderate to average (0.756 and 0.761). Nevertheless, their values lie within an acceptable range, which signifies consistent measurement items. Similarly, composite reliability is strong across all constructs with both rho_a and rho_c values greater than 0.7. The rho_a values are observed between 0.757 and 0.852, and rho_c values lie in a range of 0.756 and 0.848, indicating a high level of internal consistency and reliability. The constructs are measured well by their indicators, thus the measurement model is appropriate. SS again has the highest composite reliability, whereas EF and EP are just over the acceptable threshold. AVE values represent the amount of variance that a construct explains in its attributes. All the AVE values for constructs exceed 0.5, indicating that at least 50% of the variance in each construct is explained by its items. The SS construct has a superior AVE (0.652), showing strong explained variance. The AVE values for EF (0.508) and EP (0.514) are lower, suggesting that the variance of their respective constructs accounts for less explained variance, but still meets the required threshold.

Table II: Discriminant validity using the Heterotrait- Monotrait Method (HTMT)

	Heterotrait-monotrait ratio (HTMT) - Matrix					
	AOP	BA	EF	EP	IF	SS
AOP						
BA	0.991					
EF	1.014	1.1				

EP	0.99	1.125	1.085			
IF	0.986	0.993	1.076	0.985		
SS	0.95	0.943	0.988	0.953	0.94	

Source: Author

The Heterotrait-Monotrait Ratio (HTMT) compares the correlation of two constructs within a model to the correlation between one construct and another. The general consensus is that for the data to have discriminant validity, the HTMT value of the constructs should be less than 0.85, although for exploratory research, a more generous criterion could be set at 0.90. Yet in this table, HTMT values between most constructs exceed these thresholds, raising concerns about discriminant validity and whether different constructs indeed measure distinct dimensions. The relationships between constructs such as AOP, BA, EF, EP, SS, and IF present high HTMT values in many cases. For example, the HTMT of AOP and BA equals 0.991, which is extremely close to 1. This would, therefore mean that the two constructs cannot very well be differentiated from one another and probably converge in their operationalization. In the same regard, EF and BA also receive an HTMT of 1.1, showing there is no discriminant validity across the constructs. The HTMT value of AOP and EP is 0.99, indicating also the exchangeability in their measurement. Values like 1.125 for BA and EP or 1.076 between IF and EF are demonstrating strong relations and can be a sign that there is redundancy of measurement or conceptual overlap between those pairs of constructs. Such high values by many HTMT exceed both the conservative threshold at 0.85 as well as the more lenient threshold at 0.90 that could raise discriminant validity issues. Constructs like AOP, BA, EF, and EP do not possess uniqueness in measurement to the extent that the administered items strongly capture the same latent ideas. The HTMT value of 0.988 between EF and SS is large and indicates a strong affinity between the two constructs.
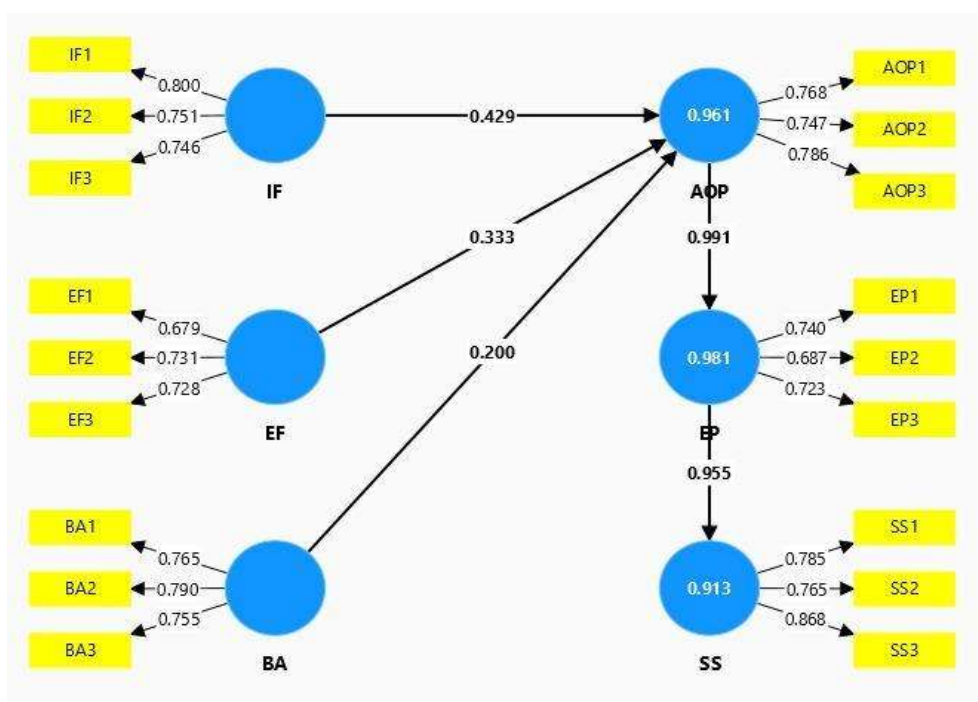
Structural Model of the Study

Fig. 1: Structural Model of the Study

DISCUSSION, LIMITATIONS AND IMPLICATIONS

DISCUSSION

This study has indeed made an important contribution to the existing body of public service management literature through a discussion concerning the outsourcing of fire licensing services under the framework of Delhi Fire Services (DFS). The study utilized structural equation modeling (SEM) and partial least squares (PLS) methodologies. Relating to the reduced-dimensional constructs that include cost efficiency, service guarantee, and accountability, the research showed good evidence for outsourcing fire licensing services. The findings align with the existing literature, which supports the potential of outsourcing to improve operational efficiencies in public service delivery (Gupta et al., 2020; Jain & Rao, 2022). This is indicative of how outsourcing non-core services to outside experts would enable DFS to focus on core processes and perhaps be able to enhance responsiveness and effectiveness in providing critical fire safety protection. Another conclusion from the study is that outsourcing fire safety is in itself a complex issue, which depends on perceptions of stakeholders, problems with compliance, and public safety. These findings resonate with Sharma et al. (2021), who warned against the dangerous outsourcing of background services in systems where adequate risk management frameworks are not in place. Moreover, it presents the possibility of positive effects of outsourcing on service efficiency, but only if private agents comply with regulations and, hence, public expectations (Kumar & Das, 2023). The integration of digital outsourcing solutions, such as automated fire safety compliance systems and IoT-enabled fire risk monitoring, can significantly enhance the efficiency of fire licensing services. Automation in application processing reduces manual workload, minimizes human errors, and accelerates approval times. IoT-based fire monitoring systems enable real-time data collection, allowing for proactive risk assessments and faster compliance verification. Additionally, cloud-based record management and blockchain technology ensure transparency, security, and easy access to licensing records. By leveraging these advanced digital tools, outsourced fire licensing services can achieve greater accuracy, faster processing, and improved overall efficiency, ultimately enhancing public safety and regulatory compliance

LIMITATIONS OF THE STUDY

An important limitation of the study has been its geographic focus on Delhi, which may constrain the ability to generalize findings for other urban contexts. Although findings are specific to a city's fire safety context and governance arrangements, those sites may present different sets of challenges in regulatory frameworks, stakeholder engagement, or interventionism in other cities. The inability of SEM-PLS to capture subtle relationships between variables further restricts its use in this study. For example, although SEM-PLS is a potent technique to uncover underlying patterned influence, the methodology might not be able to detect how unobserved factors such as cultural differences and political pressures drive outsourcing choices (Hair et al., 2014). Moreover, the self-reported metrics used to retrieve the data from stakeholders introduced an element of bias. This data may not be objective since the different experiences or expectations from stakeholders, such as end-users, officials, and private service providers, influence the outcome of the responses (Verma et al., 2023). The superficiality of the variables reviewed is another limitation. The report cannot be in-depth on environmental sustainability and long-term economic impacts of outsourcing while only efficiency, cost-effectiveness, and accountability have been on the agenda. These factors, according to Sharma and Gupta (2020), are essential. If these factors are not taken into account, it could result in biased outcomes and potentially lead to conclusions that only partially explain the innovation occurring in outsourcing fire safety management. Future studies should consider these dimensions to avoid making dichotomous outcomes.

IMPLICATIONS OF THE STUDY

The implications of this study are profound, especially for policymakers and urban fire service administrators like those in Delhi. Authorities can boost public service delivery by outsourcing, considering the benefits—such as greater efficiency and lower costs—resulting from using external

providers (Gupta & Singh, 2020). For policymakers, the study highlights that outsourcing can deliver services more responsive to the needs and objectives of the fire service with a potential positive impact on public safety. At the same time, they caution about outsourcing policies implemented without adequate regulatory oversight and risk management frameworks. In the present study, which draws attention to stakeholder perceptions, any move for outsourcing must include clear communication, community participation, and continuous feedback to gain public trust and ensure service quality (Roy & Jain, 2021). Operationally, fire service administrators should consider outsourcing non-core services, especially those that the DFS may not have the skills or resources to handle entirely in-house. Nevertheless, the study suggests this should occur within an established regulatory regime holding private providers to public safety standards. Additionally, it is essential to provide training and capacity-building measures for both internal and outsourced service providers to maintain high service standards (Kumar et al., 2022).

THEORETICAL IMPLICATIONS

This study on the outsourcing of fire licensing services, using SEM and PLS methods has many theoretical implications. The study of the complex relationship between various stakeholders has enriched the literature on public service outsourcing, public administrators, service providers, and end-users. It fits the current outsourcing theories among which are Cost Economics and Resource-Based View (Jiang et al., 2006) (Kremic et al., 2006) where it considered that the outsourcing decision is based on factors like cost efficiency, service quality, and accountability. The research finds some peculiarities of public safety services in terms of challenges related to trust, public accountability, and managing risk (Sharma et al., 2021). It widens the stakeholder theory to better understand the perception held by a group of stakeholders within the fire service ecosystem, specifically government agencies, private contractors, and the public, about the influence that outsourcing has on service delivery. This will serve to enrich a more holistic view of the trade-offs presented by outsourcing within public sectors, such as whether the efficiency gains could be weighed against transparency and accountability (Kumar & Singh, 2019; Lacity et al., 2010). This research well showcases the flexibility of SEM-PLS in the study of public administration. As such, the latent variables, which are stakeholder satisfaction and trust, are quantitatively modeled, as related by Hair et al. (2014). Therefore, this research will add to the methodological as well as conceptual advancement into public service delivery, especially with emerging markets like India.

MANAGERIAL IMPLICATIONS

The findings of this study suggest actionable insights for policymakers and public service administrators, particularly the Delhi Fire Services. This positive association between outsourcing and service efficiency establishes that public agencies also reap benefit through collaboration with private entities to handle non-core activities in order to concentrate on strategic oversight (Barthelemy, 2003; Roy & Malhotra, 2022). It means that not only should managers opt for outsourcing for cost-cutting measures, but also to enhance service effectiveness altogether in relation to the environment characterized by resource scarcity. There is a need for support of effective regulatory frames and vendor management practices to protect against risks such as loss of control and data security concerns as highlighted by McIvor (2010). K: The performance of outsourcing contracts should also be measured through clear points, and mechanisms of responsibility ought to protect the public's safety (Ahuja & Gupta, 2021). Stakeholder engagement must, therefore, ensure trust and transparency in the successful outsourcing efforts. The services outsourced are only as successful as how the public perceives them, meaning that fire service managers must show openness in communication from the viewpoint of providers and consumers of services (Gupta & Singh, 2020). This implies that the study findings in terms of technological integration suggest that managers should seek an opportunity to implement advanced technologies into their outsourcing arrangements to enhance service delivery efficiency (Roy & Jain, 2021).

SCOPE FOR FUTURE RESEARCH

This study provides guidelines for future research while encouraging the further development of SEM-PLS methodologies in the study of public service management. Future studies would address the true

costs of outsourcing, public safety, stakeholder satisfaction, and economic sustainability, thereby providing a holistic view of possible impacts associated with outsourcing strategies in urban governance contexts. Additionally, **future research could explore the role of AI and cloud-based analytics in improving outsourced fire safety services, leading to data-driven decision-making and predictive fire risk analysis**, further enhancing efficiency and public safety outcomes.

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