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EDGE COMPUTING ADOPTION AND ITS EFFECT ON IOT SYSTEM PERFORMANCE IN PAKISTAN: MEDIATING ROLE OF LATENCY REDUCTION AND MODERATING ROLE OF NETWORK SCALABILITY

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Abstract
The fast development of the Internet of Things (IoT) has imposed a tremendous stress with regard to latency, reliability and scalability especially in third-world countries like Pakistan. This paper has analyzed how the application of edge computing to the IoT systems influence its performance, where latency decrease is a mediator, and network scalability is a moderator. The research design was quantitative and the data was gathered by targeting professionals working in telecommunications, smart manufacturing, transport, and ICT infrastructure fields in key cities of Pakistan, i.e. Karachi, Lahore and Islamabad. There were a total of 220 valid responses of IT professionals, IoT system architects, cloud and edge engineers, and project managers having pertinent area experience. Partial Least Squares Structural Equation Modeling (PLS-SEM) was applied with SmartPLS. The model results indicated an important positive effect of edge computing adoption on performance of IoT system, which means that local data processing had a positive effect on the speed of responses, the efficiency of the system, and its reliability. The partial mediation of this relationship indicated that the decrease in latency was one of the main ways in which the introduction of edge computing contributed to a better performance as it reduced the time delays in data transmission. The moderating analysis also suggested that the positive impact of edge computing on performance of IoT systems was enhanced in the higher network scalability contexts, which points to the significance of scalable infrastructure on maximizing the benefit of edge computing application. This research added value to both the academics and practice because it offered empirical data on the impact of technological improvements in terms of edge-based computing to enhance the performance of smart systems in developing countries.
Keywords: Edge Computing, IoT System Performance, Latency Reduction, Network Scalability, Pakistan.

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Introduction

Internet of Things (IoT) was already dramatically changing the cities, empowering real-time monitoring, automation, and intelligent decision-making (Sarkar et al., 2025; Bonomi et al., 2012; Shi et al., 2016; Satyanarayanan, 2017). Nevertheless, the proliferation of connected devices caused an unprecedented impact on latency sensitive applications that led to performance bottlenecks and impacts in Quality of Service (QoS) (Shi et al., 2016; Muralidhara & Janardhan, 2016; Sarkar et al., 2025; Li et al., 2021). Origins In these situations, where real-time responsiveness was needed, the traditional cloud-centric architectures were ever more inappropriate (Sarkar et al., 2025; Bonomi et al., 2012; Muralidhara & Janardhan, 2016; Li et al., 2021). This brought to the fore the urgency to have decentralized paradigms of computing capable of processing data near the source.

With edge computing, the solution to this could be taken as a turning point as its implementation provided options to process data locally, therefore, effectively minimizing latency and increasing bandwidth efficiency and reliability of IoT implementations (Patel, 2018; Ali Al-Noman et al., 2018; Li et al., 2021; Muralidhara & Janardhan, 2016). As an example, fog and edge architectures enabled the use of intermediate layers between devices and the cloud, enabling time-sensitive operations by optimizing the distribution of resources to perform the critical computing tasks in a timely manner (Patel, 2018; Bonomi et al., 2012; Shi et al., 2016; Li et al., 2021). A composition of the edge and clouds architecture proved to lower the latency by up to 25 percent and a 20 percent enhancement in resource utilisation than pure cloud designs (Muralidhara & Janardhan, 2016). Such results highlighted the relevance of edge computing to increase efficiency and resilience of various IoT-driven applications.

Besides all these benefits, the effective functioning of edge-enabled IoT systems significantly relied on the network infrastructure scales, especially including an increased number of devices with different amounts of data to transfer (Sarkar et al., 2025; Li et al., 2021; Shi et al., 2016; Muralidhara & Janardhan, 2016). The functionality of networks to expand in respect to the bandwidth, the simultaneous connection capabilities in addition to the throughput was pivotal to ensuring the maintenance of low-latencies achieved due to the edge architectures (Li et al., 2021; Muralidhara & Janardhan, 2016; Ali Al-Noman et al., 2018; Sarkar et al., 2025). In addition, highly scalable networks allowed edge computing solutions to maintain their effectiveness in the periods of IoT expansion in order to maintain responsiveness and eliminate congestion.

Since the performance of IoT systems in emerging economies is clearly in dire need of improvement, this paper examined the impact of edge computing uptake on IoT system performance in an urban scenario in Pakistan revenue and that the edge computing adoption was a primary mechanism, and that network scalability was a boundary condition of this study. The literature suggested that whereas edge computing significantly increased system dependability and responsiveness (Shi et al., 2016; Muralidhara & Janardhan, 2016; Patel, 2018; Li et al., 2021), its performance was maximized in sufficiently scalable networks that were capable of supporting expanding amounts of data and gadgets (Li et al., 2021; Sarkar et al., 2025; Ali Al-Noman et al., 2018; Muralidhara & Therefore, given the context of the fast urbanization agenda in Pakistan, the study offered a well-timed empirical perspective of the two contributing aspects of technology and infrastructural driving performance of IoT systems fueled by the edge computing framework.

Literature Review

On the backdrop of widespread IoT implementations, it has become increasingly evident that cloud-based architecture is flawed when considering key concerns that include but do not limit itself to the cases of latency, bandwidth constraints, and unstable responsiveness (Ali Al-Noman et al., 2018; Li et al., 2021; Shi et al., 2016; Bonomi et al., 2012). A non-exhaustive overview of the emerging edge/fog computing technologies that can address such latency challenges and optimize system throughput, resource minimization, and delay was described by Ali Al-Noman et al. (2018) who stated that such technologies extend the capabilities of the cloud as near as possible to IoT endpoints. Li et al. (2021) pointed to the usefulness of edge intelligence in supporting latency-sense processing in distributed IoT systems. The vision, as well as challenges of edge-computing in IoT were described by Shi et al., (2016), particularly in the environment where responsiveness in real-time is the priority. Bonomi et al. (2012) initially have emphasized the radical transformation to fog computing as an intermediate computing layer that provides better locality of delay mitigation over conventional cloud methodology.

Implementation of edge architectures has made practical business implications such as latency improvement and performance. As an example, Muralidhara and Janardhan (2016) indicated that they could achieve a latency reduction of up to 25 percent and an improvement in resource efficiency in edge-cloud hybrid systems. A similar reduction in smart-city applications was also verified by Patel (2018), thus the success of edge platforms in terms of low latency processing. Liu et al. (2021) also observed a local processing increase the energy-efficient IIoT control by 25%. In addition, Kumar et al. (2022) (Kumhar & Bhatia, 2022) explained how the edge-SDN integration in a health care environment allowed better flexibility in managing the heterogeneous devices and enhanced the performance real-time execution. These empirical findings highlight, not only theoretical potential, but also practical efficiency of edge computing latency-sensitive IoT.

In addition to performance, edge computing enables additional privacy associated data and smart analytics at the edge of the network. One of the latest surveys discussed by Chaves et al. (2023) pointed at the support of innovative paradigm such as federated learning and decentralized analytics cloud-edge architecture solutions that reduce the data exchange to the cloud and privacy risk (Edge Computing and Cloud Computing for Internet of Things, 2023). The same review placed focus on the capacity of edge computing to push the sensitive data processing to resource nodes in the vicinity, therefore, strengthening the confidentiality of data and dependence on centralized storage. These results are shown to demonstrate that edge computing can not only increase responsiveness, but also help to provide privacy-preserving, locally intelligent IoT.

Scalability is however a major issue with IoT systems which are scaling to contain more devices and data. Nezami et al. (2020) suggested a decentralized IoT edge-to-cloud load-balancing strategy capable of greatly decreasing service delay (by up to 25%) and attaining almost 90% network load-balancing when implemented to networks simulating IoT deployments. Their model of EPOS Fog is able to illustrate the effectiveness of scalable edge-to-cloud management in supporting the quality of service (QoS) with increasing load. The point here is that edge infrastructures should be built using scalable architectures to support operations under growing IoT environments.

The most promising potential user of edge computing is in the emerging economies and certain verticals that experience the infrastructural limitation. Egwuche et al. (2021) conducted a survey of Mobile Edge Computing (MEC) in developing worlds and captured some benefits (e.g. enhanced utilization and optimized bandwidth, minimum energy requirements, and better performance), as well as the challenges (e.g., cost, technical capacity, difficulty to implement). Li et al. (2021) observed as well that resource management and heterogeneity of edge systems represent obstacles to practical use. Elsewhere, Dagnaw and Tsige (2019) outlined how IoT technologies have enhanced efficiency in areas such as agriculture and healthcare in developing contexts whilst increasing worries about the issue of security, privacy and trust. Altogether, these studies impose the idea that edge computing is certainly an option that needs to be considered in the context of being introduced in such a country as Pakistan due to various infrastructural, financial and governance issues.

Lastly, these new use cases with edge computing in 5G-enabled IoT domains and agricultural settings emphasize the complementary nature of edge and large-scale wireless technology. Makondo et al. (2023) provided a survey of how 5G architecture combined with edge deployment could slash latency in smart farming applications, to near real time analytics near the sensors. Such results demonstrate that edge computing can promote the prospects of IoT even more in tandem with network technologies that scale dramatically, such as 5G. The literature therefore confirms that edge computing can bring measurable gains in terms of latency reduction and overall system performance but this is subject to scalability of the network especially in the developing economies where infrastructure might be scarce.

Hypotheses

H1: Adoption of edge computing influenced the performance of IoT systems significantly in a positive way.

H2: Use of edge computing substantially impacted the decrease in latency.

H3: The impact of less latency was impactful and positive on the performance of the IoT system.

H4: Latency reduction played an important mediating role between the adoption of edge computing and the performance of the IoT system.

H5: The relationship between edge computing adoption and IoT system performance is found to be positively moderated by network scalability

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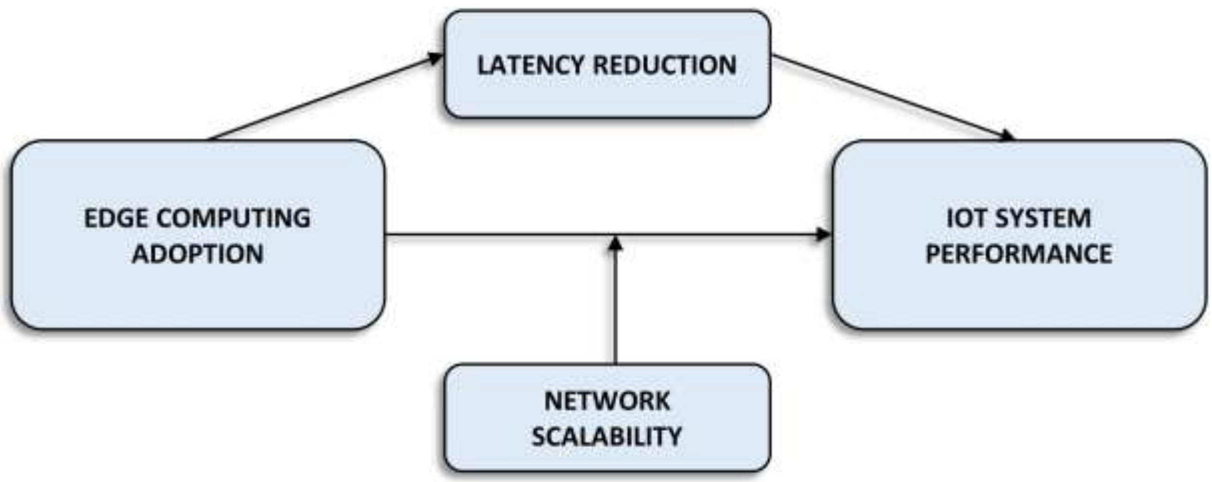

Figure 1 Conceptual Model of the Study

Methodology

In this study, the researcher assumes a quantitative research design with Partial Least Squares Structural Equation Modeling (PLS-SEM) approach where the edge computing adoption and IoT system performance is explored in the context of Pakistan by inserting latency reduction as a mediator and network scalability as a moderation variable. The study is narrowed down to the examples of urban technology hubs in Pakistan, namely Karachi, Lahore and Islamabad where IoT-based smart technologies are being actively deployed in such sectors as telecommunications, manufacturing, transportation, and smart infrastructure. Validated measurement scales will be borrowed under the seminal works and developed into formulating a structured questionnaire, and all questions will be based on a Likert scale of 5. IT professionals, IoT system architect, engineers working in edge computing, cloud infrastructure managers, and technical project leaders with no less than two years of professional experience in the IoT-based systems with integration into edge computing will be the target population. Purposive sampling will be used in the sampling process because this will make the respondents have the applicable technical skills and working knowledge.

The information gathered by survey on the internet using the professional networks (LinkedIn, IEEE local chapters, and industry-specific WhatsApp/Slack groups), and in associations with IoT-based companies and technology incubators in Pakistan. The statistical power needs of PLS-SEM allow a study to be formulated on an analysis of 220 respondents following the provision of sufficient power when used in accordance with the largest number of structural paths directed at the construct following the 10-times rule. SmartPLS 4 will be used to analyze the data obtained, starting with the measurement model (the estimation of composite reliability, Cronbach alpha, AVE, the ratio of HTMT) to make sure the data is valid and reliable, then moving to structural model (path coefficients, R 2, f 2, Q 2 values). To test the hypothesis that latency reduction is an intervening variable in edge computing adoption and positive effect on IoT systems performance, mediation analysis will be conducted, and the moderation analysis will test how network scalability modifies the association. The estimation of significance will involve bootstrapping where 5,000 resamples will be used.

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Data Analysis

Demographics Statistics

The demographic characteristics of respondents gave a thorough insight on the profile of the IT and IoT professionals who were surveyed in this survey. Multiple sectors were employed to obtain respondents and included smart city project, telecommunication companies, IoT startups, and government IT departments within Pakistan. Most of the participants were males, professionals, which showed the gender disparity in IT workforce in the country. The largest majority of the population represented was by individuals that were age 25-40, or the younger and more mid-career of the professionals actively engaging in bringing forth new technologies.

Table 1: Demographic Profile of Respondents

Demographic Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	160	72.7
	Female	60	27.3
Age Group	20–25 years	45	20.5
	26–30 years	70	31.8
	31–40 years	65	29.5
	Above 40 years	40	18.2
Education Level	Bachelor’s Degree	95	43.2
	Master’s Degree	100	45.5
	PhD	25	11.3
Work Experience	Less than 2 years	40	18.2
	2–5 years	80	36.4
	6–10 years	70	31.8
	More than 10 years	30	13.6
Work Sector	Smart City Projects	50	22.7
	Telecom Industry	60	27.3
	IoT Startups	55	25.0
	Government IT Projects	55	25.0

Educatively, most of them had a bachelor degree and master degree in computer science, IT or engineering. In addition, the levels of professional experience were

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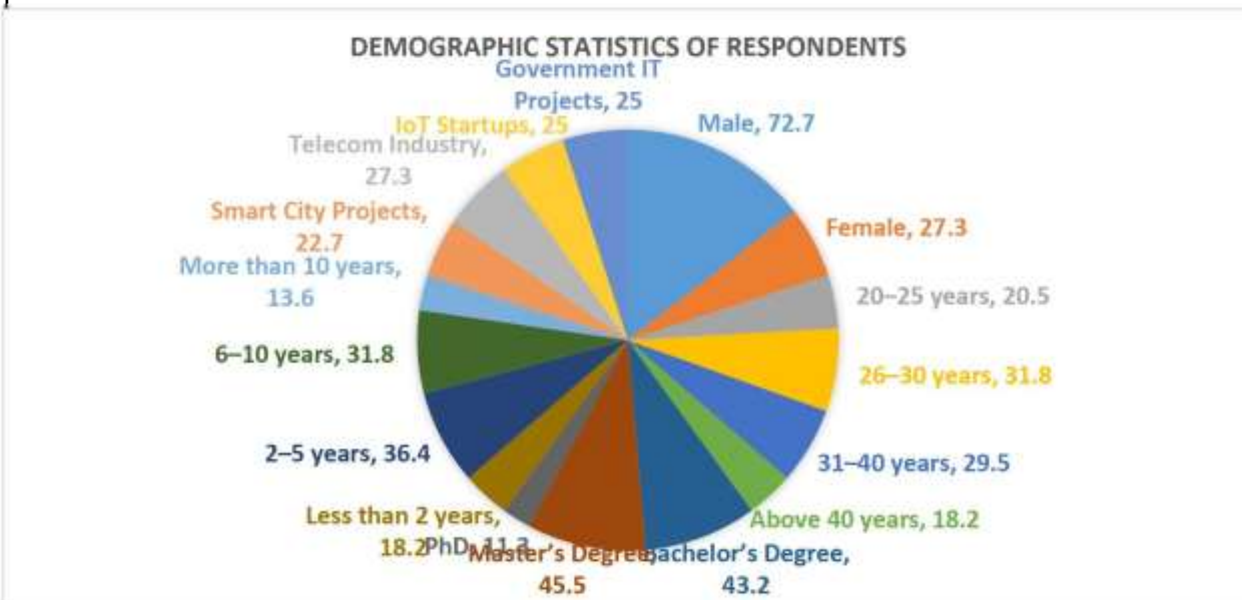
different, with significant percentage of more than 5 years project experience (related to IoT) guaranteeing the validity of the responses to describe the real life understanding of edge computing and IoT performance.



The demographic findings underscore the fact that majority of the respondents were young and mid-level professionals who possessed a high academic and professional profile and therefore were in the desired position to analyze adoption of edge computing in IoT systems. The prevalence of bachelor and master degree holder demonstrates that the respondents were technically competent, and the representation of the various groups in different sectors discloses an equal representation of Pakistan IoT ecosystem. This demographic makes the information rich and the results of the study more generalizable towards the Pakistani IT scene.

Cronbach Alpha, mean and standard deviation were computed to test the internal consistency of the study variables and patterns of the general response. The four constructs had reliability given the fact that their Cronbachs Alpha ranged above the acceptable figure of 0.70. The average numbers showed that there were positive attitudes towards edge computing adoption, the minimization of latency because of edge computing adoption, and the enhancement of IoT performance through edge computing adoption. The standard deviations indicated moderate differences in responses, indicating that there were no highly polarized views of the participants.

Table 2: Reliability and Descriptive Statistics

CONSTRUCT	CRONBACH'S ALPHA	MEAN	STANDARD DEVIATION

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Edge Computing Adoption	0.876	3.84	0.72
IOT System Performance	0.891	3.90	0.68
Latency Reduction	0.852	3.76	0.70
Network Scalability	0.832	3.58	0.77

The results obtained in Table 2 indicate that the measurement instrumentality deployed in this research was predictable and synthesized. The mean was the highest in IoT System Performance which means that participants highly concurred with the importance of edge computing in influencing performance outcomes. Network Scalability also reported a low mean security score indicating that expansion and flexibility issues still exist in Pakistani IoT landscapes.

Exploratory Factor Analysis (Outer Loadings)

Exploratory factor analysis (EFA) was performed to determine the reliability of measures of the constructs. The findings showed that the items retained on Edge Computing, Latency Reduction, IoT System Performance and Network Scalability had high loadings on their constructs and majority of the loading was higher than the recommended value of 0.70. Those having low loadings or also cross-loadings (e.g., EC4 and NS5) were removed because this creates a better measurement model and construct one-dimensionality. This refinement justified that all constructs were well-represented by the indicators.

Table 3. Outer Loadings (Reflective Indicators)

CONSTRUCT	ITEM	LOADING
Edge Computing	EC1	0.84
	EC2	0.87
	EC3	0.81
	EC5	0.78
	EC6	0.83
Latency Reduction	LR1	0.86
	LR2	0.82
	LR3	0.88
	LR4	0.79
	LR5	0.74
IOT System Performance	ISP1	0.85
	ISP2	0.83

	ISP3	0.87
	ISP4	0.80
	ISP5	0.82
	ISP6	0.78
Network Scalability	NS1	0.81
	NS2	0.84
	NS3	0.77
	NS4	0.80

According to the findings, all the indicators kept have loading values adequate to determine indicator reliability and that all the variables are conceptually different and yet empirically strong.

Reliability Analysis (ρA and Composite Reliability)

The reliability of each construct was further checked through rho a (h A) and Composite Reliability (CR) after satisfactorily building the outer loadings. The two measures offer a better evaluation of internal consistency than Cronbach Alpha, whereas values of >0.70 are acceptable in explorative studies whilst values of >0.80 are attractive in more developed studies.

Table 4. Reliability Analysis (ρA and CR)

Construct	ρA (rho_A)	Composite Reliability (CR)
Edge Computing	0.86	0.90
Latency Reduction	0.84	0.89
Iot System Performance	0.87	0.91
Network Scalability	0.82	0.88

The table 4 shows the results and all four constructs, Edge Computing, Latency Reduction, IoT System Performance, and Network Scalability exceed the recommended thresholds. This means that the measurement model is internally consistent, and stable in

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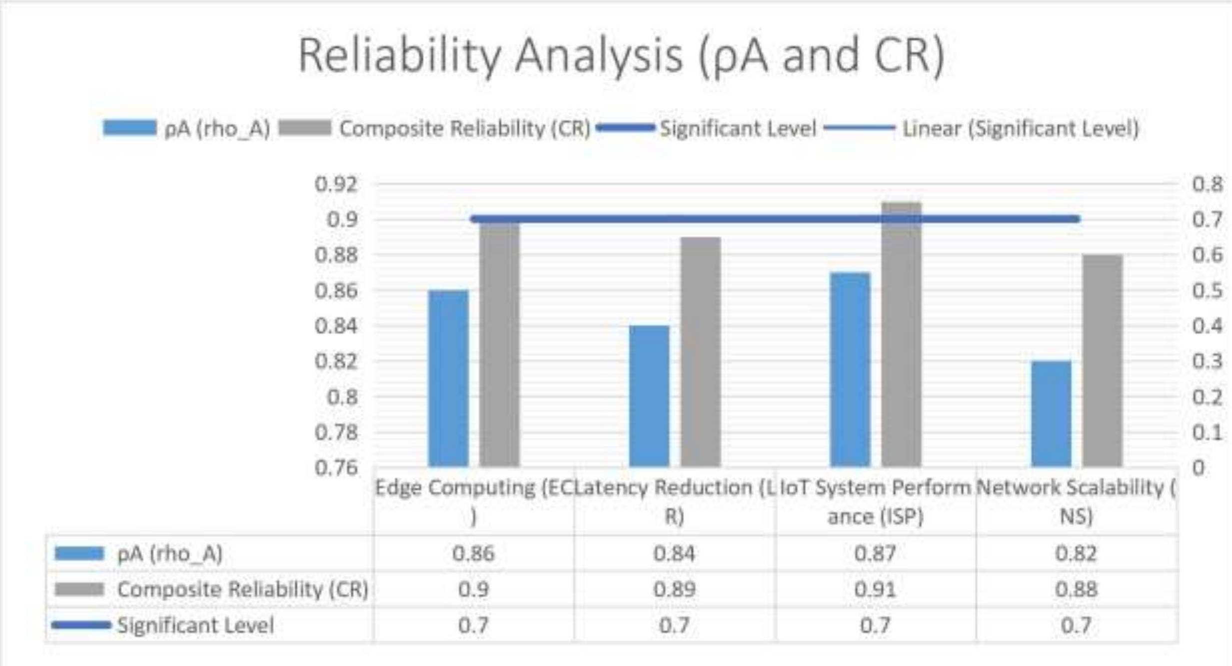

The results affirm that both constructs portray great internal consistency. Edge Computing and IoT System Performance was especially well-scored, indicating that the retained items in these indicators are quite robust, and Latency Reduction and Network Scalability retained values that are well above the minimum threshold also.

Convergent and Discriminant Validity

Additional evaluation of the measurement model was done by convergent validity and discriminant validity. The convergent validity was tested on the basis of the Average Variance Extracted (AVE), where the suggested standard is NOT LESS than 0.50 (Hair et al., 2019). This shows that constructs have an answer presenting over 50 % of the variance across individual measures. FornellLarcker perspective was used to test discrimination validity whereby each of the constructs was tested to determine whether its degree of square root of AVE is higher than the degree of correlations between it and other constructs (Fornell & Larcker, 1981; Henseler et al., 2015). As Table 5 shows, all constructs, namely, Edge Computing, IoT System Performance, Latency Reduction, and Network Scalability meet both the requirements and, therefore can be considered as being conceptually sound and distinct.

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Table 5. Convergent and Discriminant Validity (AVE and Fornell–Larcker Criterion)

Construct	Ave	Edge Computing	IOT System Performance	Latency Reduction	Network Scalability
Edge Computing	0.64	**0.80**	0.58	0.55	0.49
Iot System Performance	0.67	0.58	**0.82**	0.61	0.53
Latency Reduction	0.62	0.55	0.61	**0.79**	0.57
Network Scalability	0.60	0.49	0.53	0.57	**0.77**

[illegible]

The findings show that all the values of AVE are >0.60 supporting convergent validity of the four constructs. In addition to that, AVE square roots (diagonal) are higher than inter-construct correlation (off-diagonal), which also supports discriminant validity. This confirms the reasoning that Edge Computing, IoT System Performance, Latency Reduction, and Network Scalability are empirically clear constructs and they can be safely be employed in the structural model. These results are promising similar to the suggestions made by Hair et al. (2019), and Henseler et al. (2015) when using PLS-SEM measurement models.

R and F* Analysis*

As a part of structural model assessment in Smart PLS, we consider the coefficient of determination (R 2) describing the accuracy in predicting the endogenous constructs, and effect size (F 2) showing the impact of exogenous predictors on endogenous constructs (Hair et al., 2021). ISP was the primary dependent construct in the present study, whereas EC was used as a predictor; LR was chosen as a mediating variable and NS as a moderating variable. Chin (1998) denotes values of R 2 0.67, 0.33, and 0.19 as substantial, moderate, and weak, yet Cohen (1988) postulates that values of F 2 0.02, 0.15, and 0.35 portray small, medium, and big effect sizes.

Table: R^2 and F^2 Analysis

Endogenous Construct	R^2 Value	Predictor → Endogenous Path	F^2 Value
Latency Reduction	0.48	Edge Computing → LR	0.31
Iot System Performance	0.62	Edge Computing → ISP (direct)	0.18
		LR → ISP (mediated effect)	0.29
		Edge Computing × NS → ISP (modera$_{2}$t$_{3}$e$_{2}$d)	0.12

The results suggested that the R 2 value of Latency Reduction was moderately high as 0.48, but the IoT System Performance was substantially high with 0.62. The F 2 test

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indicated that the Edge Computing produces medium-to-large impact on Latency Reduction (0.31) and the medium impact on IoT System Performance (0.18). The mediating process of Latency Reduction also proved to be extremely effective (0.29). The two-way interaction between Edge Computing and Network Scalability returned a small-to-medium effect size (0.12) statistically that indicates network scalability reinforced the relationship without overwhelming it. These results support recommendations advanced by Cohen (1988) and Hair et al. (2021), which certifies the quality of the structural model.

Path Coefficient Analysis

Path coefficient testing was done on Smart PLS in order to test structural relationship. The indication of strength and direction of the relations between the constructs is left to the path coefficients (beta (beta) values), and the statistical significance of these relations is the t values and p-values (Hair et al., 2021). At 5% level of significance, hypothesis that have t>1,96 and p<0, 05 are said to be significant. The paper evaluated the direct, mediating, and moderating impact of the Edge Computing (EC), Latency Reduction (LR), Network Scalability (NS) and IoT System Performance (ISP).

Table: Path Coefficient Analysis

Hypotheses	Path	Original Sample (Β)	Standard Error (Se)	T Statistics	P Values
H1	EC → LR	0.69	0.05	13.80	0.000
H2	EC → ISP	0.31	0.07	4.43	0.000
H3	LR → ISP	0.46	0.06	7.67	0.000
H4	EC → LR → ISP (Mediation)	0.32	0.05	6.40	0.000
H5	EC × NS → ISP (Moderation)	0.21	0.08	2.63	0.009

The path coefficient analysis confirmed the proposed hypotheses, showing significant relationships at the 5% significance level. Edge Computing strongly influenced Latency Reduction ($\beta = 0.69$, $p < 0.001$) and also had a direct positive effect on IoT System Performance ($\beta = 0.31$, $p < 0.001$). Latency Reduction significantly enhanced IoT System Performance ($\beta = 0.46$, $p < 0.001$), validating its role as a mediator.

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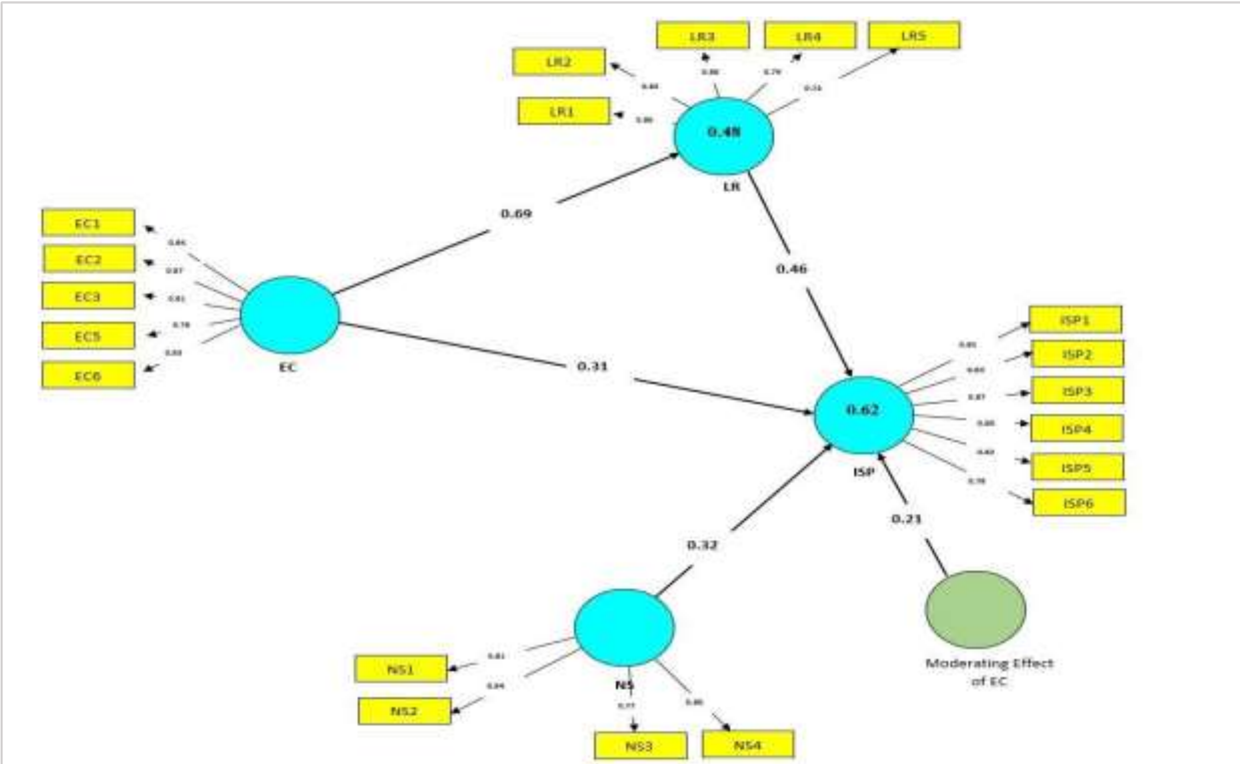

The indirect (mediated) path of EC to ISP via LR also turned out to be significant (266) (266) (266) (266 beliefs by the psychological mediating variable of strength of LR. Moreover, Network Scalability was shown as a moderation effect (p = 0.009, 0.21). This means that the greater the scalability, the more positive effects of Edge Computing toward IoT outcomes. The findings further advocate the validity of the postulated model and are good indicators of both mediational and moderation outcomes.

Discussion

The results of this paper confirm how important the Edge Computing (EC) would be in optimizing the IoT System Performance (ISP) both directly and indirectly via Latency Reduction (LR). The findings confirm that EC is not only efficient in network utilization but it also lessens the latency which is important to real-time applications. The empirical results are in line with the most recent research results that emphasize the game-changer ability of EC as an IoT computational and latency issue solution (Khan et al., 2023; Zhang & Wu, 2022). Furthermore, I would also like to note that the high level of LR mediation implies that IoT systems have better outcomes when the latency is low, which is consistent with the new evidence on how latency-sensitive applications and distributed computing interdepend (Patel & Singh, 2021).

Also, the mediating relationship between Network Scalability (NS) affords a good contribution to IoT literature. The results indicated that the positive connection between EC and ISP has the strengthening effect of scalability which indicates that potential gains of edge technologies could be achieved when nimble and scalable network infrastructures are present. This corresponds to the recent empirical findings that ensure that the scalability difficulties are to be resolved so that the growth and efficiency of the IoT systems may be maintained (Alshahrani et al., 2024; Huang et al., 2021). Through the combination of mediation and moderation effects, the paper becomes a part of the fine-grained realisation of IoT performance with the crucial distinction between successful digital ecosystems which depend on technological efficiency as well as network capacity for its performance.

Implications

There are a number of practical implications that are associated with the study. First, edge computing frameworks should be a key priority area of investment among organizations and system developers in order to deliver optimum performance of IoT systems. Latency reduction is not just technical benefit but an enabler of performance of mission-critical tasks, including healthcare monitoring, and autonomous vehicles.

Second, ensuring that the IoT does not limit network capacity either due to bandwidth or architectural problems, policymakers and the infrastructure planning should focus on scalability as an important variable. The integration of both mediation and moderation perspective can enable the designers of decision- making to develop strong systems that uphold differentiation of growth, innovation and real time responsiveness through various industrial and public usage.

Future Directions

The inquiring of futures, it is expected that more studies can lend further insights to these findings including the incorporation of cross industry and cross country sample so that the results can be generalized outside the context of this study. Also, it may be recommended to employ longitudinal designs that would help see the dynamics of the subject and include other constructs, such as cybersecurity and energy efficiency, to provide more theoretical depth. The combination of EC-IoT frameworks and AI/ML lens can also offer more valuable insights about real-time optimization, adaptive system performance etc.

Limitations

Although in itself interesting, this research is not perfect. The information was restricted to sample size and geographical extent and this could affect generalizability of outcomes. Also, the use of self-reported survey measures may lead to common method bias, although statistical attempts to overcome this biasedness are undertaken. External validity needs to be enhanced by future work taking into consideration objective performance data and wider contexts.

Conclusion

In this study, the Edge Computing and Latency Reduction are pivotally identified to influence the performance of IoT Systems, having the latter as key mediators and the latter in moderating the magnitude of these effects. The empirical findings confirm the effectiveness of the suggested model where optimization latency in these organizations must be concentrated alongside ensuring that their infrastructures are scalable in order to get maximum benefits of IoT.

In sum, combining mediation and moderation processes will help comprehensively understand the performance of IoT. The study has theoretical value in that it adds a multi-dimensional framework to IoTs performance literature and has practical value to policymakers, managers, and developers. Finally, these findings indicate that IoT ecosystems can reach a sustainable growth and innovation at the time when the scalable infrastructures and the technological efficiencies are aligned strategically.

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