



Role of Queue Management Practices in Service Organizations: A Comparative Study in Bengaluru

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Abstract—

Customer dissatisfaction with waiting lines is widespread in urban service settings, yet general satisfaction ratings do not reveal which aspect of queue management is responsible. This study compares queue management practices across Healthcare Clinics, Banking Institutions, Restaurants, and Retail Outlets in Bengaluru; assesses customers' perceptions of five queue-management dimensions; and examines their relationship with overall waiting and service experience. A quantitative, descriptive, cross-sectional, within-subjects comparative design was adopted. A structured Google Forms questionnaire was completed by 121 conveniently sampled respondents, each evaluating all four sectors. The instrument measured Waiting-Time Management, Queue Discipline and Fairness, Waiting Environment, Staff and Service Management, and Information and Technology using five-point Likert items, together with one overall experience rating per sector. Internal consistency was assessed using Cronbach's alpha. Repeated-Measures ANOVA and the Friedman test were used for sector comparisons, followed by Bonferroni-adjusted Wilcoxon signed-rank comparisons where omnibus differences were significant. Spearman's rank correlation examined associations between composite queue management scores and overall experience ratings. Composite queue management differed significantly across sectors ($F = 95.863$, $p < .001$), with means of 2.95 for Healthcare Clinics, 3.15 for Banking Institutions, 3.35 for Restaurants, and 3.54 for Retail Outlets. Waiting-Time Management, Waiting Environment, and Information and

Technology differed significantly across sectors, whereas Queue Discipline and Fairness and Staff and Service Management did not. Composite queue management was positively associated with overall experience in all four sectors ($\rho = .436, .386, .227$, and $.229$, respectively; all $p < .05$). The findings indicate that customer-perceived waiting-time management and information/technology are important areas of cross-sector differentiation in this Bengaluru sample, while the correlational results should not be interpreted as causal effects.

Keywords— queue management; waiting-time perception; service operations; customer service experience; within-subjects design; Bengaluru

I. INTRODUCTION

Waiting is an unavoidable component of many service encounters, but the way a waiting process is organised can shape how customers evaluate the service. Queue management therefore extends beyond reducing elapsed time: it also concerns fairness, information, physical waiting conditions, staff coordination, and the use of technology. Maister's [1] psychology of waiting lines emphasises the role of perceived and expected waiting, while Bitner's [2] servicescape framework highlights the influence of physical

surroundings on service evaluations. More recent empirical work similarly indicates that perceived waiting and expectations may be more closely associated with satisfaction than objective clock time alone [15], and that progress information can affect customers' responses to waiting [4].

Queue research has also demonstrated the operational consequences of capacity constraints. Studies of hospitals, restaurants, and banking systems have used queueing models, simulation, and process-improvement approaches to identify bottlenecks,

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staffing requirements, and service-flow problems [6], [10], [12]. In retail settings, perceived checkout crowding has been associated with emotional discomfort and switching intentions among Bengaluru consumers [14]. These studies, however, generally focus on a single service sector or use different instruments and respondent groups, limiting direct cross-sector comparison.

The present study addresses this gap through a within-subjects design in which the same 121 Bengaluru consumers evaluated Healthcare Clinics, Banking Institutions, Restaurants, and Retail Outlets using an identical five-dimension instrument. The design reduces between-respondent variation in rating tendencies and allows sector comparisons to be made within the same respondent group.

A. Objectives

1. To compare different queue management practices across the selected service sectors in Bengaluru.
2. To assess customers' perceptions of queue management practices across the selected service sectors.
3. To examine the relationship between queue management practices and customers' overall ratings of the waiting and service experience.

B. Research Questions

Queue management is especially relevant in service organisations because customers usually experience the service process before they experience the final service outcome. A customer may therefore evaluate a service encounter partly through how long the wait appears, whether the sequence of service appears fair, whether the waiting space is comfortable, whether staff explain delays, and whether technology makes the customer's position or expected wait visible. These elements are not identical, and a single satisfaction question can conceal important operational differences.

The sectoral context also matters. Healthcare clinics may involve appointments, registration, triage, and uncertainty about consultation duration. Banking institutions commonly use token or counter-based systems and experience demand peaks around particular periods. Restaurants face uncertainty in table availability and seating capacity, while retail outlets often concentrate waiting at checkout points. The same customer may consequently encounter very different queue structures across sectors. A common measurement framework is useful when the purpose is

to compare these experiences rather than to optimise only one type of service system.

The present study therefore treats queue management as a multidimensional construct. The five dimensions were selected to capture both operational and perceptual aspects of waiting: the management of elapsed or expected waiting time, the fairness and discipline of the queue, the physical waiting environment, staff and service coordination, and information and technology. The separate overall waiting/service experience rating provides a concise customer-level outcome against which the composite queue-management measure can be examined.

RQ1: Do queue management practices differ significantly across Healthcare Clinics, Banking Institutions, Restaurants, and Retail Outlets in Bengaluru, both overall and across the five dimensions?

RQ2: How do customers perceive queue management practices across the four sectors in terms of dimension-specific scores and overall sector ratings?

RQ3: Is there a statistically significant association between overall queue management scores and customers' overall waiting and service experience within each sector?

II. LITERATURE REVIEW

The literature reviewed for this study covers operational queue modelling, perceived waiting time, queue fairness, waiting environments, staff conduct, technology, and sector-specific service evidence. Four patterns are particularly relevant to the present study.

A. Operational Management of Waiting and Capacity

Operational studies show that waiting is shaped by the relationship between arrivals, service capacity, staffing, and process design. Hospital studies have used process improvement, artificial intelligence, and capacity planning to reduce delays [6], [10]. Restaurant research similarly demonstrates that server allocation and capacity decisions can materially affect customer waiting [12], [13]. These studies support treating waiting-time management as a distinct operational dimension rather than as a general satisfaction item.

B. Perceived Waiting, Expectations, and Progress Information

Waiting is not experienced solely as elapsed clock time. Zhang et al. [15] reported significant relationships between expected, perceived, tolerance, and reasonable waiting time and patient satisfaction,



while actual clock time was not statistically significant in their model. In another study, communicating expected waiting time altered patient satisfaction, indicating that expectation management can be part of queue management [16]. Caruelle et al. (2023) likewise found asymmetric satisfaction responses when actual waiting was shorter or longer than expected. These findings provide a theoretical and empirical basis for measuring information and perceived waiting alongside operational time.

C. Fairness, Waiting Environment, and Technology

Queue fairness is another component of the waiting experience. Chatterjee [5] examined queue justice in an emerging-market context and found that customers may evaluate service order using considerations beyond strict first-come, first-served rules. The physical waiting environment also matters: Bitner [2] established the servicescape as a component of service evaluation, while more recent studies have highlighted seating, cleanliness, information, and staff responsiveness in healthcare and restaurant settings [1], [9]. Technology can improve queue visibility and convenience, but its effect is context dependent; Obermeier et al. [11] found that queuing technology did not necessarily change overall satisfaction in low-wait retail environments.

D. Research Gap

The literature in this study is largely fragmented by industry: hospitals, restaurants, retail outlets, and banking systems are commonly studied separately. Comparative studies also differ in measurement scales, constructs, and respondent populations. The present study addresses these limitations by using the same five queue-management dimensions and the same 121 respondents across four service sectors in Bengaluru. The within-subjects structure provides a consistent basis for comparing perceptions across sectors.

E. Conceptual Framework

The framework also reflects an important distinction between queue performance and queue perception. A technically efficient process may still be evaluated negatively if customers cannot understand their position, perceive the sequence as unfair, or wait in an uncomfortable environment. Conversely, information, progress visibility, and a suitable environment may moderate the experience of a delay without necessarily changing the underlying service capacity. The present measurement approach does not claim that one dimension is universally more important than

another; instead, it allows the relative pattern across sectors to be observed empirically.

Within this framework, the Composite Queue Management score is calculated as the arithmetic average of the five dimension scores. This composite is used for the overall sector comparison and for the association analysis with the direct experience rating. Dimension-level analysis is retained because two sectors can have similar composite scores while differing in the particular aspects of queue management that generate those scores. The framework consequently supports both an overall comparison and a more diagnostic interpretation.

The study operationalises queue management through five dimensions: Waiting-Time Management (WTM), Queue Discipline and Fairness (QDF), Waiting Environment (WE), Staff and Service Management (SSM), and Information and Technology (IT). The arithmetic mean of these dimensions forms the Composite Queue Management score. The composite score is examined against a separate overall waiting/service experience rating for each sector.

III. METHODOLOGY

A. Research Design

The study used a quantitative, descriptive, cross-sectional, within-subjects comparative design. The same 121 respondents evaluated all four service sectors, producing 484 sector-level evaluations. This repeated-measures structure was selected so that each respondent served as their own comparison point.

B. Population and Sampling

The population comprised customers in Bengaluru with experience of queuing for service at healthcare clinics, banking institutions, restaurants, and retail outlets. Convenience sampling was used. The final usable sample was 121 respondents.

C. Instrument and Measurement

Data were collected through a structured, self-administered Google Forms questionnaire. The instrument contained three demographic items, 80 Likert-scale queue-management items (five dimensions $\times$ four items $\times$ four sectors), and four overall sector-rating items. Dimension items were rated from 1 (Strongly Disagree) to 5 (Strongly Agree). The overall sector item used a five-point scale from Very Poor to Very Good.

D. Data Collection and Ethics

Data were collected online between 9 and 14 September 2026. Participation was voluntary and the questionnaire stated that responses would be used for



academic purposes. No names, contact details, or precise locations were collected. Respondents supplied only age group, gender, frequency of service use, and their sector-wise ratings.

E. Reliability and Statistical Analysis

The repeated-measures structure has a direct implication for inference. Because the four sector observations for each respondent are linked, an independent-samples ANOVA or independent-samples t-test would not reflect the actual structure of the data. Repeated-Measures ANOVA accounts for the fact that observations from the same respondent are related. The Friedman test provides a complementary rank-based comparison for the same matched observations. Reporting both tests is useful because the survey uses Likert-type measures and because the two procedures rely on different distributional assumptions.

The post-hoc procedure was applied only where the omnibus comparison indicated a statistically significant sector difference. There are six possible pairs among four sectors. Without adjustment, repeated pairwise testing would increase the family-wise probability of a false-positive finding. The Bonferroni procedure therefore uses an adjusted significance threshold of $.05/6 = .0083$ for each family of six comparisons. The Wilcoxon signed-rank test was selected because each pair consists of two related observations from the same respondents.

For Objective 3, Spearman's rank correlation was used because the variables originate from ordinal response scales and because the research question concerns association rather than prediction or causal explanation. A positive coefficient indicates that higher queue-management scores tend to occur with higher overall waiting/service experience ratings. The coefficient should not be interpreted as evidence that changing queue management would necessarily produce a corresponding change in the experience rating.

Cronbach's alpha was calculated for each dimension within each sector. Sector comparisons were examined using Repeated-Measures ANOVA and the Friedman test. Where omnibus tests were significant, pairwise sector comparisons were examined with Wilcoxon signed-rank tests and Bonferroni adjustment. Spearman's rank correlation was used to examine the association between composite queue management scores and overall waiting/service experience ratings. Statistical decisions used $\alpha = .05$; the Bonferroni-adjusted pairwise threshold was .0083.

IV. RESULTS AND DISCUSSION

A. Reliability

All 20 alpha coefficients exceeded .70, ranging from .723 to .952, indicating acceptable to very high internal consistency for the four-item dimension scales.

B. Descriptive Statistics

Tables I and II present the mean scores for the five queue-management dimensions and the resulting Composite Queue Management score for each service sector. The composite score is the arithmetic mean of the five dimension scores.

Table I: Mean Scores of Queue-Management Dimensions by Sector

Sector	Mean scores
Healthcare Clinics	WTM = 2.66; QDF = 3.20; WE = 2.92
Banking Institutions	WTM = 3.05; QDF = 3.29; WE = 3.05
Restaurants	WTM = 3.43; QDF = 3.33; WE = 3.24
Retail Outlets	WTM = 3.82; QDF = 3.44; WE = 3.46

Table II: Staff, Technology, and Composite Queue-Management Scores

Sector	Mean scores
Healthcare Clinics	SSM = 3.28; IT = 2.69; Composite QM = 2.95
Banking Institutions	SSM = 3.32; IT = 3.04; Composite QM = 3.15
Restaurants	SSM = 3.29; IT = 3.48; Composite QM = 3.35
Retail Outlets	SSM = 3.29; IT = 3.68; Composite QM = 3.54

Waiting-Time Management showed the largest mean spread (2.66 to 3.82), followed by Information and Technology (2.69 to 3.68) and Waiting Environment (2.92 to 3.46). Queue Discipline and Fairness varied within a narrower range (3.20 to 3.44), while Staff and Service Management varied only from 3.28 to 3.32.

C. Comparative Tests

Table III reports both the Repeated-Measures ANOVA and Friedman test results. The two



procedures reached the same statistical decision for every construct.

Table III: Comparative Tests Across Service Sectors

Construct	Comparative results	test
Overall	RM-ANOVA	F =
Queue	95.863, $p < .001$;	
Managem	Friedman	$\chi^2 =$
ent	138.110, $p < .001$	
Waiting-		
Time	F = 60.254, $p < .001$;	
Managem	$\chi^2 = 118.985$, $p < .001$	
ent		
Queue	F = 2.400, $p = .068$; χ^2	
Discipline	= 3.833, $p = .280$	
& Fairness		
Waiting	F = 13.474, $p < .001$;	
Environm	$\chi^2 = 32.383$, $p < .001$	
ent		
Staff &		
Service	F = 1.267, $p = .285$; χ^2	
Managem	= 5.023, $p = .170$	
ent		
Informatio		
n &	F = 58.682, $p < .001$;	
Technolog	$\chi^2 = 111.278$, $p < .001$	
y		

The Repeated-Measures ANOVA and Friedman test reached the same decision for every construct. Overall queue management, Waiting-Time Management, Waiting Environment, and Information and Technology differed significantly across sectors. Queue Discipline and Fairness and Staff and Service Management did not show statistically significant cross-sector differences.

D. Post-Hoc Pairwise Results

All six pairwise comparisons were significant for the Composite Queue Management score and for Waiting-Time Management after Bonferroni adjustment. For Waiting Environment, three of six comparisons were significant: Healthcare Clinics versus Restaurants (adjusted $p = .0021$), Healthcare Clinics versus Retail Outlets (adjusted $p < .001$), and Banking Institutions versus Retail Outlets (adjusted $p = .0003$). For Information and Technology, five of six comparisons were significant; Restaurants versus Retail Outlets was not significant after adjustment (adjusted $p = .0953$).

E. Association with Overall Experience

The descriptive results and the correlation results point in the same broad direction: sectors with higher composite queue-management ratings also tend to receive higher direct overall experience ratings within this respondent sample. However, the magnitude of the association is not identical across sectors. Healthcare Clinics show $\rho = .436$, Banking Institutions $\rho = .386$, Restaurants $\rho = .227$, and Retail Outlets $\rho = .229$. Thus, the relationship is positive in all four settings but varies in strength.

This variation is substantively relevant. It suggests that customers' overall waiting/service experience is related to their assessment of queue management, while also indicating that the global experience rating contains information beyond the five queue-management dimensions. The study does not include additional causal variables such as service quality, price, clinical outcome, product choice, or employee performance, so the correlations should not be interpreted as an exclusive explanation of overall experience.

Because each respondent rated all four sectors, the correlation estimates are based on the same respondent pool but on sector-specific pairs of variables. The findings therefore describe associations within the observed Bengaluru sample rather than population-level causal effects.

Table IV: Spearman Correlation Between Composite Queue Management and Overall Experience

Sector	Spearman correlation
Healthcare Clinics	$\rho = 0.436$; $p < .001$
Banking Institution	$\rho = 0.386$; $p < .001$
s	
Restaurant	$\rho = 0.227$; $p = .012$
s	
Retail Outlets	$\rho = 0.229$; $p = .012$

Composite queue management was positively associated with the overall waiting/service experience rating in every sector. The coefficients indicate monotonic association; they do not establish that queue management caused the observed experience ratings.

F. Discussion

The cross-sector pattern is consistent with the distinction in the literature between operational waiting and the customer's perception of that waiting.



Waiting-Time Management and Information and Technology displayed the largest sector-level differences in the present sample, while Queue Discipline and Fairness and Staff and Service Management were comparatively stable. This pattern is compatible with research showing that perceived waiting, expected waiting, and progress information can shape service evaluations [15], [4].

The significant differences in Waiting Environment also align with servicescape research, which treats physical surroundings as part of the service experience [2]. However, the post-hoc results show that not every sector pair differed on this dimension, suggesting that environmental perceptions were less sharply separated than waiting-time perceptions.

The positive associations between composite queue management and overall experience across all four sectors are consistent with the broader service literature linking waiting conditions with customer evaluations [3], [7]. The association was stronger in Healthcare Clinics and Banking Institutions than in Restaurants and Retail Outlets in this sample. Because the study is cross-sectional and correlational, this pattern should be interpreted as an association rather than a causal effect.

The within-subjects design is an important methodological feature. Every respondent evaluated all four sectors using the same instrument, reducing the influence of differences between separate respondent samples. At the same time, the single-session structure may have introduced fatigue or order effects, and the convenience sample limits generalisability.

V. CONCLUSION

This study examined queue management practices across Healthcare Clinics, Banking Institutions, Restaurants, and Retail Outlets in Bengaluru using a five-dimension within-subjects framework. The results show significant cross-sector differences in overall queue management, Waiting-Time Management, Waiting Environment, and Information and Technology, while Queue Discipline and Fairness and Staff and Service Management did not differ significantly. Composite queue management was positively associated with overall waiting/service experience in every sector. The findings therefore support viewing queue management as a multidimensional service-operations construct in which both process speed and information visibility form important components of the customer-perceived waiting experience.

A. Managerial Implications

The dissertation proposes sector-specific managerial responses based on the observed dimension means. For Healthcare Clinics, real-time mobile queue-status communication, appointment slotting, and waiting-area improvements are proposed in response to comparatively lower Waiting-Time Management, Information and Technology, and Waiting Environment scores. For Banking Institutions, digital token systems, peak-period counter reallocation, and improved advisory waiting areas are proposed. For Restaurants, digital waitlists, pager systems, and pre-seating improvements are proposed. For Retail Outlets, continued self-checkout/mobile checkout provision and clear express-lane discipline are proposed. These are recommendations derived from the descriptive findings; they were not tested as interventions in this study.

B. Limitations and Future Research

An additional limitation concerns measurement context. The questionnaire asks respondents to evaluate service sectors as categories rather than recording a contemporaneous queue episode with an objectively observed arrival time, service start time, queue length, and service completion time. The results therefore represent customer perceptions and remembered service experiences, which are appropriate to the stated objectives but should not be treated as operational time measurements.

Future research could strengthen the framework by combining the existing perception instrument with objective operational indicators. For example, researchers could record actual waiting time, number of customers in the queue, number of active servers, peak and off-peak periods, abandonment or renegeing, and the use of digital queue systems. Linking these measures with customer ratings would help distinguish whether a lower perception results from longer physical waiting, poor information, environmental discomfort, fairness concerns, or other service characteristics.

A longitudinal design could also examine whether perceptions change after a queue-management intervention. Sector-specific experiments could test appointment slotting in clinics, dynamic counter allocation in banking, digital waitlists in restaurants, or self-checkout and express-lane interventions in retail. Such designs would be more suitable for examining causal effects than the present cross-sectional correlation analysis. Replication with probability or stratified sampling across different



Bengaluru zones and other Indian cities would further improve the external validity of the findings.

Finally, future studies could examine whether age, service-use frequency, purpose of visit, or digital familiarity moderates queue perceptions. The present study deliberately focuses on sector comparison using the same respondents, so these subgroup questions fall outside its primary analytical scope. They nevertheless provide opportunities to extend the five-dimension framework without changing its core comparative logic.

The findings are limited by the convenience sample of 121 respondents, the single-city setting, the short six-day collection period, self-reported perceptions, and the absence of objective measures such as clock-time waiting, queue length, or server utilisation. The within-subjects questionnaire also required 80 Likert items across four sectors in one sitting, which may have created fatigue or order effects. Future research could combine customer perceptions with objective operational measures, replicate the framework in additional cities, and use longitudinal or experimental designs to examine changes following specific queue-management interventions.

C. Declarations

Conflict of Interest: No conflict of interest was reported for the study.

Funding: No external funding was reported for the study.

Ethical Considerations: Participation was voluntary, the academic purpose of the survey was stated, and no personally identifying information was collected. The underlying study does not report a formal institutional ethics approval number.

Data Availability: The study is based on primary survey data collected from 121 respondents. A public data repository was not specified in the underlying study.

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