Chapter

Measuring the Service Quality of Mobile Smart Devices: A Framework for Best Practices

Abdulla Jaafar Desmal and Zainab Merza Madan

Abstract

This chapter presents a comprehensive framework for measuring and managing service quality of mobile smart devices across seven key dimensions: interactions, usability, efficiency, information quality, availability, security, and reliability. Grounded in established models like SERVQUAL and E-S-QUAL, the framework identifies specific metrics based on user perceptions for evaluating expertise, accuracy, responsiveness, and customization. The SERVQUAL model outlines five service quality dimensions: tangibles, reliability, responsiveness, assurance, and empathy. E-S-QUAL adapts these to the digital environment. The proposed framework draws on these seminal models while incorporating new factors relevant to interconnected, artificial intelligence (AI)-enabled mobile platforms and devices. The framework is designed to enable proactive service quality management throughout the customer journey with mobile smart devices—from product design and testing to postsales support. A continuous measurement, analysis, and improvement process is outlined involving quantitative and qualitative techniques. An implementation road map covers considerations for organizing, change management, and training to integrate the methodology into product development processes. The goal is to provide technology companies with actionable and evidence-based guidance for optimizing satisfaction and loyalty among mobile smart device consumers. As these devices continue proliferating, managing user expectations through integrated hardware, software, and service experiences will be key to competitive positioning in mobile ecosystems.

Keywords: service quality, mobile devices, user experience, satisfaction, loyalty, SERVQUAL, E-S-QUAL

1. Introduction

1.1 Background and importance of service quality for mobile smart devices

The widespread adoption of mobile smart devices like smartphones and tablets has fundamentally transformed how consumers interact with technologies and access information and services. As digitalization accelerates, mobile platforms provide ubiquitous connectivity and enable innovative applications across many aspects of life including entertainment, social connections, shopping, finances, health, education,

and more. Consequently, mobile devices have become deeply integrated into daily routines for many people.

Service quality is critically important for providers of mobile platforms and applications to satisfy users, meet expectations, and encourage engagement. Perceived service quality directly influences customer satisfaction, loyalty, and long-term business success. However, evaluating and measuring quality can be complex for mobile contexts due to unique characteristics like intangibility, variability across users and contexts, and continuously evolving technologies and features. Service quality remains a high priority but also an ongoing challenge.

1.2 Challenges and opportunities of service quality for mobile smart devices

Delivering high-quality service through mobile platforms involves many potential complications. Device limitations, connectivity issues, security risks, and technology glitches can degrade experiences. Frequent feature updates change how people interact with apps and information. Diverse usage contexts like location, activity, or goals alter perceptions of quality. Personalization and customization enable more tailored experiences but also greater variability. Rapid evolution cycles continually reshape mobile technologies and ecosystems.

Despite these hurdles, mobile services also provide exciting possibilities to improve quality in innovative ways. Smart sensors and usage data analytics offer insights to understand users and contexts to optimize experiences. Machine learning (ML) and artificial intelligence (AI) can power intelligent assistance and interactions. 5G and enhanced mobile broadband will enable more immersive and seamless services. Leveraging these capabilities can enhance quality but requires adaptable strategies.

1.3 Purpose and outline of chapter

This chapter provides a comprehensive framework to evaluate and guide service quality management for mobile smart devices. Key objectives are to:

- Review established service quality theories and adapt principles to mobile environments.
- Identify core dimensions and metrics to assess mobile service quality.
- Develop implementation strategies for measurement, analysis, and improvement.

1.4 Defining service quality

Service quality refers to a customer's evaluation of how well a provided service meets expectations and satisfies needs [1]. It involves both subjective and objective factors across multiple dimensions. High-quality service directly leads to positive outcomes like customer satisfaction, loyalty, word-of-mouth promotion, and long-term business success [2]. The most widely used framework characterizes service quality along five key dimensions: reliability, assurance, tangibles, empathy, and responsiveness [3]. Reliability focuses on providing dependable and accurate service.

Assurance involves knowledge, competence, and courtesy of staff. Tangibles cover physical facilities, equipment, and overall presentation. Empathy relates to caring and individualized attention to customers. Responsiveness concerns promptness and ability to deliver timely service.

1.5 Mobile service quality

In the context of mobile platforms and applications, characteristics like intangibility, variability, and rapid evolution require adapting traditional service quality concepts [4]. Key dimensions include network quality covering connectivity and transmission; content quality focused on accuracy, completeness, and format; interaction quality dealing with operability, convenience, and customization; and contextual quality aligned to usage situations [5]. Both subjective perceptions and objective performance metrics are important for mobile service quality.

1.6 Strategic importance

Achieving high mobile service quality has become strategically vital for many businesses and organizations. Mobile channels are often the primary way companies engage with customers and provide services and support. With growing reliance on mobile platforms, any shortcomings in service quality can negatively impact customer acquisition, retention, loyalty, and profitability [6]. Organizations must continuously monitor, assess, and improve mobile service quality to enable positive experiences that fulfill user needs and expectations.

2. Service quality models

Service quality has been studied extensively across disciplines including marketing, management, and information systems science. Several foundational models that inform research on mobile service quality have been developed.

2.1 SERVQUAL model

One of the most widely adopted service quality frameworks is the SERVQUAL model developed by Parasuraman, Zeithaml, and Berry (1988). This model characterizes service quality along five key dimensions:

- Reliability – ability to perform the promised service dependably and accurately.
- Assurance – knowledge and courtesy of employees and their ability to convey trust and confidence.
- Tangibles – appearance of physical facilities, equipment, personnel, and communication materials.
- Empathy – caring, individualized attention provided to customers.
- Responsiveness – willingness to help customers and deliver prompt service.

The SERVQUAL model proposes that service quality depends not just on actual service delivery, but also the gaps between a customer's expectations and their perceptions of the service experience. By measuring both expectations and perceptions across these five dimensions through surveys or interviews, providers can identify areas where perceived service falls short of desired expectations. This framework equips organizations to understand customer perspectives and target improvements accordingly.

The SERVQUAL instrument has been applied in many industries and service contexts, making it one of the most widely utilized service quality models. However, SERVQUAL has faced some criticism. The expectation-perception gap approach can be difficult to implement reliably, with debate about whether customers can accurately recall preservice expectations [7]. The five dimensions may not fully capture all possible facets of service quality. Applicability across various service contexts has also been questioned [8].

Nonetheless, the SERVQUAL model pioneered the conceptualization of service quality as a multidimensional construct. It provides a useful foundation and starting framework that can be adapted or supplemented for specific service contexts. The model's focus on understanding customer perspectives through the gaps approach gives important insights for managing service quality. As such, SERVQUAL has strongly influenced subsequent service quality research and frameworks.

2.1.1 SERVPERF model

A widely employed adaptation of SERVQUAL is the SERVPERF model developed by Cronin and Taylor (1992). This streamlined model is based solely on perceived service performance rather than expectation-perception gaps. SERVPERF measures customer perceptions of quality across the same five SERVQUAL dimensions, without directly measuring prior expectations [7].

Cronin and Taylor (1992) empirically tested both SERVQUAL and SERVPERF approaches and found perceived performance alone accounted for more of the variation in customer satisfaction. They argued service providers should focus primarily on performance delivery rather than expectation management. The SERVPERF model simplifies data collection and analysis by relying only on performance measures. Subsequent studies have affirmed SERVPERF explains more variance in satisfaction and loyalty.

However, conceptual arguments for incorporating expectations remain strong. Customers often have preconceived service expectations that if unmet can undermine perceptions [9]. Measuring gaps can identify problem areas directly, rather than just low perception scores. Thus while SERVPERF offers advantages in execution, SERVQUAL provides richer diagnostics. Each approach has merits for developing mobile service quality frameworks.

2.1.2 IT alignment model

An important perspective for managing quality of technology-enabled services comes from the information systems (IS) success model developed by DeLone and McLean (2003). This model provides a comprehensive framework highlighting the interrelated dimensions of information quality, system quality, and service quality that drive intentions to use, user satisfaction, and net positive benefits. A key emphasis is the need to carefully adapt metrics and measures of IS success to the specific technology, application, and usage context [10].

As mobile platforms transform service ecosystems, enabling new forms of service delivery, consumption, and value creation, the DeLone and McLean framework provides critical guidance to reevaluate service quality assessment. Traditional models like SERVQUAL may not fully capture new dynamics, interactions, and outcomes made possible by smart mobile technologies and interfaces. More adaptable, context-aware approaches are required.

The DeLone and McLean model defines quality constructs as follows:

- Information quality – Considers content issues like completeness, accuracy, format, and timeliness of information. High information quality requires delivering current, reliable, and personalized content.

- System quality – Focuses on usability factors like accessibility, ease of use, system flexibility, and integration. High system quality provides simple, dependable, and intuitive technical interfaces.

- Service quality – Measures overall support delivered by service providers. It shares key dimensions with SERVQUAL including reliability, responsiveness, assurance, and empathy.

A key insight is distinguishing the separate but interdependent roles of information, system, and service quality for overall user satisfaction and system success. For mobile service ecosystems, advanced interfaces and content delivery may exceed traditional support services in dominating quality perceptions.

The model also emphasizes relationships between quality constructs, usage intentions, user satisfaction, and net benefits. Service quality alone is insufficient—positive outcomes depend on optimizing information and system quality. High information and system quality can also compensate for some service delivery shortcomings.

This model provides a more holistic, context-aware perspective on service quality. It underscores the need for flexible, multidimensional approaches adaptable to evolving mobile platforms and usage contexts. As technology-enabled services transform, so must measurement frameworks to capture new drivers of quality perceptions and system success.

2.1.3 Hierarchical model

Brady and Cronin (2001) proposed a multidimensional, multilevel conceptualization of service quality known as the Hierarchical Model. This model asserts that customers form perceptions of quality based on evaluations of performance at different levels [11].

The three primary levels in the hierarchy are:

- Interaction quality – The lowest level representing the interaction between a customer and service provider. It includes factors like attitude, behavior, expertise, and communication of employees.

- Physical environment quality – The second level covers ambient conditions, design, and social factors related to the servicescape. It ranges from intangible aspects like the atmosphere to tangible elements such as facilities and equipment.

- Outcome quality – The highest level focused on the results and what is accomplished through the service act. It encapsulates perceptions of what the customer obtains from the service experience.

A key premise is that customers make bottom-up quality judgments across these levels. Interaction quality lays the foundation. The environment and conditions surrounding service delivery form the next facet of evaluation. Finally, the ultimate outcome achieved determines perceptions of highest-level quality.

The model further proposes three subdimensions of quality for each level:

- Quality of service product – Core service functionality and offerings.
- Quality of service delivery – How the service is provided.
- Quality of service environment – Conditions under which service occurs.

By distinguishing between hierarchical levels and quality subdimensions, this model provides a more nuanced, multidimensional conceptualization of service quality. It moves beyond the SERVQUAL focus on just customer-employee interactions to also encapsulate broader environmental and outcome considerations.

For mobile service contexts, mapping quality perceptions to interaction, environment, and outcome levels can give greater diagnostic precision. Interaction may translate to human-device interactions and interfaces. The service environment consists of mobile hardware, operating platforms, and ecosystems. Outcomes depend on how technology-enabled services generate value across user contexts. A hierarchical approach allows linking specific quality issues to subdimensions within appropriate levels. This framework enhances understanding of multidimensional drivers to optimize mobile service quality.

2.1.4 Synthesis of models

The service quality models reviewed offer complementary conceptual perspectives for examining mobile service quality characteristics and requirements. While differing in their specific approaches, several key insights emerge across the major frameworks that can inform an integrative mobile service quality model:

- Multidimensional construct – Service quality is widely recognized across models as a multidimensional construct comprised of complex, interdependent subdimensions. Assessment requires a holistic perspective across key facets like interaction quality, environment quality, outcome quality, system performance, content quality, human-computer interaction, customer support, subjective perceptions, and value creation. No single dimension fully represents overall service quality. An integrative model must incorporate key dimensions specific to mobile service ecosystems.
- Adaptable measures – Models emphasize selecting appropriate metrics and adapting evaluation frameworks to fit different technologies, applications, and usage contexts. Mobile services have distinct characteristics necessitating customized, context-aware measures that capture new ecosystem dynamics, interactions, and outcomes enabled. Traditional models provide useful starting points but mobile-specific adaptations are required.

- Gaps modeling – Understanding gaps between customer expectations and perceptions provides powerful diagnostics to precisely identify problem areas. Assessing only perception of actual service performance is insufficient to fully determine drivers of quality shortfalls. Comparing user expectations to real-world service delivery gives greater precision in diagnosing issues. This vital gaps perspective must be incorporated to enable targeted mobile service improvements.

- Hierarchical levels – Layered quality models highlight that customers evaluate service quality at multiple levels, from discrete touchpoint interactions up to the overall environment and ultimate end results. Mobile services should be examined at interactive, environmental, and outcome dimensions to provide a complete perspective. This mapping of service quality levels gives greater insight into multidimensional drivers.

- Customer perspective – Incorporating subjective customer perceptions, rather than just objective performance metrics, provides crucial insights into quality judgments. For mobile services especially, quality hinges on how users experience and evaluate services within their particular contexts. Quantitative metrics must be complemented by qualitative insights from the user standpoint.

- Continuous improvement – Models recognize service quality as dynamic, necessitating ongoing monitoring, assessment, and enhancement. Mobile service providers must continually track shifting usage patterns, technology changes, perception evolutions, and outcome metrics to maintain quality as ecosystems rapidly transform. A continuous improvement mindset is essential.

These shared principles can guide synthesizing the strengths of each model into an integrative mobile service quality framework. Key tenets include:

- Assessing multiple dimensions spanning system performance, content delivery, human-computer interaction, customer support, and value creation.

- Adapting dimensional measures and evaluation models specifically for mobile service environments.

- Quantifying expectation-perception gaps across dimensions to pinpoint improvement opportunities.

- Mapping quality perceptions to interactive, environmental, and outcome levels.

- Bridging objective performance metrics with subjective user perspectives.

- Enabling continuous improvement closed-loop processes, given contextual dynamism.

No single model fully captures the complexity of assessing and managing mobile service quality. However, synthesizing elements of established models provides a robust foundation. The SERVQUAL model delivers core quality dimensions along with the vital gaps perspective. The DeLone and McLean IS Success Model

emphasizes adaptable, context-specific measures spanning information, system, and service quality. Brady and Cronin's Hierarchical Model provides a multilayered view to map quality perceptions. The SERVPERF model focuses on performance metrics from the customer standpoint.

An integrative mobile service quality framework should incorporate synthesized elements:

- Customized quality dimensions spanning technology performance to experience to value.
- Gap analysis between expectations and perceptions across all dimensions.
- Levels ranging from component interactions to holistic service ecosystems.
- Objective metrics paired with subjective customer viewpoints.
- Continuous monitoring and improvement processes to track evolving contexts.

In essence, the integrative framework must be multidimensional, adaptable, hierarchical, gaps-driven, customer-centric, and dynamically managed to address complex and rapidly changing mobile service environments. This provides a robust platform to comprehensively evaluate and enhance mobile service quality from multiple crucial perspectives.

2.1.5 Challenges and tradeoffs

However, developing and implementing such an integrative framework also poses challenges and tradeoffs that must be considered:

- Model complexity – A multidimensional, layered model with adaptable metrics and continuous improvement processes will be more complex to conceptualize, operationalize, and manage. Simpler models may be easier to apply but provide less comprehensive insights.
- Measurement difficulty – Assessing expectations gaps, hierarchical levels, and subjective perceptions will require more extensive and specialized data collection through surveys, interviews, and analytics. Detailed contextual data are harder to gather consistently.
- Framework customization – Adapting measures and models for different mobile services and usage contexts demands significant upfront customization efforts and expertise. A one-size-fits-all approach will have less applicability.
- Data integration – Bridging diverse datasets like technical performance indicators, customer feedback, and usage metrics poses analytical and interpretive difficulties. Integrating insights is more challenging than isolated data streams.
- Resource requirements – Implementing continuous improvement processes and multidimensional monitoring requires more extensive technology, staffing, and management resources to coordinate. Budget limitations may constrain framework scope.

These challenges underscore why many providers apply only simplified service quality models. Yet, the integrative approach delivers significant benefits in providing complete, targeted, and actionable intelligence to drive mobile service excellence.

3. Toward an integrative model

Synthesizing established service quality models provides a strong conceptual foundation for an integrative mobile service quality framework. However, translating these concepts into an operational model requires further specification of dimensions, measures, and data integration strategies.

3.1 Potential dimensionality

Dimensions that could comprise an integrative model include:

- Interaction quality: Covers interactions between the user and the mobile device, app interfaces, virtual assistants, support channels, and any direct touchpoints. Key metrics include ease of use, convenience, customization, and communication effectiveness.

- Platform quality: Encompasses the underlying mobile operating system and capabilities including connectivity, speed, reliability, security, and device/app ecosystem integration. Focuses on performance measures.

- Content quality: Assesses the delivered information and services via the mobile platform including completeness, accuracy, relevance, timeliness, visual appeal, and personalization.

- Support quality: Measures availability, responsiveness, assurance, empathy, and communication of any customer support channels provided by the mobile service provider. Aligns with SERVQUAL dimensions.

- Contextual value: Subjective user-based assessment of how well the mobile services improve experiences or add value across usage contexts like work, leisure, shopping, travel, etc. Captures value-in-use.

These dimensions span technological and human elements of mobile service delivery, incorporating both performance metrics and user perceptions. The dimensions can be mapped to interaction, environment, and outcome quality tiers, with some spanning multiple levels.

3.2 Data collection approaches

Assessing these dimensions requires integrating diverse datasets:

- Technical performance metrics: Platform data on reliability, availability, throughput, latency, and other indicators from monitoring tools, network measurements, and operations records.

- User behavior analytics: Application usage patterns, journeys, and behaviors derived from mobile analytics platforms and app telemetry data. Provides insights into interaction quality.

- Subjective user feedback: Surveys, interviews, and self-reports to measure perceived quality across dimensions including contextual value added. Enables quantifying expectation-perception gaps.

- Support service metrics: Key performance indicators for customer support channels like call center response times, resolution rates, satisfaction scores, and usage volumes.

- Contextual data points: Situational details like user location, activity, goals, and other contextual variables that may affect quality perceptions and value. Can be collected via mobile sensors, surveys, or interviews.

Integrating these data streams provides a holistic, multidimensional dataset for model development and application. Advanced analytics techniques can help bridge quantitative and qualitative data. Contextual data add a crucial mobile-specific element.

3.3 Analysis and interpretation

Key analysis techniques include:

- Correlation analysis: Determine relationships and interdependencies between quality dimensions, technical metrics, perceptions, and value levels. Highlight the strongest drivers.

- Regression modeling: Estimate models predicting overall service quality and value based on dimension fulfillment levels. Identify the most significant dimensions for improvement prioritization.

- Gap scoring: Quantify gaps between user expectations and perceptions for each dimension. Diagnose shortfalls requiring attention, guided by gap magnitude.

- Context analytics: Profile variation in quality perceptions, gaps, and value across contextual variables. Adapt dimensions to usage situations.

- Journey mapping: Understand quality shortfalls across temporal user journeys encompassing multiple touchpoints. Identify problematic steps.

Interpreting integrated results requires a collaborative, cross-functional approach with stakeholders spanning technology, operations, marketing, and product teams. Statistical findings must be translated into tactical interventions personalized to each mobile service. Ongoing iteration and learning is critical for continuous enhancement.

3.4 Implementation architecture

A high-level architecture for an integrative mobile service quality platform includes:

a. Data ingestion infrastructure: Ingests technical metrics, user analytics, survey data, and other sources into a unified data lake, applying cleaning and transformation pipelines.

b. Analytics engine: Provides a toolkit to execute correlation analysis, regression modeling, gaps scoring, contextual analytics, journey mapping, and other techniques on the integrated dataset.

c. Interpretation tools: Enables collaborative filtering, visualization, and annotation of analysis results to extract insights. Provides capabilities to derive interventions.

d. Improvement processes: Closes the loop by linking identified issues to solution development workflows, postimplementation tracking to measure improvements, and capability building for ongoing enhancement.

e. Governance framework: Establishes policies, standards, controls, and processes to manage data collection, storage, access permissions, privacy, lifecycles, and overall platform security.

A modular architecture provides flexibility to start with foundational elements and expand capabilities over time. Open frameworks and interoperable components can integrate with existing mobile data and analytics investments, where possible. With thoughtful design, integrative mobile service quality platforms can deliver ongoing value.

This section has outlined potential strategies and components to progress from conceptual models to an operationalized integrative framework. Further elaboration and specificity would be required based on particular mobile service contexts. However, a multidimensional, data-driven approach following user-centric design principles demonstrates feasibility and value.

3.5 Critical evaluation and limitations

While an integrative model offers benefits, critical evaluation also reveals limitations that should be considered in implementation:

a. Generalizability vs. Contextualization Tradeoff

An integrative model aims to provide a generalizable framework by synthesizing findings across contexts. However, effective implementation requires extensive customization and contextual adaptation. Optimal dimensionality, data sources, analytics, and interventions will differ significantly across mobile service providers, market segments, use cases, and devices. A completely standardized approach lacks contextual precision. Yet, highly individual implementations sacrifice generalizability. Striking the right balance is challenging.

b. Subjective Perceptions vs. Objective Metrics Tension

Incorporating both subjective customer perceptions and objective performance metrics provides a more complete picture. But discrepancies between perceived quality and measured quality will inevitably arise, requiring interpretive caution. Relying too much on perceptions risks overlooking actual underlying issues. Focusing solely on technical metrics misses the customer angle. Determining appropriate weight between perspectives is difficult.

c. Static vs. Dynamic Equilibrium

An integrative model must be dynamically adaptable to changing expectations, technologies, and market conditions. But frequent model changes risk instability, inconsistent tracking, and initiative fatigue, if taken too far. The rate of change required to stay current, without introducing instability from continual changes, needs to be deliberately evaluated.

d. Theoretical Ideal vs. Operational Reality

As conceptualized, an integrative framework is thorough yet complex. But resource constraints, data limitations, and siloed teams may restrict implementation scope in reality. Adoption risks remaining superficial without proper organizational supports, resources, and buy-in. A simplified or phased approach may become necessary.

e. Upfront Investment vs. Realized return on investment (ROI)

Significant upfront investment is required to develop and launch an integrative model, with uncertain ROI realization. Short-term costs and resourcing needs could deter adoption, especially if leaders expect immediate returns. A proof-of-value pilot with projected returns backed by data may help secure buy-in for larger implementation.

These limitations warrant further examination to develop mitigation strategies. For instance, general frameworks could be created for common mobile contexts, then customized through rapid prototyping techniques. Change management and participation from both IT and business teams could bridge metrics and perceptions. Gradual rollout can allow stabilizing models before full launch. Despite limitations, an integrative approach carries major potential, if thoughtfully addressed.

4. Key dimensions of mobile device service quality

Multiple frameworks have been proposed for evaluating service quality of technology-based services and products [12–14]. Synthesizing key elements of these models, seven core dimensions emerge as most relevant for mobile smart devices: interactions, usability, efficiency, information quality, availability, security, and reliability.

4.1 Interactions

A primary way users evaluate service quality of mobile devices is through interactive experiences across various touchpoints [15]. This includes physical device interactions, customer service, online account management, and ecosystem integration. Metrics for assessing interaction quality focus on customization, convenience, responsiveness, and employee expertise [16].

Specific metrics include: personalized greeting, polite tone, agent knowledge, query resolution time, convenience of contact channels, proactive communications, and community forum responsiveness. Surveys, interviews, focus groups, and online reviews can collect user perceptions on these interaction metrics [17]. Data analytics on query volumes, channel usage, and response times also provide insights.

4.2 Usability

Usability evaluates how easy and satisfying a mobile device's user interface and hardware are to operate [18]. Key metrics focus on learnability, efficiency, memorability, error handling, and subjective satisfaction [16].

Usability testing and user experience research techniques like prototyping, think-aloud protocols, surveys, and beta testing provide qualitative insights [19]. Analytics on task completion rates and usage patterns supply quantitative usability data. Integrating usability studies throughout product development is crucial.

4.3 Efficiency

Efficiency measures a mobile device's performance in enabling users to accomplish goals and complete tasks [16]. Metrics evaluate processing speed, battery life, storage capacity, app performance, and connectivity quality [20, 21].

Standard benchmarks, usage tests, and technical diagnostics quantify efficiency. User surveys rate perceptions of speed and battery drain. Monitoring app crashes, storage usage, and network connectivity issues highlights problem areas. Efficiency must be balanced with other dimensions like usability and reliability.

4.4 Information quality

Useful, accurate, current, and personalized information is expected from mobile devices [10]. Metrics focus on relevance, completeness, clarity, accuracy, and customization of information presentation.

Surveys, focus groups, and online reviews provide user perspectives on information quality. Automated testing verifies accuracy. Analytics on search queries and content consumption patterns provide insights for improving personalization and recommendations.

4.5 Availability

Availability evaluates service access and uptime [16, 22]. Mobile devices are reliant on networks, servers, and integrations. Metrics assess percentage uptime, service reach, and continuity during roaming and network switching.

Technical monitoring tools track uptime and performance indicators. User feedback reveals availability issues. Location data analyzes network coverage and roaming quality. Availability is a top priority dimension needing continuous monitoring and improvement.

4.6 Security

Perceived security and privacy risks negatively impact user trust and satisfaction [23]. Mobile devices store sensitive personal data. Security metrics focus on vulnerability prevention, detection, and recovery [18].

Testing tools probe known threats and vulnerabilities. User surveys gauge security perceptions. Monitoring systems track fraudulent account access, suspicious network traffic, malware infections, and other threats. Promptly addressing identified issues maintains user trust.

4.7 Reliability

Reliability represents the consistent and error-free operation of mobile hardware, software, and services [16]. Key metrics include device failure rates, software crashes, complaint volumes, and user perceptions of consistency.

Reliability testing under diverse real-world conditions is essential during product development. Postlaunch monitoring of error logs, help desk tickets, returns/repairs, and online complaints guides continuous improvement. User surveys also rate reliability satisfaction.

These seven dimensions provide a comprehensive framework for managing mobile device service quality. The appropriate metrics and measurement methods will vary by product type, development phase, and brand objectives. Ongoing multichannel data collection, analysis, and improvement is critical for aligning with customer expectations.

5. Measurement of service quality

Robust measurement strategies are required to generate data and insights across the mobile service quality dimensions proposed. Integrating quantitative performance indicators with qualitative consumer perspectives provides a comprehensive assessment.

5.1 Quantitative metrics

Quantitative data enable objective assessment of certain service quality elements related to performance, accuracy, availability, and reliability. Useful metrics can be gathered through system monitoring, testing, and analytics.

Network speed and latency benchmarks provide indicators of service efficiency and availability [24]. Standardized tools like Ookla speed tests generate comparable connectivity data across locations. Real-world usage monitoring provides complementary insights into reliability and consistency.

Component reliability can be quantified through testing under diverse operating conditions and usage profiles. Accelerated life tests analyze failure rates and modes

under environmental stress like temperature, vibration, and moisture [25]. These guide engineering improvements and also supply field reliability data.

Software quality metrics based on source code analysis techniques assess the maintainability, testability, reusability, and evolution of mobile apps [6, 26]. Automated static and dynamic analysis identifies vulnerabilities and establishes security benchmarks.

Analytics on app stability, battery and resource usage, crashes, and anomalies in large field data identifies optimization opportunities [27]. Online service uptime and response times are quantifiable through scripts and synthetic monitoring.

Usability metrics based on task times, clicks, conversions, learnability tests, and similar usage data offer objective efficiency indicators complementary to surveys [28]. Data logs provide visibility into usage patterns, while in-product telemetry tracks detailed flows.

5.2 Qualitative feedback

Despite useful insights from usage data, consumer perspectives remain important to fully assess user satisfaction across service dimensions [3]. Surveys, interviews, focus groups, and reviews reveal subjective perceptions difficult to capture through metrics alone.

Standardized rating scales allow statistical analysis and benchmarking. The System Usability Scale [29] and SERVPERF [9] provide validated instruments for measuring perceived service quality. Product-specific questionnaires customized to target contexts are also valuable.

Open-ended feedback through online reviews, interviews, and support channels provides details on pain points. Techniques like sentiment analysis assess emotions and extract common themes from unstructured feedback at scale [30, 31]. High-frequency concerns indicate systemic gaps needing priority action.

In-context user tests and observational studies reveal usability issues and interaction difficulties. Moderated sessions allow deeper probing through follow-up questions and task analysis. Remote synchronous tools have enabled more flexible and scalable qualitative testing [32].

5.3 Customer journey mapping

An emerging qualitative approach is documenting detailed customer journeys to map overall experience across channels and touchpoints [33]. This identifies emotional highs and lows, pain points and vulnerabilities throughout the user lifecycle.

Tools like experience maps, value chain diagrams, and blueprints systematically capture steps customers take before, during, and after transactions. Customer perspectives are integrated across sales, onboarding, engagement cycles, and support [6, 21]. This horizon view highlights priorities.

Journey mapping workshops, ethnographic observation, and longitudinal engagements/diaries provide immersive understanding [34]. Personas, scenarios, and storyboards make the narratives tangible. Comparison across customer segments reveals different needs.

Analytics enrich the qualitative story. Association rules analysis links emotions to touchpoints [30]. Predictive modeling identifies likely pain points and vulnerable moments [35]. Clustering classifies journeys for targeted improvements.

This cross-channel perspective across the lifecycle complements episodic surveys and transactional data with a more holistic view. Customer journey mapping integrates quantitative metrics with rich qualitative insights for driving mobile service enhancements.

6. Managing service quality

Realizing improvements requires processes linking measurement insights with strategic decisions and development prioritization. A culture valuing customer data guides mobile brands to proactively address experience gaps.

6.1 Product design and testing

Service quality focus must begin well before launch through research, prototyping, and design iteration. User needs analysis and usability testing ensure product-market fit and ease of use [19]. Incorporating metrics and feedback into requirement reviews and feature prioritization promotes satisfaction.

Developer communities and public beta testing prerelease enable crowdsourced improvements [21, 32]. Regular usability testing postlaunch identifies adoption barriers. Monitoring app store ratings and social media sentiment guides incremental enhancements.

Experience analytics and in-product telemetry provide granular visibility into painful journeys and optimization opportunities. Continuously built integration and controlled rollouts facilitate data-driven improvements [36].

6.2 Postsales support

Despite best efforts, some defects and quality gaps will remain. Analyzing incoming issues for trends highlights systemic problems versus one-offs. Monitoring channels like app reviews, call centers, online communities, and social media provides voice of the customer insights [37].

Case routing and resolution tracking based on root causes rather than symptoms drive effective diagnosis and prevention. Knowledge bases codify workarounds while development focuses on permanent fixes for common problems.

Over-the-air updates should provide fixes with minimal user effort. Push notifications and in-app messaging inform customers of solutions. Proactive alerts when usage data indicate emerging pain points also boost satisfaction [30].

Continuous improvement of support experience—through tools, training, and community engagement—is as vital as resolving technical issues. Poor service recovery compounds product frustrations.

6.3 Continuous improvement process

Sustaining mobile service quality requires institutionalizing measurement and improvement as an ongoing capability versus isolated initiatives. Regular monitoring of metrics, journey mapping, and cross-functional reviews maintain visibility [33].

Quantitative analytics inform trends and benchmarks. Qualitative insights reveal human impacts. Technical and customer teams should collaborate closely on issues spanning software, hardware, design, and communications.

Improvement goals and projects related to reliability, usability, efficiency, and other dimensions drive progress. Results are validated through sustained metric improvements and user feedback. Enablers like knowledge management, communication rhythms, and continuous education sustain gains.

With rigorous measurement, systematic processes, and cross-functional coordination, mobile brands can deliver service quality on par with innovations in smart devices and applications. The following section concludes with key takeaways.

7. Conclusion

Mobile smart devices deliver capabilities that are unprecedented yet intricately woven into everyday life. As user dependence and spend increases, managing service quality is vital alongside introducing advances. This requires a comprehensive framework spanning technical and human elements.

Key dimensions like interactions, usability, availability, and reliability were outlined. Quantitative metrics and qualitative inputs enable multifaceted measurement. Customer journey mapping provides cross-channel insights. Closing gaps requires continuous processes integrating analytics, consumer data, and multidisciplinary improvement projects.

Further research can refine techniques for specific mobile services and use cases. Comparative benchmarking across demographics and device types would offer additional nuance. As technologies evolve, new dimensions may emerge around interfaces like augmented reality and brain-computer integration.

Nonetheless, the frameworks and best practices presented offer a robust starting point for mobile brands seeking to match service quality with product innovation. In the growing data economy, competitive advantage will be defined by experience delivery as much as smart features. By instilling user-centric service quality across the mobile customer journey, companies can establish durable bonds amid fickle consumers and fleeting technologies.

Author details

Abdulla Jaafar Desmal[1*] and Zainab Merza Madan[2]

1 University of Technology Bahrain, Bahrain

2 Bursa Uludağ University, Bursa, Türkiye

*Address all correspondence to: a.desmal@outlook.com

References

[1] Parasuraman A, Zeithaml VA, Berry L. A conceptual model of service quality and its implications for future research. Journal of Marketing. 1985;**64**(1):41-50. DOI: 10.2307/1251430

[2] Zeithaml VA, Berry LL, Parasuraman A. The Behavioral consequences of service quality. Journal of Marketing. 1996;**60**(2):31. DOI: 10.2307/1251929

[3] Parasuraman A, Zeithaml VA, Berry LL. SERVQUAL: A multiple-item scale for measuring consumer perceptions of service quality. Journal of Retailing. 1988;**64**(1):12-40. DOI: 10.1016/S0148-2963(99)00084-3

[4] Desmal AJ, Hamid S, Othman MK, Zolait A. A user satisfaction model for mobile government services: A literature review. PeerJ Computer Science. 2022;**8**:e1074. DOI: 10.7717/PEERJ-CS.1074/SUPP-3

[5] Desmal AJ, Othman MK, Hamid S, Zolait A. Exploring the information quality of mobile government services: A literature review. PeerJ Computer Science. 2022;**8**:e1028. DOI: 10.7717/PEERJ-CS.1028/TABLE-2

[6] Desmal AJ, Othman MK, Hamid S. The uniqueness of Mobile government service quality: A review on quality drivers. In: 2021 International Conference on Computer Science and Engineering (IC2SE), Padang, Indonesia. 2021. pp. 1-6. DOI: 10.1109/IC2SE52832.2021.9791955

[7] Babakus E, Boller GW. An empirical assessment of the SERVQUAL scale. Journal of Business Research. 1992;**24**(3):253-268. DOI: 10.1016/0148-2963(92)90022-4

[8] Buttle F. SERVQUAL: Review, critique, research agenda. European Journal of Marketing. 1996;**30**(1):8-32. DOI: 10.1108/03090569610105762

[9] Parasuraman A, Zeithaml VA, Berry LL. Reassessment of expectations as a comparison standard in measuring service quality: Implications for further research. Journal of Marketing. 1994;**58**(1):111-124. DOI: 10.1177/002224299405800109

[10] Delone WH, McLean ER. The DeLone and McLean model of information systems success: A ten-year update. Journal of Management Information Systems. 2023;**19**(4):9-30. DOI: 10.1080/07421222.2003.11045748

[11] Brady MK, Cronin JJ. Some new thoughts on conceptualizing perceived service quality: A hierarchical approach. Journal of Marketing. 2001;**65**(3):34-49. DOI: 10.1509/jmkg.65.3.34.18334

[12] Brynjolfsson E, Hu YJ, Rahman MS. Competing in the age of omnichannel retailing. MIT Sloan Management Review. 2013;**54**(4):1-7

[13] Rafiq M, Fulford H. Measuring internet retail service quality using E-S-QUAL. Journal of Marketing Management. 2012;**28**:1159-1173. DOI: 10.1080/0267257X.2011.621441

[14] Zeithaml VA, Parasuraman A, Malhotra A. Service quality delivery through web sites: A critical review of extant knowledge. Journal of the Academy of Marketing Science. 2002;**30**(4):362-375. DOI: 10.1177/009207002236911

[15] Choi KS, Cho WH, Lee S, Lee H, Kim C. The relationships among quality,

value, satisfaction and behavioral intention in health care provider choice: A south Korean study. Journal of Business Research. 2004;**57**(8):913-921. DOI: 10.1016/S0148-2963(02)00293-X

[16] Parasuraman A et al. A conceptual framework for understanding E-service quality: Implications for future research and managerial practice. Journal of Service Research. 2005. pp. 1-46 [Working paper]

[17] Massey AP, Khatri V, Montoya-Weiss MM. Usability of online services: The role of technology readiness and context. Decision Sciences. 2007;**38**(2):277-308. DOI: 10.1111/j.1540-5915.2007.00159.x

[18] Desmal AJ, Hamid S, Othman MK, Zolait A. Exploration of the usability quality attributes of mobile government services: A literature review. PeerJ Computer Science. 2022;**8**:e1026. DOI: 10.7717/PEERJ-CS.1026

[19] Kuniavsky M. Smart Things: Ubiquitous Computing User Experience Design. San Francisco, CA: Morgan Kaufmann; 2010. DOI: 10.1016/C2009-0-20057-2

[20] Lu Y, Zhang L, Wang B. A multidimensional and hierarchical model of mobile service quality. Electronic Commerce Research and Applications. 2009;**8**(5):228-240. DOI: 10.1016/J.ELERAP.2009.04.002

[21] Desmal AJ, Othman MK, Hamid S. Evaluation of Government Service Quality from the Prospective of Reliability. In: International Conference Technology and Entrepreneurship in Digital Society. Russia; Jan 2020. pp. 5-14. DOI: 10.17747/TEDS-2019-5-14

[22] Desmal AJ, Othman MK, Hamid S, Zolait AH. EGovemment service quality measurement scales: A literature review. In: 2019 International Conference on Innovation and Intelligence for Informatics, Computing, and Technologies, 3ICT 2019. Sakhier, Bahrain: Institute of Electrical and Electronics Engineers Inc.; 2019. DOI: 10.1109/3ICT.2019.8910293

[23] Chen SCGSD. Interpreting dimensions of consumer trust in E-commerce. Information Technology and Management. 2009;**4**(3):303-318

[24] Desmal AJ, Hamid S, Othman MK, Zolait AH. Proposed a model to evaluate mGovernment service quality from the perspective of Perceived Ease of Use (PEU). International Conference on Innovation and Intelligence for Informatics, Computing, and Technologies, 3ICT 2022. 2022. DOI: 10.1109/3ICT56508.2022.9990856

[25] Teng X, Pham H. Considerations for combining the uses of accelerates life testing and field service data in reliability and warranty analyses. Reliability Engineering and System Safety. 2006;**91**(9):1014-1021

[26] Jaafar A. Service Quality Framework for Mobile Government Services in Kingdom of Bahrain/Abdulla Jaafar Mohamed Hasan Ali. Kuala Lumpur, Malaysia: Universiti Malaya; 2022

[27] Ciurumelea A, Schaufelbühl A, Panichella S, Gall HC. Analyzing reviews and code of mobile apps for better release planning. In: 2017 IEEE 24th International Conference on Software Analysis, Evolution and Reengineering (SANER), Klagenfurt, Austria; 2017. pp. 91-102. DOI: 10.1109/SANER.2017.7884612

[28] Sauro J, Lewis JR. Quantifying the User Experience: Practical Statistics for User Research. 2nd ed. Morgan Kaufmann, UK: Morgan Kaufmann; 2016

[29] Brooke J. SUS: A 'quick and dirty' usability scale. Usability Evaluation In Industry. 2020;**189**(194):207-212. DOI: 10.1201/9781498710411-35

[30] Liu Y, Teichert T, Rossi M, Li H, Hu F. Big data for big insights: Investigating language-specific drivers of hotel satisfaction with 412,784 user-generated reviews. Tourism Management. 2017;**59**:554-563. DOI: 10.1016/j.tourman.2016.08.012

[31] Zhang Y, Fang Y, Wei KK, Ramsey E, McCole P, Chen H. Repurchase intention in B2C e-commerce - a relationship quality perspective. Information Management. 2011;**48**(6):192-200. DOI: 10.1016/j.im.2011.05.003

[32] Desmal AJ, Alsaeed M, Hamid S, Zolait AH. Feedback for Excellence: Improving mGovernment Services Through User Insights. In: 2023 International Conference on Innovation and Intelligence for Informatics, Computing, and Technologies, 3ICT 2023. 2023. DOI: 10.1109/3ICT60104.2023.10391312

[33] Rosenbaum MS, Otalora ML, Ramírez GC. How to create a realistic customer journey map. Business Horizons. 2017;**60**(1):143-150. DOI: 10.1016/j.bushor.2016.09.010

[34] McColl-Kennedy JR, Zaki M, Lemon KN, Urmetzer F, Neely A. Gaining customer experience insights that matter. Journal of Service Research. 2019;**22**(1):8-26. DOI: 10.1177/1094670518812182

[35] Desmal AJ, Bin Othman MK, Hamid SB, Zolait AH, Kassim NBA. Proposing a service quality framework for Mobile commerce. In: Lecture Notes of the Institute for Computer Sciences, Social-Informatics and Telecommunications Engineering. Bahrain: LNICST; 2019. pp. 203-212. DOI: 10.1007/978-3-030-23943-5_15

[36] Rahman AA, Helo P, Hao Y, Weldeghiorgis A. T. Cloud Manufacturing Provided Selection. Ideal value co-creation a DEMATEL-ANP based approach. 2015;90:338-349

[37] Maalej W, Kurtanović Z, Nabil H, Stanik C. On the automatic classification of app reviews. Lect. Notes Informatics (LNI), Proceedings of - Series Gesellschaft fur Informatik. 2017;**P-267**(3):61-62