Comparing Internal and External User Perceptions of a National Research Funding Information System (NRFIS): A Comparative Study

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Abstract.

Digital transformation in the public sector requires information systems that provide consistent and equitable services to diverse stakeholder groups. A National Research Funding Information System (NRFIS) has become a strategic digital platform for managing research funding processes end-to-end across government institutions, universities, and research organizations. While previous evaluations have examined such systems using structural models, limited attention has been given to differences in perceptions between internal stakeholders and external research stakeholders. This study compares user perceptions regarding System Quality (SY), Information Quality (IQ), Service Quality (SQ), Use (UE), User Satisfaction (US), and Net Benefits (NB) between internal and external users of NRFIS. A total of 335 respondents participated, comprising 290 external stakeholders and 45 internal stakeholders. Descriptive results show that internal users consistently reported higher perceptions across all constructs: SY (4.28 vs. 3.94), IQ (4.42 vs. 3.99), SQ (4.39 vs. 3.87), UE (4.42 vs. 3.97), US (4.47 vs. 3.98), and NB (4.56 vs. 3.95). Chi-Square tests confirm statistically significant differences across all constructs ($p < 0.01$). Mann–Whitney U tests further validate substantial median differences (all $p < 0.001$). These findings demonstrate robust perception gaps between user groups, highlighting the need for improved onboarding, training, and support mechanisms for external stakeholders. This study contributes to digital governance literature by revealing structural disparities in user experience and provides policy recommendations for enhancing inclusiveness and effectiveness of NRFIS-based research funding services.

Keywords: *Digital governance; NRFIS; research funding system; user satisfaction; comparative study and public sector ICT.*

I. INTRODUCTION

Digital transformation has emerged as a cornerstone of public sector modernization, propelled by the imperatives of transparency, accountability, and operational efficiency [4], [6]. Governments worldwide increasingly deploy integrated information systems to streamline administrative workflows, enhance data interoperability, and support evidence-based policymaking. In the research and innovation ecosystem, National Research Funding Information Systems (NRFIS) exemplify this shift by managing the full grant lifecycle—from proposal submission, peer review, and contracting to financial reporting, monitoring, and project closure. These platforms interconnect funding agencies, universities, research institutions, and individual researchers while integrating with national databases for identity verification, digital signatures, electronic documentation, and financial disbursement. Despite their strategic importance, NRFIS and similar e-government systems often produce asymmetric user experiences. Internal stakeholders enjoy regular training, direct communication channels, and high system familiarity, whereas external users (primarily researchers, research managers, and institutional officers) frequently face varying levels of digital literacy, limited institutional support, and restricted access to technical assistance [19].

Such disparities can erode trust, reduce adoption among external stakeholders, and ultimately undermine the equitable distribution of public research funds.The DeLone and McLean Information Systems Success Model (D&M) remains one of the most robust and widely validated frameworks for assessing such platforms [3], [15], [16]. The updated 2003 model comprises six interrelated dimensions: System Quality, Information Quality, Service Quality, Use/Intention to Use, User Satisfaction, and Net Benefits. A major bibliometric review [17] confirmed the model's ongoing relevance, identifying strong adoption across e-government, ERP, e-learning, and health information systems. Nevertheless, empirical applications of the

model in public-sector contexts rarely segment users into internal and external groups, leaving a significant gap in understanding how differing levels of exposure, training, and support influence perceptions of system success [1], [11].

This study addresses the research question: Do internal and external users of a National Research Funding Information System perceive the six D&M success dimensions differently, and are these perceptual differences statistically significant? The specific objectives are: (1) To compare internal and external users' perceptions of System Quality, Information Quality, Service Quality, Use, User Satisfaction, and Net Benefits; (2) To examine the statistical significance of observed differences; (3) To formulate actionable recommendations for improving onboarding processes, technical support, and targeted training—especially for external stakeholders.Theoretically, this research extends the D&M model by explicitly examining user-segmentation effects in a mandatory, multi-stakeholder public-sector environment—an area that remains underexplored. Practically, the findings will equip funding agencies with evidence-based strategies to enhance system equity, boost external user satisfaction, and maximize societal returns on public research investments.

II. METHODS

This study adopted a cross-sectional, comparative quantitative design to examine differences in perceptions of National Research Funding Information System (NRFIS) success between internal and external users. The updated DeLone and McLean Information Systems Success Model [3] served as the theoretical foundation.The target population comprised all active registered users of the NRFIS as of June 2025. The online questionnaire was distributed from July to November 2025 through institutional mailing lists of universities and research institutions, and researcher communities on WhatsApp.A total of 2,200 invitations were successfully delivered. After excluding two respondents who declined consent and incomplete submissions, 335 valid responses were obtained. The final sample consisted of: Internal stakeholders: 45 respondents (13.43%), External stakeholders (researchers and institutional partners): 290 respondents (86.57%).The six D&M constructs were measured using validated multi-item scales adapted to the NRFIS context. All items employed a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). The instrument was pre-tested with 35 users; minor wording adjustments were made.To operationalize the constructs in this study, measurement items were adapted from well-established and frequently validated instruments in information systems research. System Quality was measured using 17 items sourced primarily from Nelson et al. [12] and further supported by Petter et al. [15] and Gorla et al. [7], capturing attributes such as system reliability, usability, response time, and security.

Information Quality consisted of 12 items adapted from Wang and Strong [22] and extended by Petter et al. [15], reflecting dimensions such as accuracy, completeness, relevance, timeliness, and consistency. Service Quality was assessed using 6 items drawing from the SERVQUAL conceptualization introduced by Parasuraman et al. [14] and the IS-service quality extensions proposed by Landrum et al. [10], emphasizing responsiveness, assurance, empathy, and support effectiveness. The Use construct comprised 6 items, developed based on the conceptual foundations by DeLone and McLean [3] and the Technology Acceptance Model by Davis [2], capturing frequency, intensity, and behavioral intention to use the system. User Satisfaction was measured with 9 items adapted from Wixom and Todd [23] and the User Information Satisfaction (UIS) framework by Ives et al. [9], focusing on users' evaluative responses toward system interaction. Finally, Net Benefits was evaluated using 21 items grounded in the IS-Impact Model introduced by Gable et al. [5] and supported by Petter, DeLone, and McLean [16], capturing both individual-level and organizational-level impacts arising from system use. The analytical procedures were conducted by considering both the level of measurement of the data and their underlying distributional characteristics. Because the survey items were measured using five-point likert scales and preliminary tests of normality indicated significant deviations from a normal distribution (Shapiro–Wilk, $p < .001$), non-parametric statistical techniques were deemed appropriate for this study.

To examine distributional differences between internal and external users at the item level, a Chi-Square Test of Independence was applied to all 71 indicators as well as to the aggregated construct

categories. This approach enables the identification of whether response patterns differ significantly between the two user groups.Furthermore, to compare central tendencies on overall construct scores, the Mann–Whitney U Test was employed for each of the six NRFIS success constructs: System Quality (SY), Information Quality (IQ), Service Quality (SQ), Use (UE), User Satisfaction (US), and Net Benefits (NB). Given its robustness for ordinal and non-normally distributed data, the Mann–Whitney U Test offers a suitable alternative to the independent samples t-test. In addition to statistical significance, rank-biserial correlation (r) was calculated as an effect size estimate, enabling more meaningful interpretation of group differences.All analyses were performed using IBM SPSS Statistics version 30. Statistical significance thresholds were set at $p < .05$ for standard significance and $p < .01$ for stronger evidence. These procedures collectively ensured rigorous and distribution-appropriate statistical testing aligned with best practices in non-parametric analysis.

III. RESULT AND DISCUSSION

The descriptive analysis reveals notable and consistent differences between internal stakeholders and external stakeholders across all six constructs measured in this study. Internal users report substantially higher perceptions of System Quality, Information Quality, Service Quality, Use, User Satisfaction, and Net Benefits.

Table 1. Descriptive Analysis per Construct

Construct	External Users	Internal Users
System Quality (SY)	3.9366	4.2837
Information Quality (IQ)	3.9924	4.4185
Service Quality (SQ)	3.8708	4.3926
Use (UE)	3.97	4.4222
User Satisfaction (US)	3.9821	4.4691
Net Benefits (NB)	3.9542	4.5608

Source: Author's processed data (2025)

Overall (Table 1), internal users report between 0.30 and 0.60 points higher on all constructs, suggesting that they experience the system more positively across every dimension. This outcome aligns with established IS success theory, where system familiarity, stronger organizational integration, and more direct access to training and support often result in higher perceptions of quality and usefulness [1], [11]. According to DeLone and McLean [3], the core quality dimensions of a system—system, information, and service quality—play a pivotal role in shaping user satisfaction and subsequent benefits. Since internal stakeholders typically engage with the system more frequently and have clearer access to institutional support structures, they tend to develop smoother interaction experiences.

Moreover, the higher information quality perceived by internal users reflects the principles of Wang and Strong [22], who argue that accuracy, completeness, relevance, and consistency are better achieved when users operate in environments aligned with standardized workflows. Similarly, the differences observed in service quality reflect the SERVQUAL perspective [14] and its IS-specific extensions [10], indicating that internal users' proximity to system support teams likely enhances their experiences of responsiveness and assurance. The higher Net Benefit scores are also theoretically consistent with the IS-Impact Model [5], which posits that users positioned closer to organizational processes tend to perceive stronger performance and productivity gains.The Chi-Square analysis further demonstrates clear differences in response distributions between internal and external users across all constructs.

Table 2. Chi-Square Analysis per Construct

Construct	χ^2	p-value	Interpretation
System Quality (SY)	11.35	0.003	Significant
Information Quality (IQ)	22.54	< 0.00001	Significant
Service Quality (SQ)	10.39	0.005	Significant
Use (UE)	0.682	0.0004	Significant
User Satisfaction (US)	0.804	0.00008	Significant
Net Benefits (NB)	34.61	< 0.000001	Significant

Source: Author's processed data (2025)

These results (Table 2) collectively indicate that the two user groups do not share the same response patterns on any of the constructs. This finding corroborates prior IS success studies showing that user characteristics, organizational context, and access to internal resources strongly influence system evaluation outcomes [18], [8]. Additionally, insights from Ebrahim and Irani [4] suggest that public-sector e-government systems often yield heterogeneous user experiences because different groups possess varying levels of digital readiness, internal support, and operational alignment with system processes. Therefore, the Chi-Square results provide robust evidence that user type is an important determinant of how NRFIS performance is perceived.

The Mann–Whitney U analysis reinforces the descriptive and Chi-Square findings by confirming statistically significant median differences across all constructs.

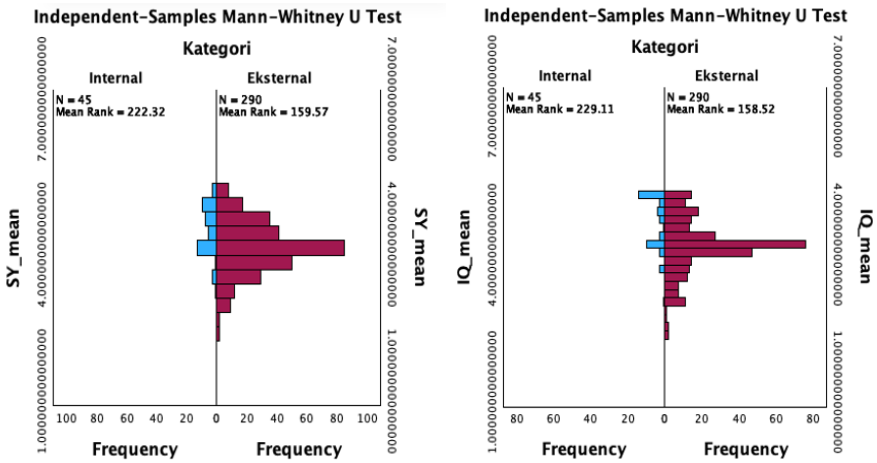
Table 3. Mann-Whitney U Analysis per Construct

Construct	p-value	Interpretation
System Quality (SY)	0.000052	Significant
Information Quality (IQ)	0.000005	Significant
Service Quality (SQ)	0.000011	Significant
Use (UE)	0.0000046	Significant
User Satisfaction (US)	0.0000013	Significant
Net Benefits (NB)	1.19E-09	Significant

Source: Author's processed data (2025)

These findings (Table 3 and Fig. 1) align closely with the theoretical propositions of DeLone and McLean [3], who suggest that variations in user roles, experience, and system engagement intensity can meaningfully shape perceived IS success. The observed differences in user satisfaction are consistent with prior work by Wixom and Todd [23], which demonstrates that satisfaction is highly dependent on personal interaction experiences and system relevance to daily tasks. Similarly, differences in perceived system usage reflect foundational TAM principles [2], where ease of use and perceived usefulness vary depending on contextual exposure to the system. The substantial gap in net benefits is supported by the IS-Impact perspective [5], which highlights that users embedded in organizational workflows usually perceive greater functional and performance-related advantages.

The findings of this study demonstrate clear and statistically robust differences between internal stakeholders and external stakeholders in their perceptions of the National Research Funding Information System (NRFIS). Results from both the Chi-Square and Mann–Whitney U tests consistently indicate that internal users evaluate the system more positively across all six constructs of the DeLone and McLean IS Success Model. These statistically significant gaps reinforce previous insights that user perceptions of information systems are shaped by contextual factors such as organizational role, proximity to system workflows, and the extent of access to institutional resources [1], [18]. The magnitude of the differences observed here aligns with Iivari [8], who argues that heterogeneous user groups naturally form distinct perceptions of system success because of differences in expectations, exposure, and integration within organizational processes.



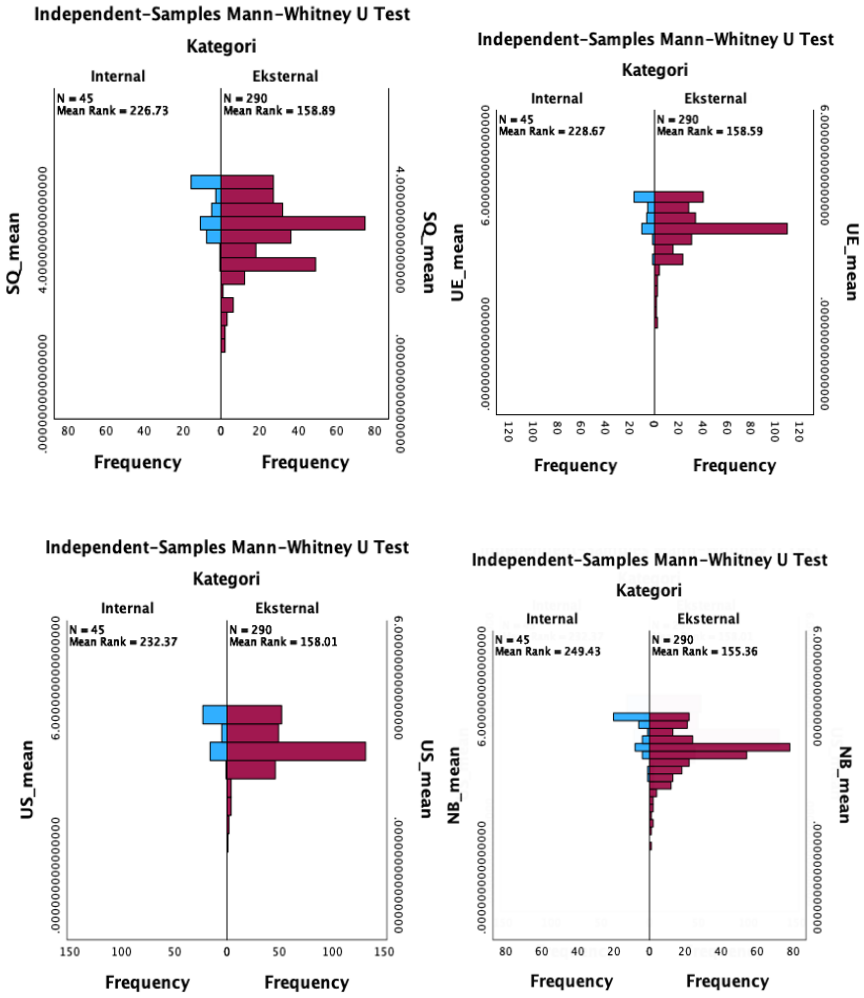


Fig 1. Mann-Whitney U Result

The higher ratings provided by internal stakeholders can be explained through established theories of IS adoption and success. Internal users typically work closely with system processes on a daily basis, enabling them to develop greater familiarity, confidence, and procedural fluency. Consistent with the Technology Acceptance Model [2], familiarity enhances perceived usefulness and ease of use, which in turn strengthens overall satisfaction and intention to use. Internal personnel also benefit from structured and unstructured forms of support—including training, peer guidance, and direct communication with system administrators—that collectively reduce friction in system interaction [3], [7]. Their stronger understanding of organizational workflows also makes system navigation more intuitive, reinforcing perceptions of system quality, information accuracy, and responsiveness. This pattern aligns with the IS-Impact Model [5], which suggests that users embedded within the operational environment of an information system tend to perceive higher levels of individual and organizational benefit.In contrast, external stakeholders operate with substantially different constraints. Their digital capabilities vary widely, and many rely solely on formal documentation or intermittent helpdesk support, which may not be sufficient for navigating complex processes. Studies in the e-government domain have frequently noted that external users—whether citizens, researchers, or institutional representatives—often struggle with interfaces designed for internal administrative logic rather than user-centered pathways [4], [19].

Moreover, external users often face more procedural complexity because they must align system requirements with the administrative procedures of their respective institutions. This dependence on institutional intermediaries can create delays, misinterpretations, and additional layers of difficulty [20]. The mismatch between system design assumptions and external user realities contributes to lower perceptions of service quality, system reliability, and overall satisfaction. Papadomichelaki and Mentzas [13] similarly highlight that differences in access to support structures often translate directly into unequal system experiences.These findings have meaningful implications for digital governance, particularly in terms of

equity, accessibility, and inclusive system design. Digital government platforms are expected to deliver not only efficiency but also fairness in how different user groups access services [6], [21]. The considerable perception gaps identified in this study indicate that current system configuration and support mechanisms favor internal users, potentially limiting the effectiveness of NRFIS for external stakeholders who constitute the majority of system beneficiaries. Improving the experience of external users will require targeted interventions such as clearer guidance, enhanced onboarding programs, more intuitive user pathways, and more responsive support services. Strengthening service quality—especially in responsiveness, empathy, and clarity—could significantly improve external users' perceptions of reliability and usefulness, which are critical for long-term system acceptance [14], [10]. Ultimately, bridging these user gaps will help ensure a more equitable digital environment and support broader national goals of transparency, accountability, and effective public-sector service delivery.

IV. CONCLUSION

This study examined perception differences between internal stakeholders and external stakeholders in their use of a National Research Funding Information System (NRFIS), applying the DeLone and McLean IS Success Model as the evaluative framework. The results consistently demonstrate that internal users score significantly higher across all six constructs—System Quality, Information Quality, Service Quality, Use, User Satisfaction, and Net Benefits—compared to external users. These differences were supported by strong statistical evidence, with both Chi-Square and Mann–Whitney U tests showing highly significant group disparities across all dimensions.The findings indicate that internal users benefit from greater system familiarity, more frequent interaction, and easier access to institutional support channels, resulting in more positive evaluations of system performance and service responsiveness. In contrast, external users face varying levels of digital capability, limited access to assistance, and more complex procedural requirements. These structural differences shape their overall experience and contribute to lower perceptions of satisfaction and net benefits.The study highlights the importance of recognizing user heterogeneity in digital public-sector systems.

For research funding platforms like NRFIS, ensuring equitable access and consistent user experience across diverse stakeholder groups is essential. The results call for strategic improvements in system usability, onboarding processes, and support mechanisms to reduce capability gaps and improve the experience of external users. More broadly, the findings reinforce digital governance principles emphasizing inclusion, accessibility, and user-centered system design. Based on the results, several practical recommendations can be proposed. First, external users would benefit from standardized training, clearer guidance materials, and more responsive support channels to bridge capability and information gaps. Enhancing service quality—particularly in responsiveness and communication—may increase user satisfaction and system acceptance among external stakeholders. Second, simplifying procedural workflows and reducing unnecessary complexities could help improve perceived ease of use and system reliability. Third, periodic usability evaluations and experience-based feedback loops should be implemented to ensure that the platform evolves in line with user needs across all segments.Finally, future research is encouraged to incorporate qualitative methods to explore user experiences in greater depth, as well as comparative analyses across different program types or institutional groups. Expansion into cross-agency or cross-country benchmarking could further enrich the understanding of how public-sector digital systems can deliver equitable value to diverse user populations.

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