2024 EVALUATION REPORT

Framework for the Promotion of Excellence in a National Network of Science Centres: Lessons Learned

science, technology & innovation
Department:
Science, Technology and Innovation
REPUBLIC OF SOUTH AFRICA

NRF
National Research Foundation

SAASTA
South African Agency for Science and Technology Advancement

This report has been produced for the sole purpose of evaluating and reporting on project outputs as agreed upon between key stakeholders

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The Framework for the Promotion of Excellence in Science Centres and the Science Centre Quality Assurance Project is an initiative of the Department of Science, Technology and Innovation (DSTI), administrated by the South African Agency for Science and Technology Advancement (NRF-SAASTA).

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EXECUTIVE SUMMARY

The Framework for the Promotion of Excellence in a National Network of Science Centres (PENNSC) represents a strategic initiative aimed at advancing Science, Engineering, and Technology (SET) literacy and youth development within South Africa. Spearheaded by the Department of Science, Technology and Innovation (DSTI), PENNSC underscores the importance of science centres as vital platforms for science engagement. Through standardised accreditation and quality assurance mechanisms, PENNSC seeks to enhance the quality and accessibility of science engagement activities while promoting collaboration and innovation within the science centre community.

The transition to a digitised accreditation process marks a significant milestone in streamlining evaluation processes and improving efficiency and transparency. The implementation of an online platform system has facilitated greater accessibility, accuracy, and effectiveness in evaluations, aligning with broader national objectives outlined in the White Paper on Science and Technology (1996). By embracing digital technology, all stakeholders aim to strengthen their contribution to SET awareness, youth development, and the National System of Innovation (NSI).

The evaluation and accreditation process provides valuable insights into the strengths, challenges, and potential areas for improvement within the science centre community. For this purpose, mean percentage scores (MPS) were used to provide practical insights that can be emulated by the decision-makers to enhance certain areas through improvement plans and modifications in certain areas of the accreditation processes.

The evaluation design adopted a descriptive research approach that was found to be appropriate for a comparative analysis of the scores between the peer and accreditation committees. To analyse data, the study used the mean, standard deviation and t-test analysis.

Through a comprehensive review of operational performance, common strengths, areas for improvement, and deficiencies key evaluation indicators have been identified. The weaknesses where improvement is needed in their descending sequence were found in the following areas, quality management and benchmarking; governance and planning; people, service offerings and communication.

Though there is a convergence of opinions between the two committees on the challenges and strengths in most operational areas, their scoring on grand planning and people showed some discrepancies in that their different views were substantial and quite high to some extent.

Furthermore, the peers were generally modest in their scoring as compared to the accreditation committee, but they had larger differences in their scoring as opposed to the accreditation committee. Despite this, the results findings provide a solid basis for developmental planning and awareness campaigns, aiming to enhance the effectiveness and sustainability of science engagement efforts nationwide.

The accreditation process relies heavily on fairness, consistency, and transparency. However, discrepancies were identified in two sets of data, where values deviated significantly from the mean. Such inconsistencies undermine alignment with evaluation standards and should be addressed to preserve the integrity of the process. Furthermore, focus group discussions highlighted the need for enhanced communication, greater standardisation, clearer guidelines, and stronger support mechanisms to improve the overall accreditation process.

In conclusion, the findings in this study serve as a key milestone in best practice lessons of the accreditation process since its digitalised implementation in 2018/19. The recommendations form the basis for corrective measures emanating from real-time data as evidence to inform decision-making. By implementing these recommendations, stakeholders can leverage success this far to enhance the effectiveness, transparency, and impact of science engagement efforts in advancing excellence in science centres nationally and fostering a culture of continuous improvement and innovation in the science engagement space.


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1. INTRODUCTION

The Framework for the Promotion of Excellence in a National Network of Science Centres (PENNSC) is a response to the call articulated in the White Paper on Science and Technology (1996) to cultivate a robust National System of Innovation (NSI) in South Africa. Recognising the pivotal role of Science, Engineering, and Technology (SET) in driving social and economic progress, the White Paper underscores the need for a society that values and understands SET principles. In alignment with these objectives, the Department of Science, Technology and Innovation (DSTI) spearheaded efforts to promote SET awareness and youth development through collaborations with science centres.

Science centres play a crucial role in this endeavour by providing interactive platforms for society to engage with SET concepts. They serve as vital complements to formal education systems, particularly in the fields of mathematics and science, which are foundational to SET proficiency and the cultivation of a skilled workforce. It was for this purpose that the DSTI endorsed the establishment of a network of science centres across South Africa, each dedicated to advancing science and technology literacy, enhancing Science, Technology, Engineering and Mathematics (STEM) education outcomes, identifying and nurturing talent, and offering career guidance in STEM disciplines.

Central to PENNSC's approach is the implementation of accreditation and quality assurance mechanisms. These frameworks aim to standardise and elevate the quality of science centres' offerings, unique in their meaningful interactions, and most importantly, to promote good governance while facilitating access to resources and opportunities for member institutions. By adhering to accreditation criteria, science centres can demonstrate their credibility, access financial support from the DSTI, and participate in knowledge-sharing initiatives in both national and international space (Department of Science and Innovation, nd).

However, PENNSC recognises the importance of balancing regulatory oversight with the flexibility to accommodate the diverse missions and contexts of individual science centres. As such, the framework emphasises the development of implementation plans and accreditation criteria that prioritise user-friendliness and support for continuous improvement with evidence-based data that informs decision-making (Department of Science and Innovation, nd).

In summary, PENNSC represents a concerted effort to leverage science centres as catalysts for SET engagement and youth development within South Africa. By fostering collaboration, standardisation, and innovation within the science centre community, PENNSC aims to cultivate a culture of scientific literacy and excellence that drives national progress and prosperity.


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2. BACKGROUND

The evaluation of South African science centres operates within the overarching Framework for the Promotion of Excellence in Science Centres in South Africa. This framework is designed to ensure the optimal functioning and sustainability of science centres, while enhancing accessibility to science engagement activities for target audiences. It adheres to a structured process involving self-evaluation, site inspections, and comprehensive evaluations by evaluation committees.

However, a significant advancement occurred following a post-mortem meeting held in Pretoria in October 2015. Recommendations were made to digitise the accreditation process, aiming to improve efficiency and transparency. This led to the formation of two committees: one to review the project instrument and another to develop an online platform system for evaluations.

The first committee, comprising representatives from various stakeholders such as the then Department of Science and Technology (DST), now the Department of Science, Technology and Innovation (DSTI) and the South African Agency for Science and Technology Advancement (SAASTA), meticulously crafted the specifications and terms of reference for the online platform through a series of meetings held between November 2015 and April 2016.

Simultaneously, the second committee, consisting of experts from DSTI, SAASTA, and prominent science centres, spearheaded the procurement and development of the online platform system. The system went live on 1 March 2018, followed by training for the science centre community to ensure effective utilisation.

This transition to a digitised system represents a significant milestone in streamlining the accreditation process, offering greater accessibility, efficiency, and accuracy in evaluations. By embracing digital technology, the framework entered a new era of enhanced effectiveness and adaptability, furthering its commitment to promoting excellence in science engagement across the nation.

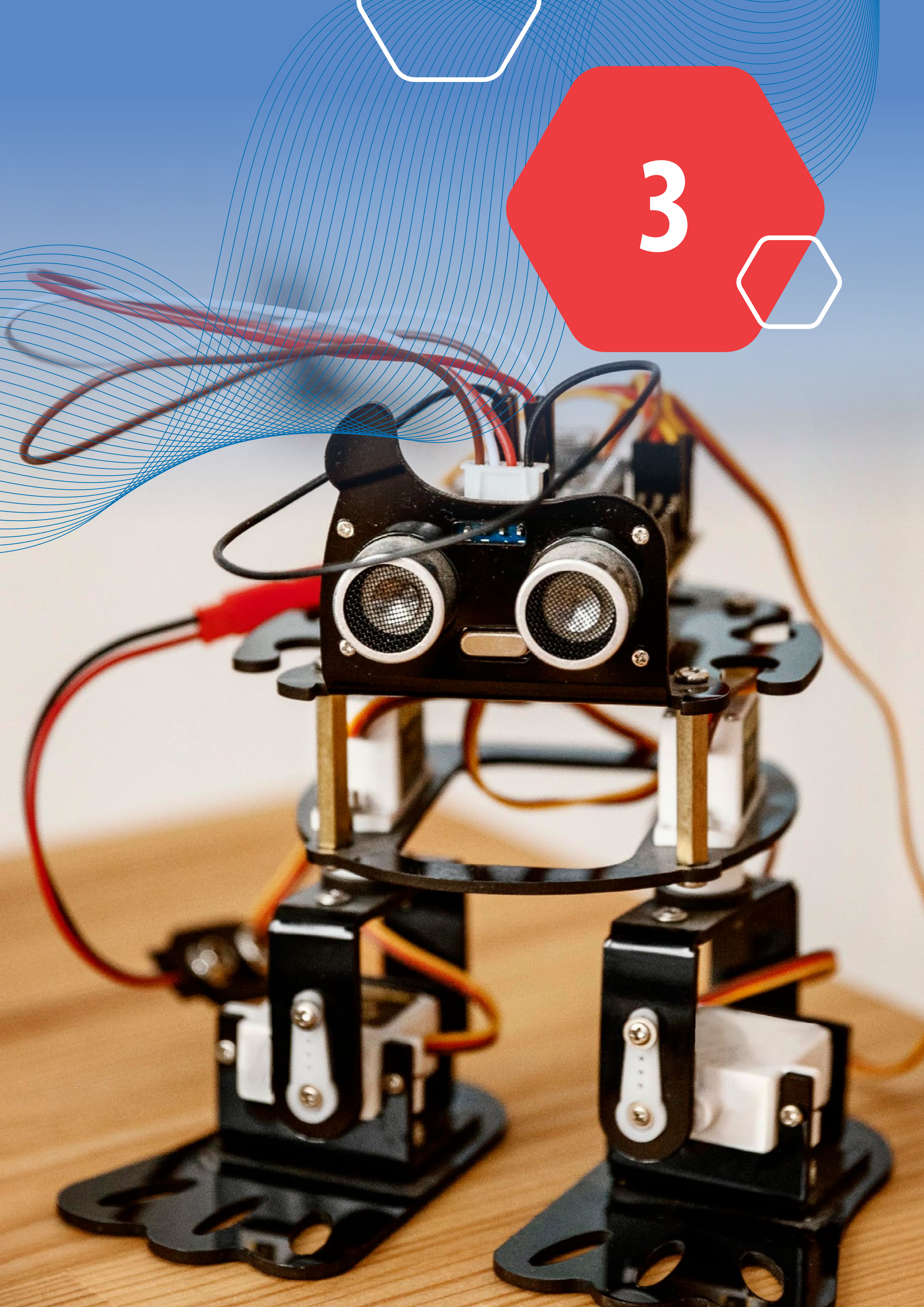
The initiation of the digitisation process aligns with the broader objectives outlined in the White Paper on Science and Technology (1996), which emphasises the importance of Science, Engineering, and Technology (SET) in driving national prosperity and sustainable development. Through the digitisation of the accreditation process, the South African Science Centre community aims to strengthen its contribution to SET awareness, youth development, and the advancement of a healthy National System of Innovation (NSI).

Following the digitisation, the evaluation and accreditation process for South African science centres was initiated. This follows a structured approach outlined within the Framework for the Promotion of Excellence in Science Centres in South Africa. This process begins with a self-evaluation by the science centre, followed by a basic site inspection to verify its existence and assess its basic operational standards.

Upon confirmation of the science centre's existence, a peer evaluation committee, duly appointed, undertakes a comprehensive weeklong evaluation using a digitised scoreboard. This scoreboard focuses on various operational areas crucial for the sustainability of the science centres. Each area undergoes meticulous consideration, with documents scrutinised, interviews conducted, and scores objectively allocated based on a culmination of the assessments.

Following the evaluation process, an additional report is compiled to explain matters beyond the scoreboard and provide contextual insights related to the evaluation findings. This serves as the foundational basis for evaluation by a duly appointed accreditation committee.

The accreditation committee convenes to review the collective information and subsequently rescores based solely on the submissions. While some divergence between the assessments of the peer evaluation committee and the accreditation committee is anticipated, the objectivity inherent in the scoreboard is expected to mitigate significant discrepancies. This assumes that due diligence was observed during the peer evaluation process and that findings are adequately supported or explained.



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3. PURPOSE OF THE REPORT

The purpose of the report is to present the collective outcome of a comprehensive review conducted by SAASTA on the implementation of the Framework for the Promotion of Excellence in Science Centres. It is a review that focused on the assessment of the outcome of the accreditation process that led to the production of 28 accreditation reports after the evaluation of the respective science centres. A statistical analysis of the reports was undertaken to identify patterns and deviations within each operational area, aiming to offer a quantitative perspective on the observed divergences, if any, in the accreditation process.

Additionally, the report integrates inputs gathered from committees through focus group discussions held in early 2023. Termed a "post-mortem meeting," these discussions aimed to capture challenges, lessons learned, and qualitative insights from stakeholders regarding the implementation process of the Framework for the Promotion of Excellence in Science Centres since its inception into a digitalised process in 2018. The qualitative data, including viewpoints and proposals related to the evaluation tool, is intertwined with the quantitative findings derived from the statistical analysis.

> By combining quantitative insights from the statistical analysis with qualitative inputs from the focus group discussions, the report provides a comprehensive overview of the results findings to provide evidence-based data that is necessary for instructional development and possible modification of the process and, if need be, starting from the selection of committees to related instruments until the final stages of producing a report. Ultimately, the report aims to contribute towards data-driven strategies that are informed by real-time data sourced through statistical analysis of available data, observations and learning experiences.

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4. OBJECTIVES OF THE STUDY

The objectives of the study encompass a multifaceted approach aimed at gaining comprehensive insights into the performance and effectiveness of the accreditation process for South African science centres:

Objective 1 - Investigate the overall performance of science centres on Key Evaluation Indicators:

This objective entails conducting a thorough examination of the overall performance of science centres based on Key Evaluation Indicators (KEIs). These KEIs include governance and planning, service offering, people, communication, and quality management and benchmarking.

Objective 2 - Comparative analysis of scoring between Peer and Accreditation Committees:

This objective involves conducting a comparative analysis of scoring between the Peer Evaluation Committee and the Accreditation Committee. Examining the scores between these two committees is to assess alignment or divergence across various operational areas, to establish potential discrepancies or areas of consensus in the evaluation process. Understanding the differences in scoring between the two committees can provide insights into the consistency and objectivity of the evaluation process.

Objective 3 - Establish Practices and Learned Experiences:

This objective focuses on establishing learning practices by synthesising insights gleaned from the evaluation process. It involves identifying best practices, challenges, and lessons learned from both quantitative data (such as statistical analysis of scores) and qualitative data (gathered from focus group discussions) and, through observations. Depending on the findings, the study may recommend adjustments to the evaluation criteria, procedural enhancements, capacity-building initiatives, or policy recommendations aimed at optimising the accreditation process and promoting excellence for improved science centre operations.


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5. ETHICAL CONSIDERATIONS

Ethical considerations for SAASTA in conducting the study on the accreditation process for South African science centres include:

Informed Consent: Ensuring that science centre representatives participating in the study are fully informed about the objectives, procedures, and potential implications of the evaluation process. This includes obtaining consent from the committee members to use their suggestions and/or opinions for analysis and dissemination of findings.

Confidentiality and Privacy: Safeguarding the confidentiality of data collected during the evaluation process, including sensitive information about science centre operations and performance. Measures are in place to prevent unauthorised access or disclosure of this information.

Minimisation of Harm: Taking steps to minimise any potential harm or negative consequences that science centres may experience because of the evaluation process. This includes providing constructive feedback and support for improvement rather than punitive measures for shortcomings.

Transparency: Maintaining transparency in the evaluation process by clearly communicating the criteria, procedures, and expectations to science centres and stakeholders involved. Transparency builds trust and ensures accountability in the accreditation process.

Conflict of Interest: Mitigating potential conflicts of interest among members of evaluation committees or stakeholders involved in the accreditation process. SAASTA should ensure that individuals involved in decision-making processes maintain impartiality and act in the best interests of promoting excellence in science centre operations.

Beneficence: Ensuring that the outcomes of the study contribute positively to the accreditation process for the advancement of science centre operations and the promotion of science, engineering, and technology literacy in South Africa. Recommendations should be aimed at improving the effectiveness and impact of the accreditation framework for the benefit of science centres and their stakeholders.

Compliance with Regulations: Adhering to relevant ethical guidelines, regulations, and institutional policies governing research and evaluation activities. SAASTA should ensure that the study complies with legal and ethical standards to protect the rights and interests of science centres and the respondents involved.

By addressing these ethical considerations, SAASTA conducts the study on the accreditation process for South African science centres with integrity, transparency, and respect for the rights and well-being of all stakeholders involved.


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6. METHODOLOGY

The proposed research methodology incorporates a descriptive research design. This design was selected for its suitability to facilitate a comparative analysis of scores between the peer and accreditation committees to establish patterns in all 28 reports that were produced. The study also considered committee members' experiences and views of individuals who are in the value chain of the evaluation process. Ultimately, the research undertaken addresses the objectives of the study through the process depicted in Figure 1 below and answers the research question of the evaluation of the Accreditation Process of the South African Science Centres:

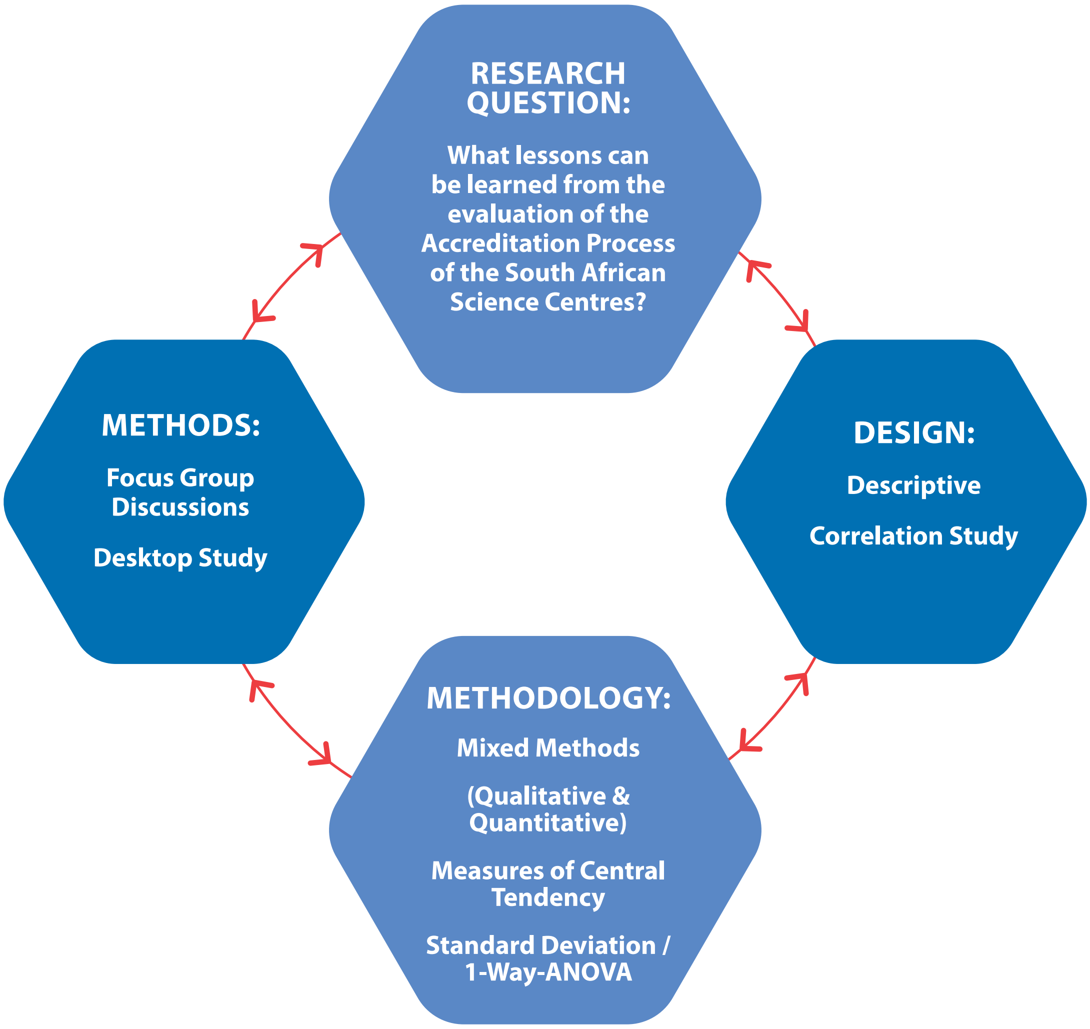


Figure 1: Visualisation of Research Design for the Study

The methodology incorporates both qualitative and quantitative approaches, utilising focus or breakaway group discussions to collect primary data from both peer and accreditation committees, and other interested parties in the value chain supplemented by secondary data sources such as science centre checklists, peer review reports, and accreditation reports.

For data analysis, mean, standard deviation and t-test methods were used collectively with insights drawn from both the Peer and Accreditation committees and a desktop analysis of 20 science centre checklists as secondary data sources. The methodology aims to establish the areas where science centres underscore or score on par.

Mean is a form of measure of central tendencies together with median and mode. These are all used to identify a single value in a data set that describes the given data set. Since they are applied for different conditions, for purposes of this study, mean was found to be appropriate. It is calculated by adding all the values in a data set divided by the number of values.

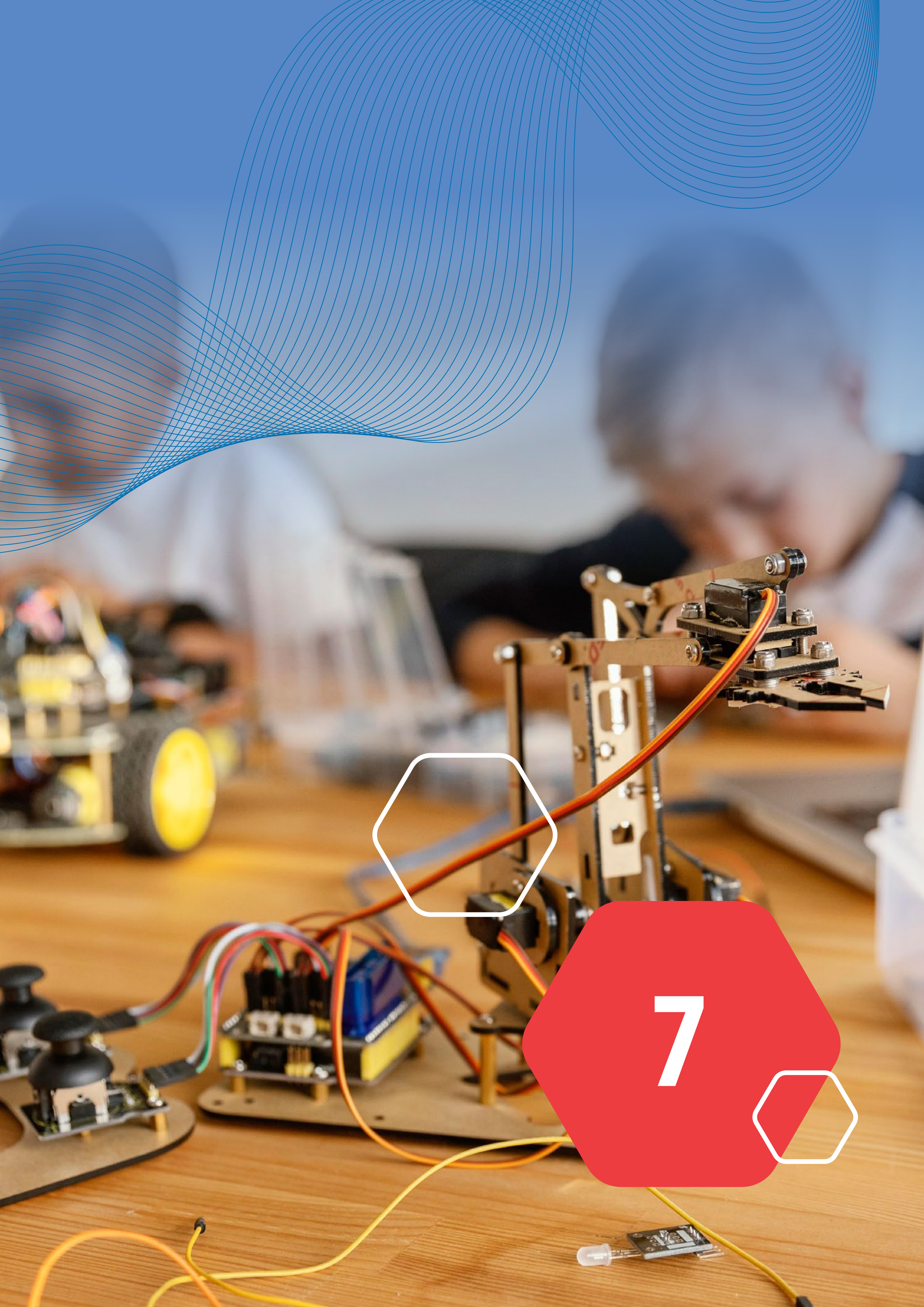
The Mean Percentage Score (MPS), will also assist the study in understanding the ratio between the scores of individual science centres to determine the areas where the highest scores were recorded as against the total weighting for each KEI. This will provide insights into areas where science centres are lagging according to the scores from each committee. Because the mean accounts for all the values in a distribution, some of which might vary as outliers to an extent that they skew the distribution making it difficult to generalise the findings, it becomes necessary to apply a standard deviation to further describe variability and to understand the extent of the variance from the mean.

The application of standard deviation becomes essential in assessing the spread or variability of individual scores within each group. While central tendencies provide a measure of the central or typical values, standard deviation offers information about the extent to which individual scores deviate from the mean. A smaller standard deviation indicates that the scores are closely clustered around the mean, signifying more agreement on the findings. Conversely, a larger standard deviation suggests greater variability, indicating differences in individual scores. In this regard, the study can conclude whether the scoring between the committees shows consensus or divergence of ideas.

Additionally, the methodology incorporates the use of a t-test for in-depth correlation of data that helps examine the difference between the two groups. This amplifies the results to determine whether the scoring results between the peer and accreditation committees are different from one another or not and whether the differences that occur are significant or not, contributing to a nuanced and informed evaluation process. When conducting the test, the assumption is made that data sourced from the groups is independent, normally distributed and that both have an equal amount of variance. The following explains what will be used to assess the scores results between the two groups:

- **df (Degrees of Freedom):** Degrees of freedom represent the number of values in the population size that are free to vary. In this context, it would be number of values in both groups minus 2 (28 x 2 = 56 – 2 = 54).
- **P-value:** This indicates the probability that any observed t-value that is large would be seen by chance and not necessarily all the time. This assumes that the null hypothesis (the assumption that there is no significant difference between group means) is true. If the p-value is less than a chosen significance level (commonly 0.05), then the null hypothesis is rejected, suggesting there is a significant difference between group means.

In summary, the integrated methodology comprising descriptive research, focus group discussions, a desktop study, and measures of central tendency, standard deviation, and t-test offers a comprehensive approach to investigating the accreditation process of the South African Network of Science Centres and deriving meaningful insights from the collected data. Thus, offering rich data-based results that will inform decision-making.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7. PRESENTATION OF FINDINGS

This section presents the outcomes of the data analysis.

7.1. Objective 1: Investigate the overall performance of science centres against key evaluation indicators

In this section, the evaluation examines checklists, peer evaluations, and accreditation reports to discern trends in science centre performance against key evaluation indicators, encompassing governance and planning, service offering, personnel, communication, and quality management, as well as benchmarks.

The evaluation of science centres often examines various operational aspects to gauge their effectiveness and adherence to required standards. One crucial aspect is the presence of documented processes, which serve as guidelines for organisational operations. In this analysis, the extent to which science centres have documented processes in place are assessed. The evaluation criterion applied determined where a process is in place for 80% or more of the sample, it is assumed that the area is effectively addressed in the population. Whereas, when the scores are between 51% and 79%, it is assumed that this is an area that requires attention. Any score equal to and lower than 50% denotes a deficiency. This methodology will be applied consistently across all subsequent data analyses. It should be noted that where the number of science centres evaluated in the dataset are lower than the number of science centre evaluated consistently, it is due to an addition to the accreditation process, predominantly focused on documented proof.

GOVERNANCE AND PLANNING

The evaluation of governance and planning is crucial for science centres as it directly affects their operational efficiency and long-term viability. This assessment focuses on the criteria governing administrative and strategic frameworks, that are integral for informed decision-making, resource allocation, and overall organisational effectiveness. Efficient governance and strategic planning are essential for science centres to fulfil their mission in science engagement, adapt to changing landscapes, and sustain their impact as effective institutions in science communication and public engagement. Under this section, there are six sub-sections, each with several key evaluation indicators.

Executive Leadership

The following presents the overall outcome of the secondary data analysis:

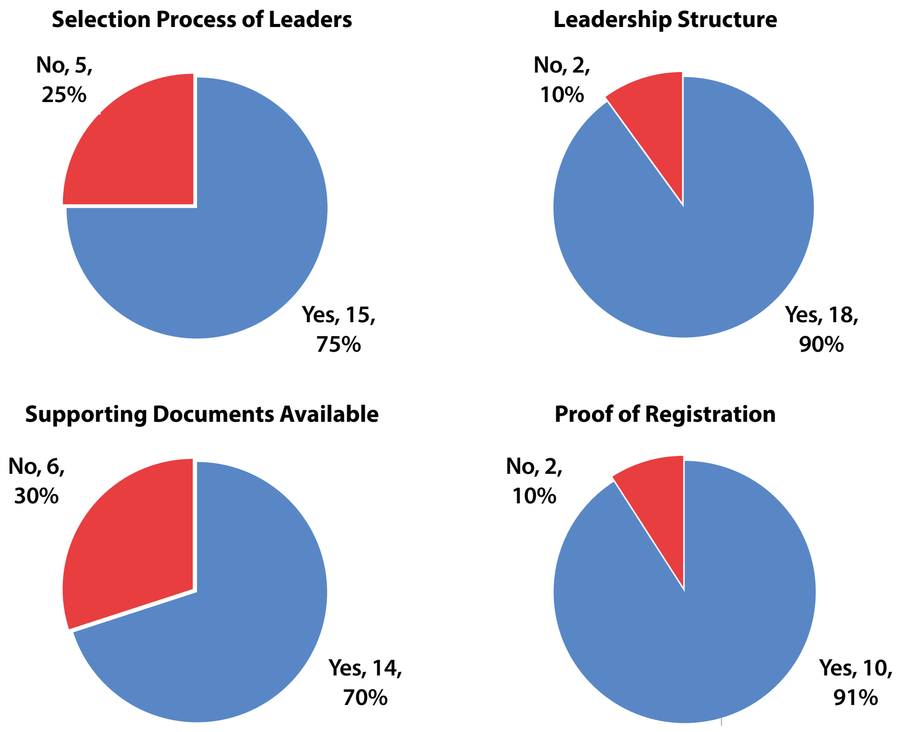


Figure 2: Visualisation of sub-categorical operational performance of science centres: Executive Leadership

Selection process of leaders: With 15 (75%) of science centres reporting having a selection process for leaders in place, this indicates a relatively high level of adherence to required procedures for leadership selection. However, it is essential to address the 5 (25%) of science centres that lack a documented selection process, as ensuring consistency and fairness in leadership appointments is crucial for suitability and fit-for-purpose organisation.

Leadership structure: The data shows that 18 (90%) of science centres have a documented leadership structure, signifying a strong emphasis on organisational hierarchy and delineation of roles and responsibilities. This high percentage suggests effective governance practices within the science centres. However, attention should still be given to the 2 (10%) of centres lacking a formal leadership structure to ensure clarity and accountability in decision-making processes.

Supporting documents available: With 14 (70%) of science centres reporting the availability of supporting documents, there is room for improvement in ensuring comprehensive documentation to facilitate operational processes. The 6 (30%) of centres lacking supporting documents may encounter challenges in the integrity and validity of recorded information, thus highlighting a need for enhanced documentation management.

Proof of registration: It is noted that this indicator was only instituted in 11 of the 20 evaluations. The overwhelming majority of 10 (91%) science centres possess proof of registration, demonstrating compliance with regulatory requirements and legal obligations. This high percentage suggests robust administrative procedures in place. However, addressing the 1 (9%) of centres without proof of registration is essential to ensure adherence to legal standards and enhance the credibility of the science centres.

Strategic Planning

The following presents the overall outcome of the secondary data analysis:

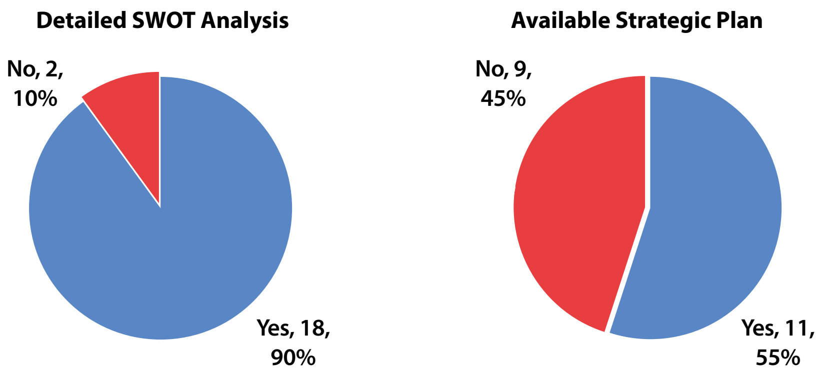


Figure 3: Visualisation of sub-categorical operational performance of science centres: Strategic Planning

Detailed SWOT analysis: The data indicates that 18 (90%) of science centres have conducted a detailed strengths, weaknesses, opportunities and threats (SWOT) analysis, which is crucial for informed decision-making and strategic planning. This high percentage suggests that science centres are proactive in identifying internal and external factors influencing their operations. The 2 (10%) of centres without a detailed SWOT analysis may benefit from conducting one to enhance their strategic planning processes and address potential challenges and harness other areas that they are good at for development and growth.

Available strategic plan: The data shows that only 11 (55%) science centres have a strategic plan available, indicating a significant proportion lacking a documented roadmap for their organisational goals and objectives. This suggests a potential gap in long-term planning and direction within the science centres. The nine (45%) of centres without a strategic plan may need to develop one to align their activities with overarching strategic objectives and enhance organisational effectiveness and sustainability.

Sustainability and Future Relevance

The following presents the outcome of the secondary data analysis:

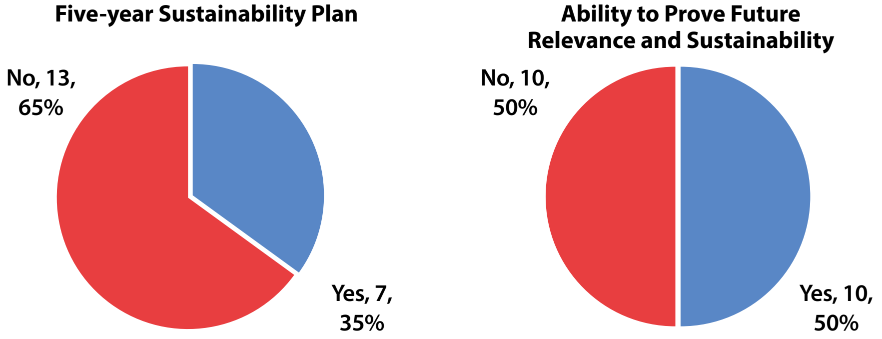


Figure 4: Visualisation of sub-categorical operational performance of science centres: Corporate Governance

Five-year sustainability plan: According to the assessments conducted by committee members, only 7 out of the 20 science centres (35%) were found to have a five-year sustainability plan in place. This indicates that a significant portion of the centres may lack a long-term strategy for ensuring their viability and relevance in the future. Developing a sustainability plan is crucial for securing resources, maintaining operations, and adapting to changing circumstances. The remaining 13 (65%) science centres may need to prioritise the development of a comprehensive plan as a trajectory to their sustainability and future relevance.

Ability to prove: The assessments conducted by committee members revealed that 10 out of 20 science centres (50%) can prove their sustainability and future relevance. This indicates that slightly more than half of the centres possess mechanisms or evidence to demonstrate their long-term viability and importance. However, the remaining 10 (50%) centres were identified as lacking the ability to prove their sustainability. These centres may need to strengthen their documentation, performance metrics, or strategic planning processes to enhance their credibility and assure stakeholders of their enduring value.

Regulatory Environment

The following presents the overall outcome of the secondary data analysis:

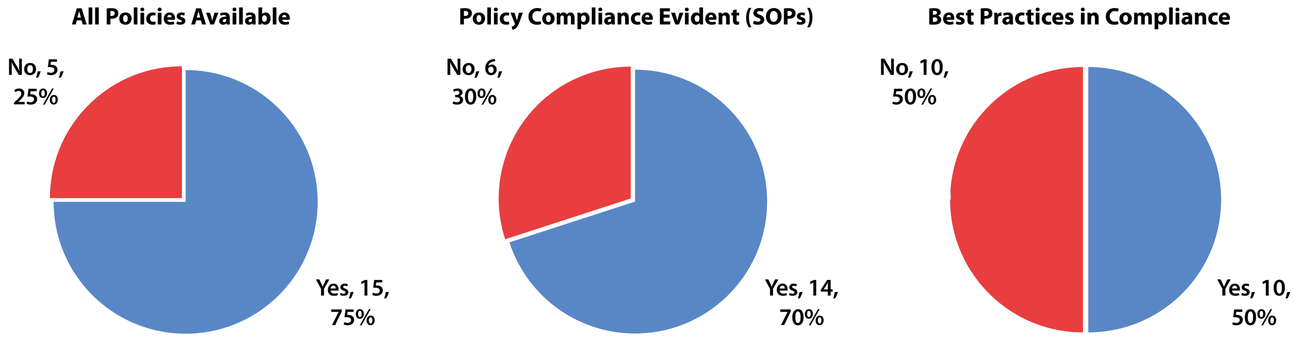


Figure 5: Visualisation of sub-categorical operational performance of science centres: Regulatory Environment

All policies available: Committee members found that 15 out of the 20 science centres (75%) have all policies available. This indicates a strong adherence to regulatory requirements and suggests comprehensive documentation of policies within these centres. However, attention should still be given to the 25% of centres lacking all policies, as ensuring full compliance with regulatory standards is essential for effective governance and operations.

Policy Compliance (e.g. SOPs in place): Among the assessed science centres, 14 out of 20 (70%) were found to be compliant with developed policies, such as standard operating procedures (SOPs) in place. This suggests a considerable effort towards ensuring adherence to established policies and procedures. However, the 30% of non-compliant centres may need to strengthen their internal processes to align with regulatory standards and improve their regulatory environment.

Best practices in compliance: The assessments revealed that 10 out of 20 science centres (50%) were found to have implemented best practices in compliance. This indicates a mixed level of adherence to industry standards and regulatory requirements among the evaluated centres. The remaining 50% of centres should identify and adopt best practices to enhance their compliance efforts and ensure alignment with industry norms and regulations.

Corporate Governance

The following presents the overall outcome of the secondary data analysis:

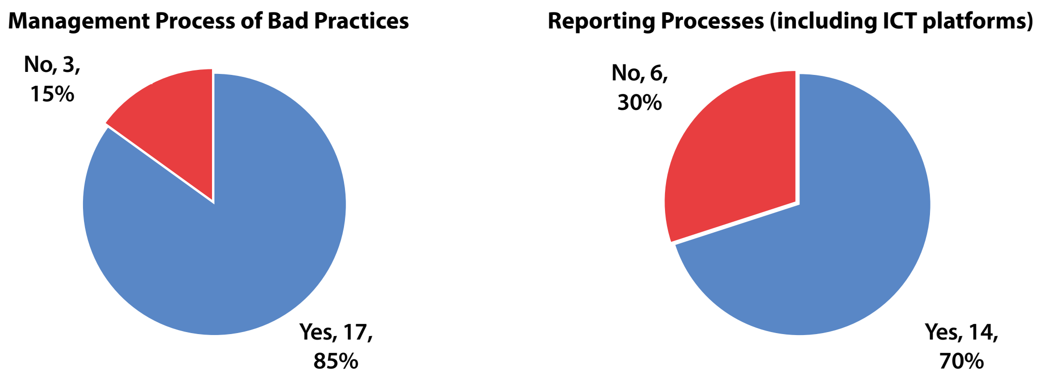


Figure 6: Visualisation of sub-categorical operational performance of science centres: Corporate Governance

Management process of bad practices: According to committee assessments, 17 out of the 20 science centres (85%) were found to have management processes in place to address bad practices. This high percentage indicates a strong commitment to corporate governance and risk management within the centres. However, attention should still be given to the 15% of centres lacking management processes for addressing bad practices, as mitigating risks and ensuring ethical conduct are essential for maintaining organisational exposure to risk.

Reporting processes and verified ICT platforms in place for data management: Among the assessed science centres, 14 out of 20 (70%) were found to have reporting processes and verified ICT platforms in place for data management. This suggests a significant effort towards ensuring transparency and efficiency in reporting and data management practices. However, 30% of centres without these processes and platforms may need to strengthen their systems to enhance data integrity, validity, accuracy, and accessibility, thus improving good governance practices.

Risk

The following presents the overall outcome of the secondary data analysis:

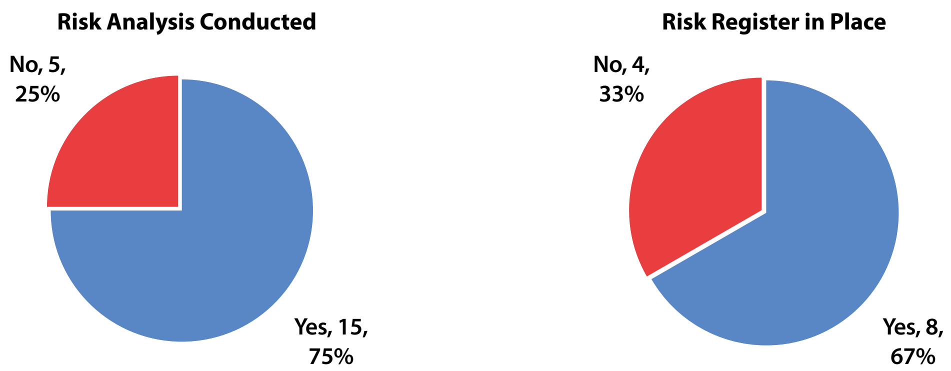


Figure 7: Visualisation of sub-categorical operational performance of science centres: Risk

Risk analysis conducted: Committee assessments revealed that 15 out of the 20 science centres (75%) have conducted risk analysis. This indicates a proactive approach to identifying and managing potential risks within the centres. However, attention should still be given to the 25% of centres that have not conducted a risk analysis, as understanding and mitigating risks are essential for ensuring science centre resilience and preparedness for the unknown.

Risk register in place: Among the evaluated science centres, 8 out of 12 (67%) were found to have a risk register in place. This suggests a considerable effort towards formalising risk management processes and documenting identified risks. However, 33% of centres without a risk register would benefit from a tool to systematically track and monitor risks, thus enhancing their ability to mitigate potential threats and uncertainties.

SERVICE OFFERING

Evaluating the service offerings of science centres is instrumental in assessing their effectiveness to fulfil science engagement mandates. By scrutinising the types of services provided, evaluators can gauge the centres' capacity to communicate scientific concepts, engage diverse audiences, and contribute to broader educational objectives. This external evaluation process ensures an objective and comprehensive assessment of how well science centres align with their science engagement mandates, facilitating adjustments and improvements in their service offerings to better serve the public and promote scientific literacy within communities. Under this section, there are three sub-sections, each with several key evaluation indicators. This is one area where individual science centres can showcase the uniqueness of their services offerings of SET capabilities to their audiences.

Exhibits

The following presents the outcome of the secondary data analysis:

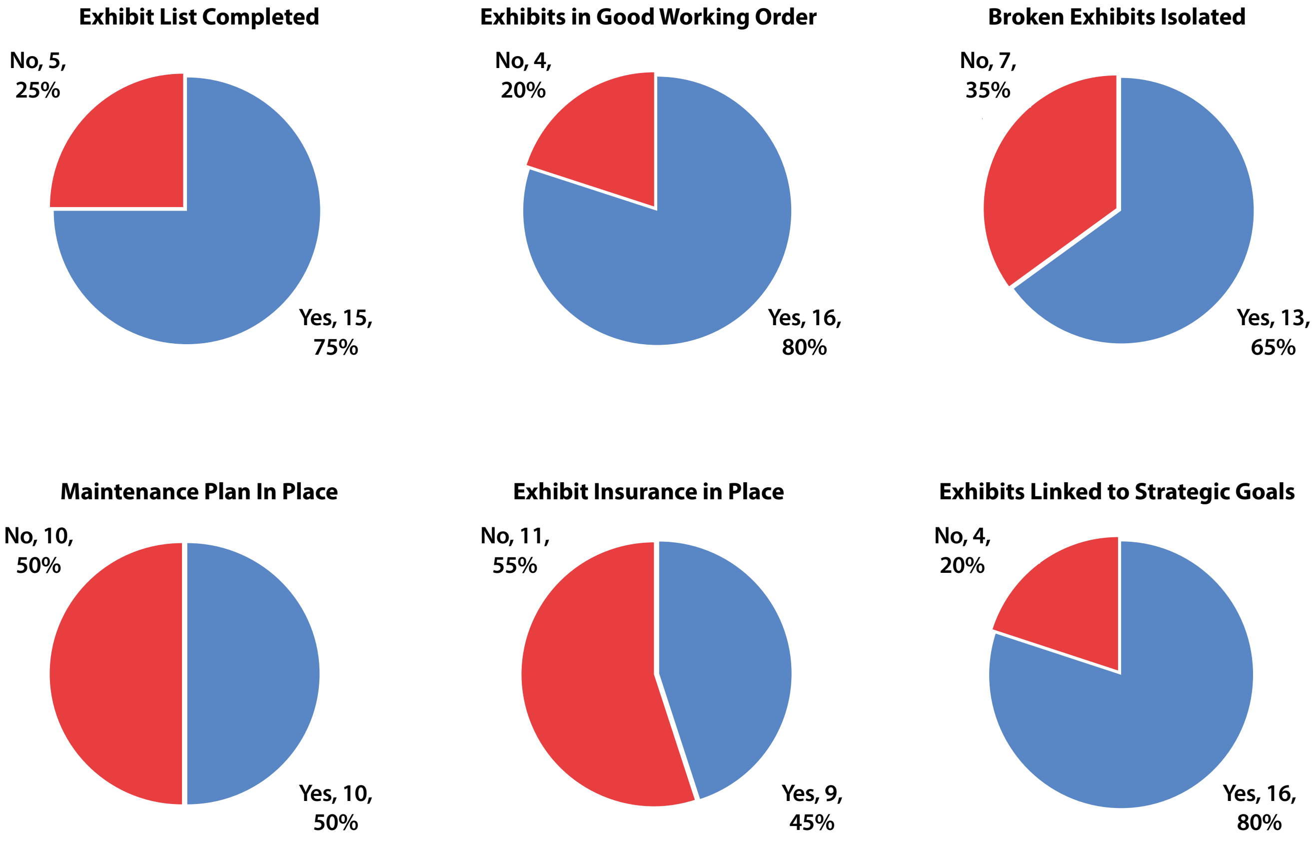


Figure 8: Visualisation of sub-categorical operational performance of science centres: Exhibits

Exhibits list completed: From the committee assessments, it was found that 15 out of 20 science centres (75%) have completed their exhibits list. This indicates a proactive approach to cataloguing and organising exhibits within the centres. However, attention should still be given to the remaining 25% of centres to ensure the completeness and accuracy of their exhibit inventory.

Exhibits in good working condition: Among the assessed science centres, 16 out of 20 (80%) were found to have exhibits in good working condition. This high percentage suggests effective maintenance and upkeep of exhibits, ensuring an engaging and functional environment for visitors. However, efforts should continue to maintain exhibits to sustain their optimal condition over time.

Broken exhibits isolated: According to the committee assessments, 13 out of 20 science centres (65%) have effectively isolated broken exhibits. This indicates proactive measures to address issues promptly and maintain the overall quality of visitor experiences. The remaining 35% of centres should improve their processes for isolating and repairing broken exhibits to enhance visitor satisfaction and safety.

Maintenance plan in place: Half of the evaluated science centres, 10 out of 20 (50%), were found to have a maintenance plan in place. Establishing a maintenance plan is crucial for ensuring the longevity and functionality of exhibits. Therefore, the other 50% of centres would benefit from implementing such a plan to proactively manage exhibit maintenance and minimise downtime.

Insurance of the exhibits exists: Only 9 out of 20 science centres (45%) were found to have insurance for their exhibits. Having insurance coverage is important to protect valuable assets and mitigate financial risks in the event of damage or loss. It is recommended that the remaining 55% of centres consider securing insurance for their exhibits to safeguard against unforeseen circumstances.

Exhibits linked to strategic goals: From the committee assessments, it was determined that 16 out of 20 science centres (80%) have exhibits linked to the strategic goals of the Department of Science, Technology and Innovation (DSTI). This suggests alignment between exhibits and the overarching mission and objectives of the DSTI. However, efforts should continue to ensure that exhibits support DSTI's strategic goals effectively and contribute to the overall success of the department's initiatives to communicate science.

Teaching and Learning Programmes

The following presents the outcome of the secondary data analysis:

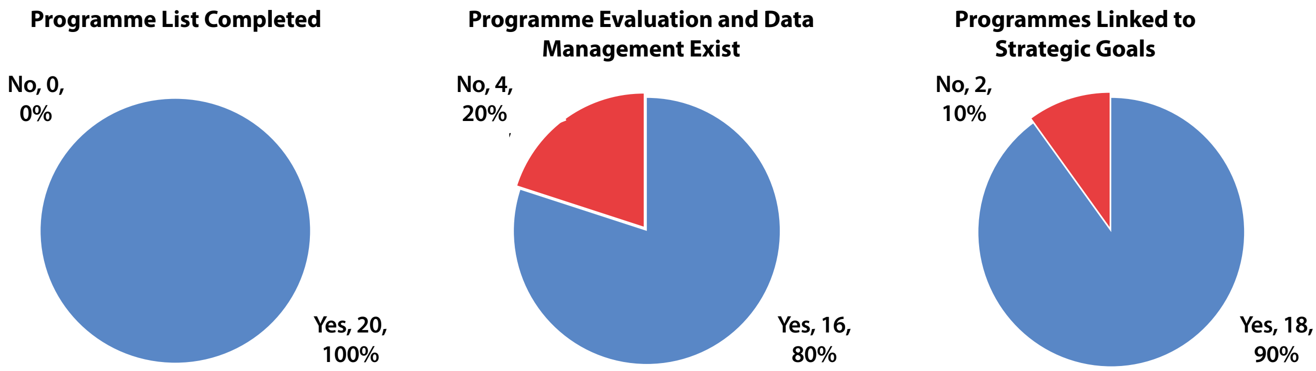


Figure 9: Visualisation of sub-categorical operational performance of science centres: Teaching and Learning

Programme list completed: From the assessment of teaching and learning programmes, it is evident that all 20 programmes (100%) have completed their programme lists. This demonstrates a thorough and proactive approach to organising and cataloguing programmes.

Programme Evaluation and Data Management: Among the assessed teaching and learning programmes, 16 out of 20 (80%) have established programme evaluation and data management systems. This indicates a substantial effort towards monitoring and improving programme effectiveness through data-driven insights. However, there is room for improvement in the remaining 20% of programmes to enhance their evaluation and data management practices.

Programmes Linked to Strategic Goals: In alignment with strategic objectives, 18 out of 20 teaching and learning programmes (90%) are directly linked to strategic goals. This high percentage underscores the concerted efforts to ensure programme alignment with overarching DSTI objectives. Nevertheless, attention should be given to the remaining 10% of programmes to strengthen their alignment with strategic goals for maximised impact.

Events

The following presents the overall outcome of the secondary data analysis:

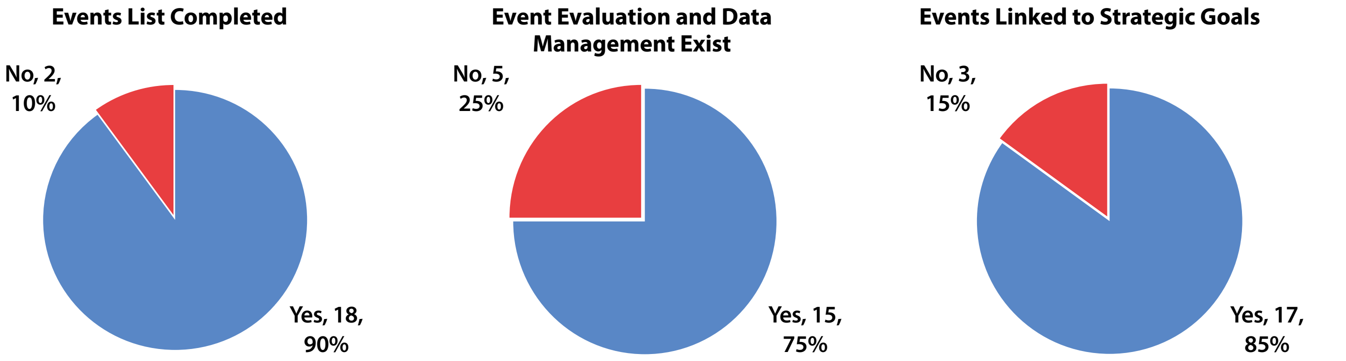


Figure 10: Visualisation of sub-categorical operational performance of science centres: Events

Science Engagement Events: From the assessment of science engagement events, it is noted that 18 out of 20 events (90%) have completed their event lists. This indicates a proactive approach to organising and cataloguing science engagement activities, ensuring comprehensive coverage within the event framework.

Events Evaluation and Data Management: Among the evaluated science engagement events, 15 out of 20 (75%) have established evaluation and data management systems. This suggests considerable effort towards monitoring and improving event effectiveness through data-driven insights. However, there is room for improvement in the remaining 25% of events to enhance their evaluation and data management practices.

Events Linked to Strategic Goals: Regarding alignment with strategic objectives, 17 out of 20 science engagement events (85%) are directly linked to strategic goals. This high percentage underscores concerted efforts to ensure event alignment with overarching objectives set by the DSTI. Attention should be given to the remaining 15% of events to strengthen their alignment with strategic goals for maximised impact on scientific engagement initiatives.

PEOPLE

Evaluating the personnel within science centres is essential for effective human resource management and the successful fulfilment of science engagement mandates. The individuals working in science centres are key contributors to visitor experiences, educational programme development, and outreach efforts. Assessing the skills, knowledge, and engagement levels of staff members is crucial for optimising both their individual performance and organisational performance to ensure the effective delivery of science engagement programmes and activities. Under this section, there are seven sub-sections, each with several key evaluation indicators.

Staffing

The following presents the overall outcome of the secondary data analysis:

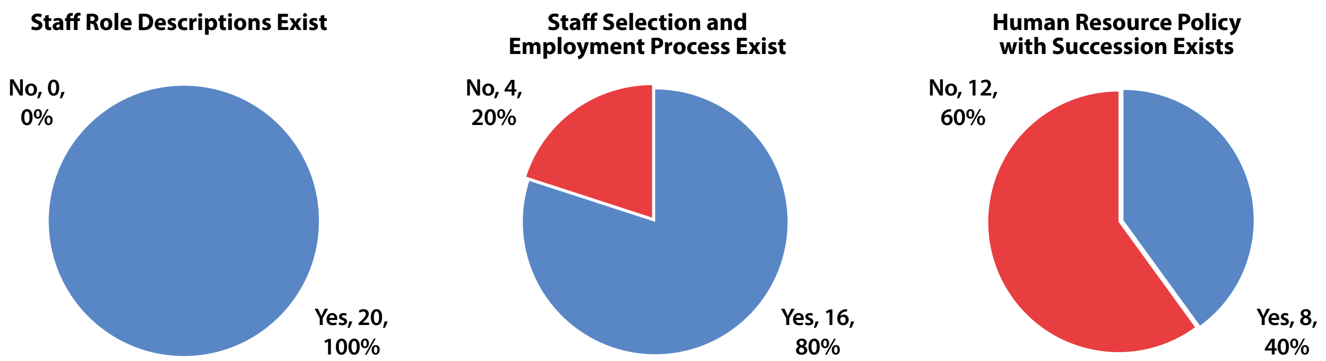


Figure 11: Visualisation of sub-categorical operational performance of science centres: Staffing

Staff role description exists: In all cases (100%), there is a staff role description in place. This indicates that the science centre has taken a comprehensive approach to defining roles within the science centre. Having role descriptions ensures clarity and alignment of responsibilities among staff members, which is essential for effective functioning and coordination within the team. With clear role descriptions, employees understand their duties, and expectations, and how their work contributes to the overall objectives of the science centre.

Proof of selection and employment process verified: In 16 out of 20 cases (80%), there is verified proof of the selection and employment process that indicates the science centre has mechanisms in place to document and validate the steps taken during recruitment, such as job postings, interviews, and reference checks. However, there is room for improvement in the remaining 20% of cases to ensure consistency and thoroughness in verification procedures, which could further enhance the credibility and reliability of the recruitment process.

Proof of HR policy with succession plan verified: Succession planning involves identifying and developing internal talent to fill key leadership positions in the future. Having a documented HR policy with succession plans demonstrates a science centre's commitment to ensuring continuity and science centre resilience in the face of turnover or leadership changes. In 8 out of 20 cases (40%), there is verified proof of a HR policy with succession plans. This indicates that there is some attention given to succession planning within the science centres. However, with only 12 (60%) of those that are lagging, there is a significant need for improvement in this area. Strengthening succession planning efforts could help mitigate risks associated with leadership transitions and ensure the long-term sustainability of the science centre.

Performance Management

The following presents the overall outcome of the secondary data analysis:

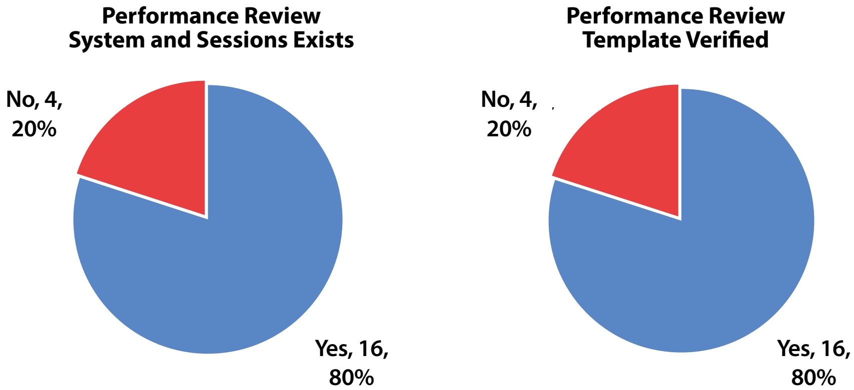


Figure 12: Visualisation of sub-categorical operational performance of science centres: Performance Management

Performance review system and sessions exist: In 16 out of 20 cases (80%), there is a performance review system and sessions in place. This indicates that the science centre has implemented a structured approach to evaluating employee performance regularly. Performance reviews provide an opportunity for managers and employees to discuss goals, provide feedback, and identify areas for development. Having such a system in place demonstrates a commitment to monitoring and improving employee performance, which is essential for science centre growth and success.

Performance Review template verified: Similarly, in 16 out of 20 cases (80%), the performance review template has been verified. This suggests that the science centre has a standardised template or form for conducting performance reviews. A verified template ensures consistency in the evaluation process across different departments or teams within the science centre. It provides a framework for assessing performance based on predetermined criteria, making the review process more objective and effective. However, there is still room for improvement in the remaining 20% of cases to ensure that all performance review templates are verified, which would contribute to greater consistency and fairness in performance evaluations.

Organisational Learning

The following presents the overall outcome of the secondary data analysis:

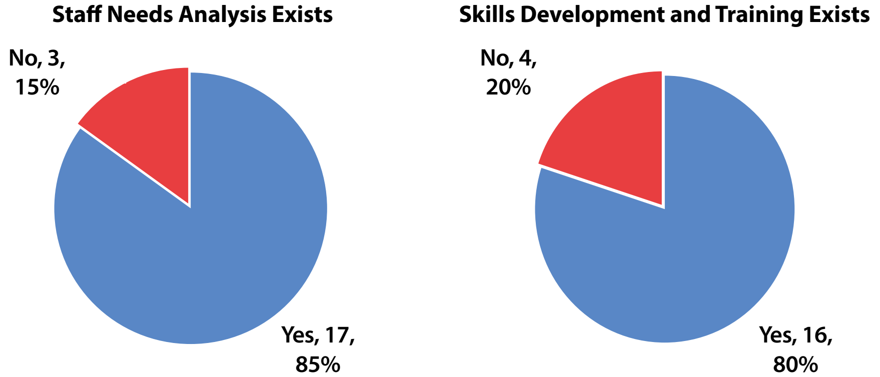


Figure 13: Visualisation of sub-categorical operational performance of science centres: Organisational Learning

Staff needs analysis exists: In 17 out of 20 cases (85%), there is a staff needs analysis in place. This indicates that the science centre conducts assessments to identify the learning and development needs of its staff members. Conducting a staff needs analysis allows the science centre to understand the skills gaps and training requirements within its workforce, which is crucial for designing effective learning and development initiatives. By addressing the specific needs of employees, the science centre can enhance job satisfaction, productivity, and overall performance.

Skills development and training exist: Similarly, in 16 out of 20 cases (80%), there are skills development and training programmes in place. This suggests that the science centre offers opportunities for employees to enhance their skills and knowledge through training and development initiatives. Investing in skills development not only benefits individual employees by enhancing their capabilities and career prospects, but also contributes to science centre success by ensuring that the workforce remains competitive and adaptable to changing business needs. However, there is still room for improvement in the remaining 20% of cases to ensure that all employees have access to skills development and training opportunities, which would contribute to a more skilled and engaged workforce overall.

Learning and Skills Development

The following presents the outcome of the secondary data analysis:

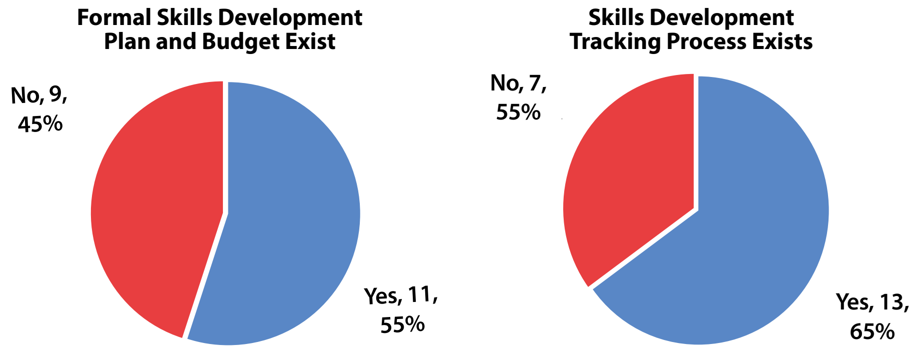


Figure 14: Visualisation of sub-categorical operational performance of science centres: Learning and Skills Development

Formal skills development plan and budget exist: In 11 out of 20 cases (55%), there is a formal skills development plan along with a verified budget. This signifies that the science centre has structured strategies in place for fostering employee growth and development, coupled with allocated resources to support these initiatives. However, it is worth noting that in 45% of cases, either no formal plan exists or the budget has not been verified. Establishing a formal plan with a clear budget allocation is crucial for effective planning, implementation, and evaluation of learning initiatives. It ensures that learning efforts are aligned with science centre goals and that resources are allocated optimally to maximise impact.

Skills development tracking process exists: In 13 out of 20 cases (65%), there is an established process for tracking skills development activities. This demonstrates the science centre's commitment to monitoring and evaluating the effectiveness of its learning programs. Tracking skills development enables science centres to assess progress, identify areas for improvement, and make informed decisions about future investments in employee development. However, it is noteworthy that in 35% of cases, there is no established tracking process. Implementing such a process is essential for ensuring that learning efforts are yielding desired outcomes and for continuously improving the science centre's capacity through targeted learning interventions.

Interns and Volunteers

The following presents the overall outcome of the secondary data analysis:

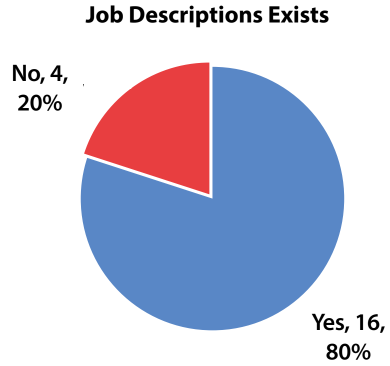


Figure 15: Visualisation of sub-categorical operational performance of science centres: Interns and Volunteers

Job descriptions exist: In 16 out of 20 cases (80%), job descriptions for interns, volunteers, and exchange programme volunteers are established within science centres. This demonstrates a proactive approach by the centres in delineating the roles and responsibilities of individuals participating in these programmes. Clear job descriptions help define expectations for both the science centre and the participants, ensuring that tasks and responsibilities are well defined. This structured approach contributes to a more organised and productive experience for interns, volunteers, and exchange participants. However, in 20% of cases, there are no job descriptions, potentially leading to ambiguity and inefficiencies in task allocation and supervision. Having job descriptions for all roles within these programmes is vital for clarity of responsibilities and effective management of employees within science centres.

Specialists

The following presents the outcome of the secondary data analysis:

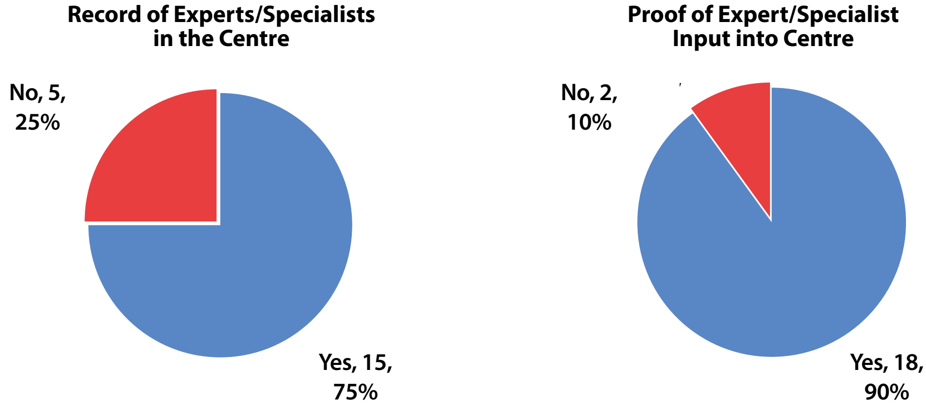


Figure 16: Visualisation of sub-categorical operational performance of science centres: Specialists

Record of experts/specialists in the centre: In 15 out of 20 cases (75%), there is a recorded list of experts or specialists within the science centre. This suggests that the centres have identified and documented individuals with specialised knowledge or skills relevant to their areas of focus. Maintaining a record of experts allows science centres to leverage their expertise for various activities such as exhibitions, educational programmes, and research projects. However, in 25% of cases, there is no recorded list of experts, which may indicate a missed opportunity to capitalise on specialised knowledge within the centre and potentially limit the scope of activities that can benefit from expert input.

Proof of expert/specialist input into the centre: In 18 out of 20 cases (90%), there is documented proof of expert or specialist input into the science centre. This demonstrates that the centres actively engage experts in their operations, programmes, and projects. Expert input can enhance the quality and credibility of the centre's offerings, ensuring accuracy and relevance in content development, educational outreach, and research endeavours. However, in 10% of cases, there is no documented proof of expert input, which may indicate a need for centres to better document and showcase the contributions of specialists to their activities. Doing so can help highlight the centre's credibility and expertise to stakeholders and the public.

Stakeholder Management

The following presents the outcome of the secondary data analysis:

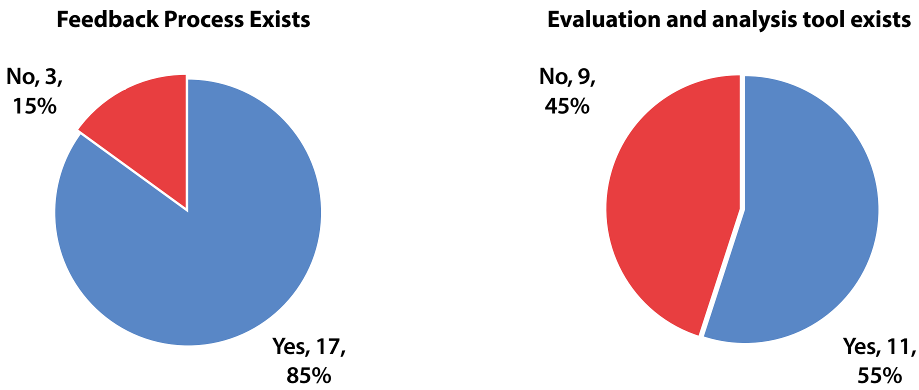


Figure 17: Visualisation of sub-categorical operational performance of science centres: Stakeholder Management

Feedback process exists: In 17 out of 20 cases (85%), there is an established feedback process within the science centre. This indicates that the centres value input from stakeholders and have mechanisms in place to gather feedback on their programmes, exhibitions, and services. A feedback process allows science centres to engage with stakeholders, understand their needs and expectations, and make informed decisions to improve their offerings. However, in 15% of cases, there is no documented feedback process, which may indicate a missed opportunity for centres to actively involve stakeholders in shaping their activities and enhancing stakeholder satisfaction.

Evaluation and analysis tool exists: In 11 out of 20 cases (55%), there is an evaluation and analysis tool in place within the science centre. This tool is essential for systematically collecting and analysing data related to the centre's programmes, exhibitions, and services. By evaluating the effectiveness and impact of their initiatives, science centres can identify strengths, areas for improvement, and opportunities for innovation. However, in 45% of cases, there is no documented evaluation and analysis tool, which may indicate a gap in the centre's ability to measure and assess its performance acknowledgement and improvement where necessary. Establishing such a tool can enable centres to track progress towards their goals, demonstrate impact to stakeholders, and continuously enhance their offerings based on evidence-based insights.

COMMUNICATION

Evaluating the communication practices and capabilities of science centres is essential for addressing advertising, marketing, and engagement effectively. Communication plays a critical role in promoting science centres and reaching diverse audiences. Assessing the clarity, reach, and effectiveness of communication methods is crucial for optimising advertising and marketing strategies, ensuring that science centres convey their offerings and educational initiatives to the public in a meaningful way. Additionally, it is important to align communication strategies with the broader science engagement mandate, enhancing visibility, attracting diverse audiences, and fostering connections with the community. Integrating effective communication practices into operational processes contributes to the seamless delivery of the science engagement mandate, underscoring the vital role of communication in the success of science centres. Under this section, there are five sub-sections, each with several key evaluation indicators.

Communication Channels

The following presents the outcome of the secondary data analysis:

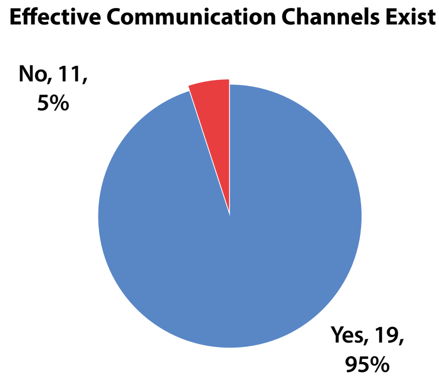


Figure 18: Visualisation of sub-categorical operational performance of science centres: Communication Channels

Effective communication channels exist: In 19 out of 20 cases (95%), effective communication channels are established within the science centre. This high percentage indicates that the centres prioritise clear and efficient communication with their stakeholders, staff, and the public. Effective communication channels facilitate the dissemination of information about programmes, events, exhibits, and educational initiatives, fostering engagement and participation. They also enable the centre to receive feedback, address inquiries, and promote collaboration with stakeholders. However, in 5% of cases, there may be room for improvement in establishing or optimising communication channels to ensure that information is accessible and reaches the intended audience effectively.

Marketing and Corporate Communication

The following presents the overall outcome of the secondary data analysis:

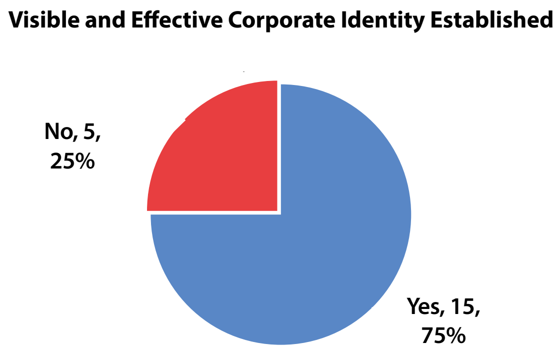
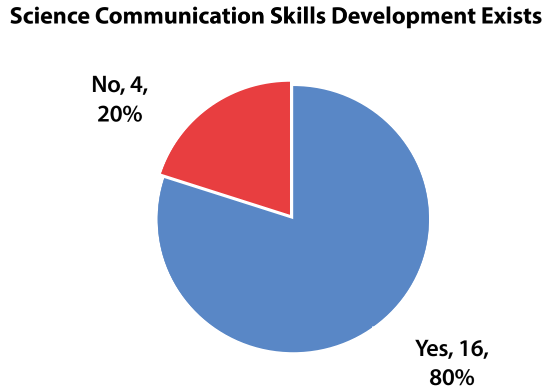


Figure 19: Visualisation of sub-categorical operational performance of science centres: Marketing and Corporate Communications

Visible and effective corporate identity established: In 15 out of 20 cases (75%), science centres have established a visible and effective corporate identity. This suggests that these centres have developed a cohesive and recognisable brand image that aligns with their mission, values, and objectives. An effective corporate identity enhances the centre's visibility, credibility, and reputation among stakeholders and the public. It ensures consistency in messaging, branding elements, and communication materials, which helps to strengthen the centre's overall impact and influence. However, in 25% of cases, there may be opportunities to further enhance and strengthen the centre's corporate identity to better differentiate itself and effectively communicate its unique value proposition to its target audience.

Science Communication

The following presents the outcome of the secondary data analysis:



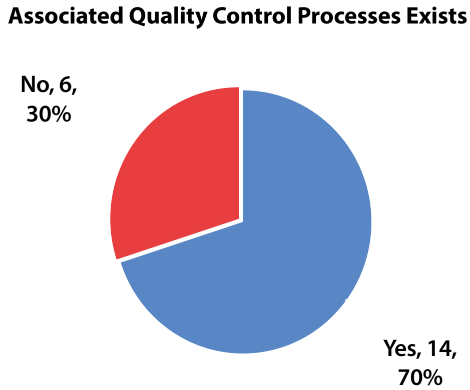


Figure 20: Visualisation of sub-categorical operational performance of science centres: Science Communication

Science communication skills development exists: In 16 out of 20 cases (80%), there is evidence of science communication skills development within the science centres. This indicates that these centres recognise the importance of effectively communicating scientific concepts and information to diverse audiences. By investing in technology to promote science communication, science centres provide tools of trade as a necessary mode of communicating science to engage and educate the public about scientific topics in an accessible and engaging manner. These tools of trade are, written scripts, videos, graphic illustrations, podcasts and exhibits, among others. This was evident during the global challenges of COVID-19 whereby both scientists and the public were in constant communication on science related matters using mainly online, TV and social media as communication channels. It was during this period that the importance of science communication in driving policy direction, shaping behaviour, as well as to spark public awareness and interest in science was realised.

According to the Science Centres Norms and Standards, interactive exhibits are among the tools that are used by the science centres to communicate science in an interactive educational experience. The interactive nature of the science centres represent a unique opportunity to spread scientific awareness, promote non-formal science education, promote scientific literacy and provide life-long learning opportunities for society in science. It is through this understanding that an exhibit in the science centre should be simple (easy to use), attractive to the visitors and present the science in an unintimidating manner, from basic science to complex science.

An interactive exhibit is defined as a device in which the visitor's response to the exhibit produces a change in the exhibit to an extent that more time will be spent around it. McLean (1993) defines interactive exhibits as "those in which visitors can conduct activities, gather evidence, select options, form conclusions, test skills, provide input, and actually alter a situation based on input". At the heart of interactivity is reciprocity of action, where a visitor acts on the exhibit and the exhibit reacts in some way. There are two ways of interaction with exhibits, physical engagement and mental engagement. Interactives might include something as simple as pressing a button which illuminates a light or something as complex as a sophisticated interactive computer system.

In this regard, the role of exhibits in science communication cannot be underestimated as they continue to foster public understanding of science and promote scientific literacy, ultimately enhancing the centre's impact and relevance within the community. However, in 20% of cases, there may be opportunities to further prioritise and invest in science communication skills development to ensure that staff members possess the requisite abilities to effectively communicate science to various audiences.

Associated Quality control processes exist: In 14 out of 20 cases (70%), there are associated quality control processes in place for science communication activities within the science centres. This indicates that these centres have mechanisms in place to ensure the accuracy, reliability, and integrity of the scientific information they communicate to the public. Quality control processes may include peer review, fact-checking, and verification procedures to uphold the credibility and trustworthiness of science communication efforts. By implementing robust quality control processes, science centres demonstrate their commitment to maintaining high standards of excellence in their communication practices. However, in 30% of cases, there may be opportunities to further strengthen and formalise quality control processes to ensure consistent adherence to best practices.

Information Management

The following presents the outcome of the secondary data analysis:

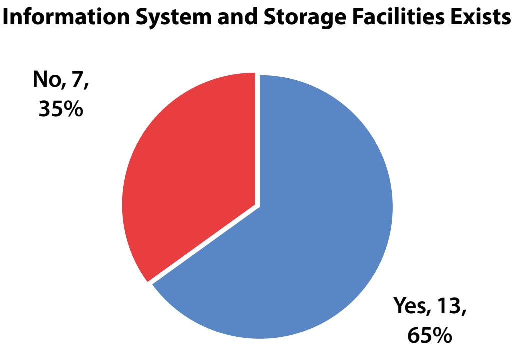
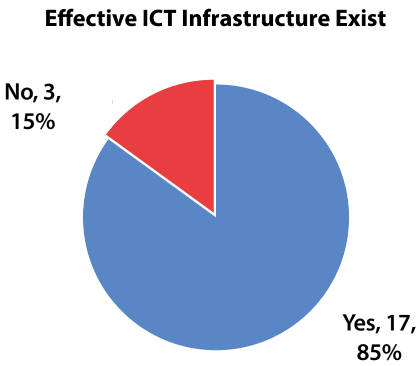


Figure 21: Visualisation of sub-categorical operational performance of science centres: Information Management

Information systems and storage facilities exist: In 13 out of 20 cases (65%), science centres have established information systems and storage facilities. This indicates that these centres have implemented infrastructure and processes to manage and store information effectively. Having such systems in place is crucial for organising, accessing, and preserving valuable data and resources related to the centre's operations, programmes, exhibits, and research activities. Information systems enable efficient retrieval and dissemination of information; facilitate collaboration among staff members, and support evidence-based decision-making. However, in 35% of cases, there is a lack of established information systems and storage facilities, which may hinder the centre's ability to safely secure information and manage document flow more effectively. Establishing robust information management systems is essential for enhancing productivity, transparency, and accountability within science centres.

Information Communication Technology

The following presents the outcome of the secondary data analysis:



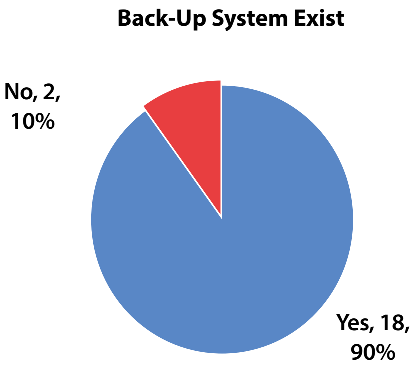


Figure 22: Visualisation of sub-categorical operational performance of science centres: Information Communication Technology

Effective ICT infrastructure exists: In 17 out of 20 cases (85%), science centres have established effective ICT infrastructure. This indicates that these centres have invested in technology infrastructure, including hardware, software, and networking capabilities, to support their operations and activities. An effective ICT infrastructure enables centres to efficiently manage data, communicate internally and externally, conduct research, and deliver educational programmes and exhibits. It also facilitates innovation and collaboration, allowing staff members to leverage technology to enhance the centre's offerings and impact. However, in 15% of cases, there may be opportunities to further strengthen ICT infrastructure to better support the centre's evolving needs and objectives.

Backup system verified: In 18 out of 20 cases (90%), science centres have verified backup systems in place. This indicates that these centres have implemented measures to protect their data and ensure business continuity in the event of system failures, data loss, or other disruptions. Backup systems help centres recover critical data and resources quickly and minimise the impact of potential disruptions on their operations. With backup systems, science centres demonstrate their commitment to safeguarding valuable information and maintaining operational resilience. However, in 10% of cases, there may be a need to review and verify backup systems to ensure their effectiveness and reliability in safeguarding data assets.

QUALITY MANAGEMENT AND BENCHMARKING

Evaluating the quality management and benchmarking practices of science centres is essential for optimising operational efficiency and ensuring the successful delivery of science engagement mandates. Quality management practices are integral to maintaining high standards in the development and execution of educational programmes, interactive exhibits, and public outreach initiatives. Benchmarking, on the other hand, provides a valuable comparative framework, allowing science centres to measure their performance against industry standards and best practices. By systematically assessing these operational aspects, science centres can identify areas for improvement, streamline processes, and enhance the overall quality of their services. This evaluative approach not only contributes to the effective delivery of the science engagement mandate, but also fosters a culture of continuous improvement, ensuring that science centres remain dynamic, responsive, and impactful in their engagement with diverse audiences. Under this section, there are four sub-sections, each with several key evaluation indicators.

Standards and Evaluation

The following presents the overall outcome of the secondary data analysis:

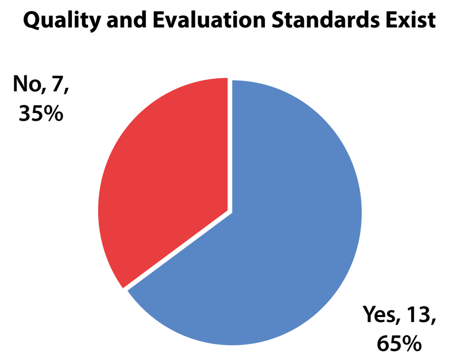


Figure 23: Visualisation of sub-categorical operational performance of science centres: Standards and Evaluation

Quality and evaluation standards exist: In 13 out of 20 cases (65%), science centres have established quality and evaluation standards. This indicates that these centres have defined criteria and benchmarks against which to assess the quality and effectiveness of their programmes, exhibits, and activities. Quality and evaluation standards help centres maintain high standards of excellence, ensure consistency in programme delivery and continuously improve their offerings based on feedback and data-driven insights. By implementing such standards, science centres demonstrate their commitment to delivering impactful and engaging experiences for their visitors and stakeholders. However, in 35% of cases, there is a lack of established quality and evaluation standards, which may present challenges in assessing and enhancing the quality and impact of the centre's offerings. Establishing clear standards and evaluation processes is essential for promoting accountability, transparency, and continuous improvement within science centres.

Procurement and Manufacturing

The following presents the outcome of the secondary data analysis:

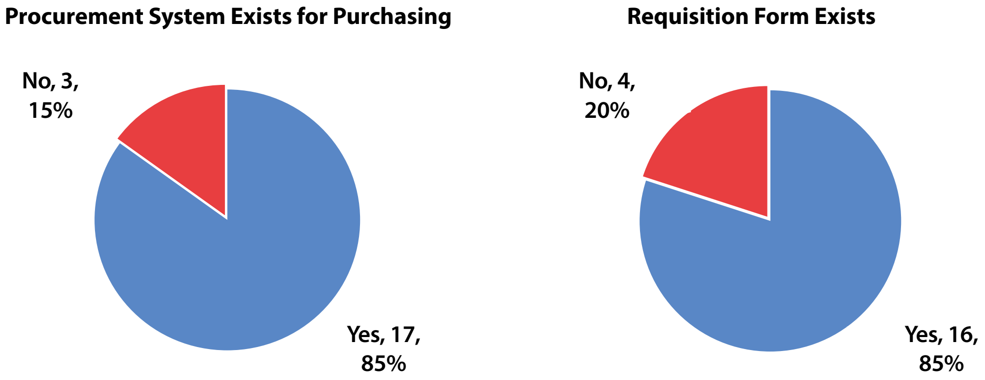


Figure 24: Visualisation of sub-categorical operational performance of science centres: Procurement

Procurement system exists and/or processes for purchasing: In 17 out of 20 cases (85%), science centres have established procurement systems and/or processes for purchasing goods and services. This indicates that these centres have structured procedures in place to acquire the necessary resources, equipment, and materials to support their operations and activities. A well-defined procurement system not only helps ensure transparency, efficiency, and compliance with regulations and best practices in sourcing and contracting, but it also fosters competitive bidding for a wide range of quality goods and services. By having robust procurement processes, science centres can effectively manage costs, mitigate risks, and maintain accountability in their procurement activities. However, in 15% of cases, there may be opportunities to further strengthen procurement systems or processes to enhance efficiency and effectiveness in resource acquisition.

Requisition form exists: In 16 out of 20 cases (80%), science centres have requisition forms in place. This indicates that these centres have standardised forms or procedures for requesting and approving purchases or services. Requisition forms help streamline the procurement process by providing a formal mechanism for documenting and tracking requests, approvals, and expenditures. By using requisition forms, science centres can ensure proper authorisation, budget control, and accountability in their procurement activities. However, in 20% of cases, there is a lack of effective requisition forms, which could potentially lead to inefficiencies or discrepancies in the procurement process. Implementing standardised requisition forms can help centres improve transparency, control, and oversight in their procurement practices.

Asset Management

The following presents the overall outcome of the secondary data analysis:

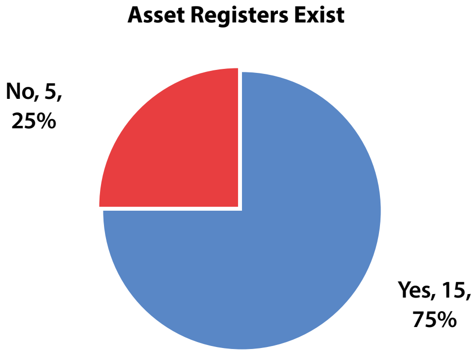


Figure 25: Visualisation of sub-categorical operational performance of science centres: Asset Management

Asset register verified: In 15 out of 20 cases (75%), science centres have verified asset registers. This indicates that these centres maintain records of their assets, including equipment, facilities, and other resources, and have verified the accuracy of these records. Verified asset registers help centres track the location, condition, and value of their assets, facilitating effective asset management and strategic decision-making. By verifying asset registers, science centres ensure the reliability and accuracy of the information used for asset tracking and management. However, in 25% of cases, there may be opportunities to improve the verification process or ensure the completeness and accuracy of asset records to enhance asset management practices within science centres.

Health and Safety

The following presents the overall outcome of the secondary data analysis:

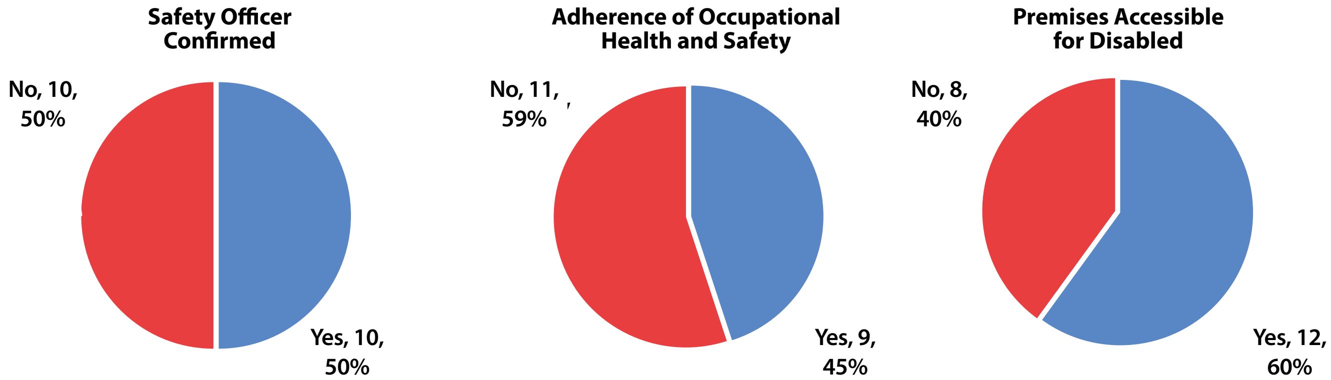


Figure 26: Visualisation of sub-categorical operational performance of science centres: Health and Safety

Safety officer confirmed: In 10 out of 20 cases (50%), science centres have confirmed the presence of a safety officer. Having a safety officer is crucial for overseeing and implementing safety protocols and procedures within the centre. They are responsible for ensuring compliance with safety regulations, conducting risk assessments, and providing training to staff to prevent accidents and injuries. However, in the remaining 50% of cases, there is no confirmation of a safety officer, indicating a potential gap in safety management.

Adherence to occupational health and safety: In 9 out of 20 cases (45%), science centres adhere to occupational health and safety standards. Adhering to these standards is essential for maintaining a safe and healthy work environment for staff, volunteers, and visitors. It involves implementing policies and procedures to prevent workplace hazards, providing appropriate safety training, and ensuring compliance with regulations. However, in the majority (55%) of cases, there appears to be a need for improvement in adhering to occupational health and safety standards, which could pose risks to individuals within the centre.

Premises accessible for people with disabilities:In 12 out of 20 cases (60%), science centres have premises that are accessible for disabled individuals. Accessibility is essential to ensure that all visitors, regardless of physical ability, can fully participate in and enjoy the centre's offerings. This includes providing ramps, elevators, accessible restrooms, and other accommodations to facilitate access for individuals with disabilities. However, in 40% of cases, there is a lack of accessibility for disabled individuals, this is in contravention of the country's aspiration of inculcating a culture of transformation, inclusivity and diversity across all sectors.

7.2. Objective 2: Comparative analysis of scoring between Peer and Accreditation Committees

GOVERNANCE AND PLANNING

The overall outcome of the data analysis is presented as follows:

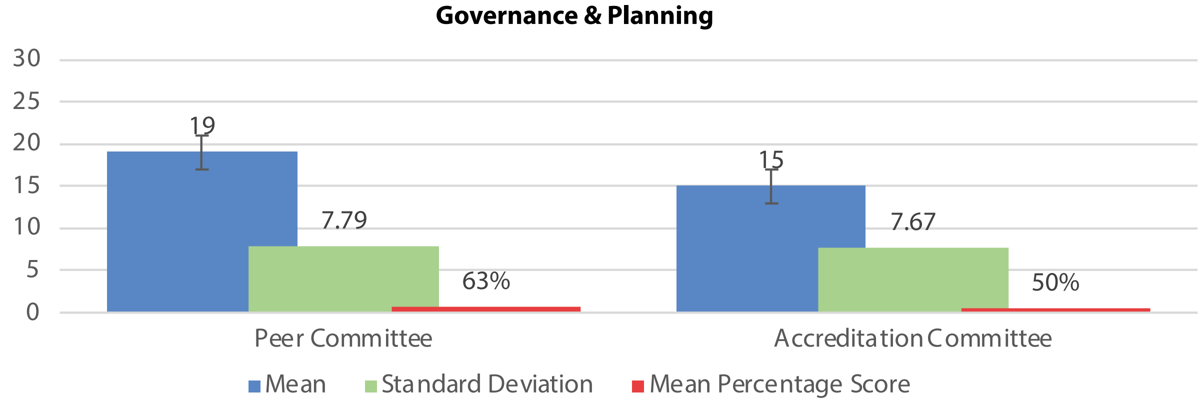


Figure 27: Combination Outcomes for Variables 1 and 2 Across 28 Reports: Governance and Planning

Mean

Figure 27 indicates that the mean of the Peer Committee i.e. 19 is much greater than that of the Accreditation Committee's 15. This means on average that the Peer Committee scored higher for governance and planning criteria as compared to the Accreditation Committee.

Standard Deviation (SD)

The standard deviations for the Peer Committee and the Accreditation Committee are depicted as 7,79 and 7,67 respectively. While the two values are not significantly different, both are exceedingly high, which means the spread of the scores by the two committees is far from the mean showing a variability of approximately 8 points. This is an indication of a larger dispersion, meaning that the distribution of their data (scores) is widely spread from the mean.

Mean Percentage Score (MPS)

The MPS values (Peer: 63%, Accreditation: 50%) represent the percentage of the maximum possible score achieved by each committee in evaluating governance and planning criteria. These values indicate the overall performance of each committee relative to the maximum achievable score. It means the peer scores show a more favourable assessment of governance and planning criteria, contrary to the accreditation committee. On average, the MPS of the two committees can be translated as 57%.

Analysis of Variance (t-Test)

The t-test was conducted, hypothetically with the assumption that the variance of values of the Peer Committee is equal to the values of the Accreditation Committee. In this regard, the t-test table below summarises the results between group variations.

Source of Variation	Observation	df	t-Stats	P(T<=t) one tail	t Critical two-tail
Between Groups	28	54	1,8662224	0,033722	2,004879

Hypothetically, the scores of the Peer Committee:

- Mean = 19
- Standard deviation = 7,79
- N = 28

are greater than the scores of the Accreditation Committee reflected as:
Mean = 15
Standard deviation = 7.67
N = 28

The analysis shows that this difference was significant with the p-value of less than 0,05 reflected as, t(54) = 2,004879, p = 2 = 0,03 (one tail).

SERVICE OFFERINGS

The outcome of the data analysis is presented as follows:

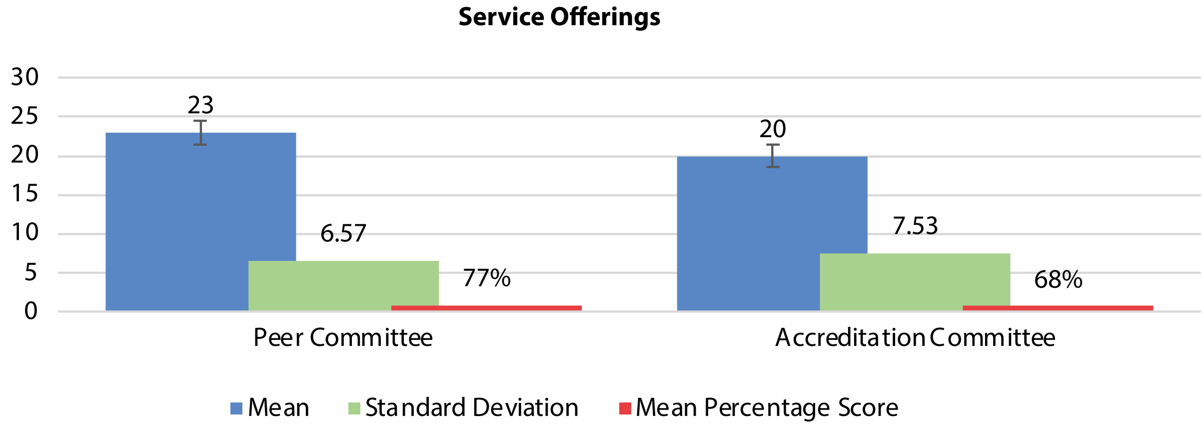


Figure 28: Combination Outcomes for Variables 1 and 2 Across 28 Reports: Service Offering

Mean

Figure 28 shows the mean score for the Peer Committee at 23, while for the Accreditation Committee at 20. This suggests that, on average, the Peer Committee scored higher in evaluating service offering criteria as compared to the Accreditation Committee scores.

Standard Deviation (SD)

The standard deviation for both the Peer Committee and the Accreditation Committee was (Peer: 6,57; Accreditation: 7,53). This suggests that the variability of the scores by the peers shows a slightly lower variability of scores away from the mean as opposed to the accreditation committee, potentially indicating differing opinions or assessment criteria among committee members. Despite this, the results in both instances suggest a larger dispersion, which means data values are widely spread away from the mean.

Mean Percentage Score (MPS)

The MPS values reflected 77% and 70% for the Peer and Accreditation Committees respectively. The higher Peer Committee score indicates a more favourable assessment of service offering criteria. Accordingly, the average score of the two committees translates to 73%.

Analysis of Variance (t-Test)

The t-test was conducted, hypothetically with the assumption that the variance of values of the Peer Committees is equal to the values of the Accreditation Committees. In this regard, the t-test table below summarises the results between group variations.

Source of Variation	Observation	df	t-Stats	P(T<=t) one tail	t-Critical two-tail
Between Groups	28	54	1,435904	0,078399	2,004879

The score results of the Peer Committee show:

- Mean = 23
- Standard deviation = 6,57
- N = 28

Hypothetically it is assumed that the results are greater than the scores of Accreditation Committees reflected as:

- Mean = 20
- Standard deviation = 7,53
- N = 28.

The analysis shows that this difference was not significant with the p-value of 0,078, which is more than the p-value of 0,05, summarised as, t(54) = 2,004879, p = 2 = 0,07 (one tail).

PEOPLE

The outcome of the data analysis is presented as follows:

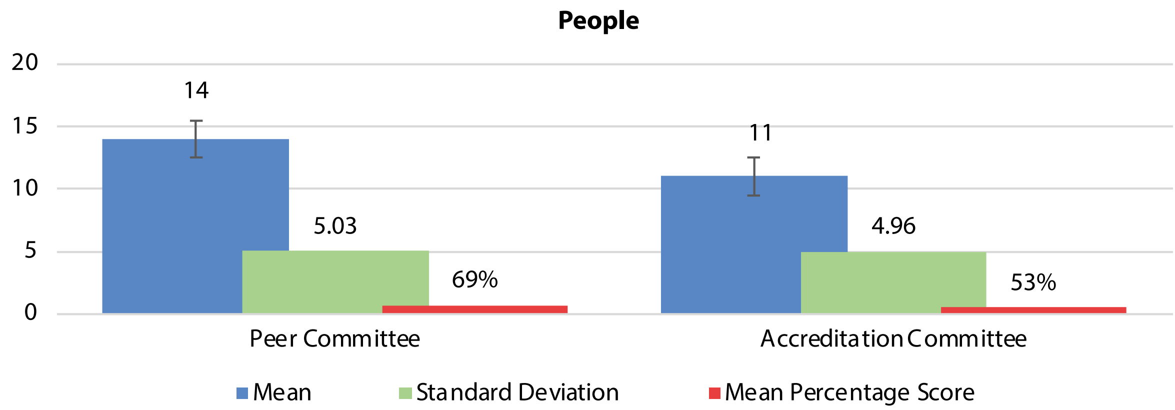


Figure 29: Combination Outcomes for Variables 1 and 2 Across 28 Reports: People

Mean

It is indicative that the mean score of the Peer Committee is 14, while for the Accreditation Committee is 11. This indicates that, on average, the Peer Committee recorded higher scores in evaluating people-related criteria contrary to the Accreditation Committee.

Standard Deviation (SD)

The standard deviation for both the Peer Committee and the Accreditation Committee (Peer: 5,03; Accreditation: 4,96), shows only slight difference when rounded to 5 points. This higher standard deviation may suggest more variability in evaluations, potentially indicating that in both instances more values are scattered away from the mean.

Mean Percentage Score (MPS)

The MPS values (Peer: 69%, Accreditation: 58%) represent the percentage of the maximum possible score achieved by each committee in evaluating people-related criteria. A higher MPS by the peers suggests a more favourable assessment of people-related criteria, while a lower MPS indicates a less favourable evaluation by the accreditation committee. The average scoring of the two committees is translated as 61%.

Analysis of Variance (t-Test)

The t-test was conducted, hypothetically with the assumption that the variance of values of the Peer Committee is equal to the values of the Accreditation Committee. In this regard, the t-test table below summarises the results between-group variations.

Source of Variation	Observation	df	t-Stats	P(T<=t) one tail	t-Critical two-tail
Between Groups	28	54	2,98347	0,008015	2,00487d

The score results of the Peer Committees show:

- Mean = 14
- Standard Deviation = 5,03
- N = 28

Hypothetically, it is assumed that these results are greater than the scores of the Accreditation Committee reflected as:

- Mean = 11
- Standard deviation = 4,96
- N = 28

According to the analysis, this difference is significant, less than the p-value of 0,05, reflected as, t(54) = 2,004879, p = 2 = 0.008015 (one tail).

COMMUNICATIONS

The outcome of the data analysis is presented as follows:

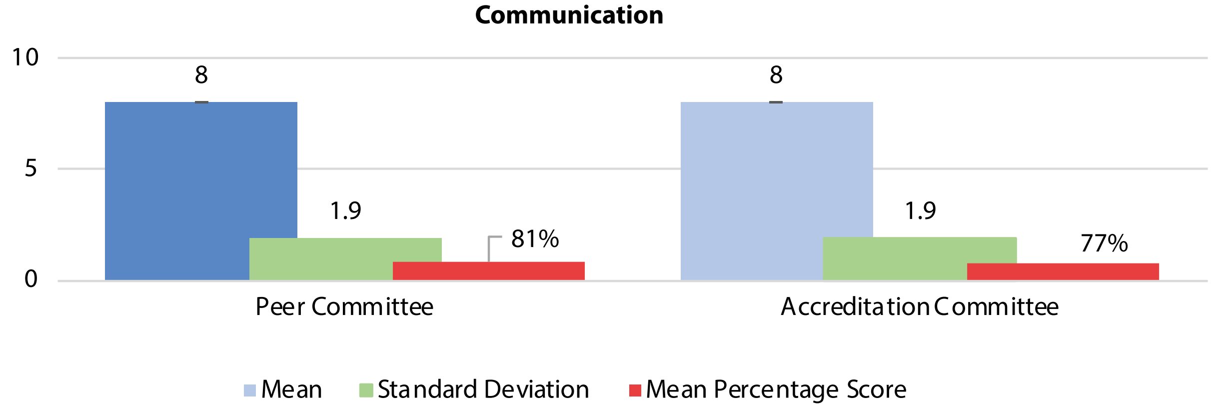


Figure 30: Combination Outcomes for Variables 1 and 2 Across 28 Reports: Communication

Mean

The mean total weighting score for both the Peer Committee and Accreditation Committee is 8, indicating the maximum possible score under the communication criteria. The mean score for both the Peer Committee and the Accreditation Committee is 8, indicating similar average scores in evaluating communication criteria.

Standard Deviation (SD)

The standard deviation for both the Peer Committee and the Accreditation Committee (Peer: 1,9, Accreditation: 1,9) This means that, on average, scores within each committee vary in similar points score from the mean. The results suggest a smaller dispersion in both instances, which means, the data values (scores) are more concentrated around the mean.

Mean Percentage Score (MPS)

The MPS values (Peer: 81%, Accreditation: 77%) represent the percentage of the maximum possible score achieved by each committee in evaluating communication criteria. Once again, the peers recorded a higher MPS, arguing a more favourable assessment of communication criteria, contrary to the accreditation committee that recorded a less favourable assessment. The average scoring of the two committees translates to 79%.

Analysis of Variance (t-Test)

The t-test was conducted, hypothetically with the assumption that the variance of values of the Peer Committee is equal to the values of the Accreditation Committee. In this regard, the t-test table below summarises the results between-group variation.

Source of Variation	Observation	df	t-Stats	P(T<=t) one tail	t-Critical two-tail
Between Groups	28	54	0,76387	0,224135	2,004879

The score results of the Peer Committees show:

- Mean = 8
- Standard Deviation = 1.9
- N = 28

Hypothetically, these results are equal to the scores of the Accreditation Committee reflected as:

- Mean = 8
- Standard deviation = 1.9
- N = 28.

The analysis reveals no significant difference with a p-value higher than 0,05, reflected as, t(54) = 2,004879, p = 2 = 0.224135 (one tail).

QUALITY MANAGEMENT AND BENCHMARKING

The outcome of the data analysis is presented as follows:

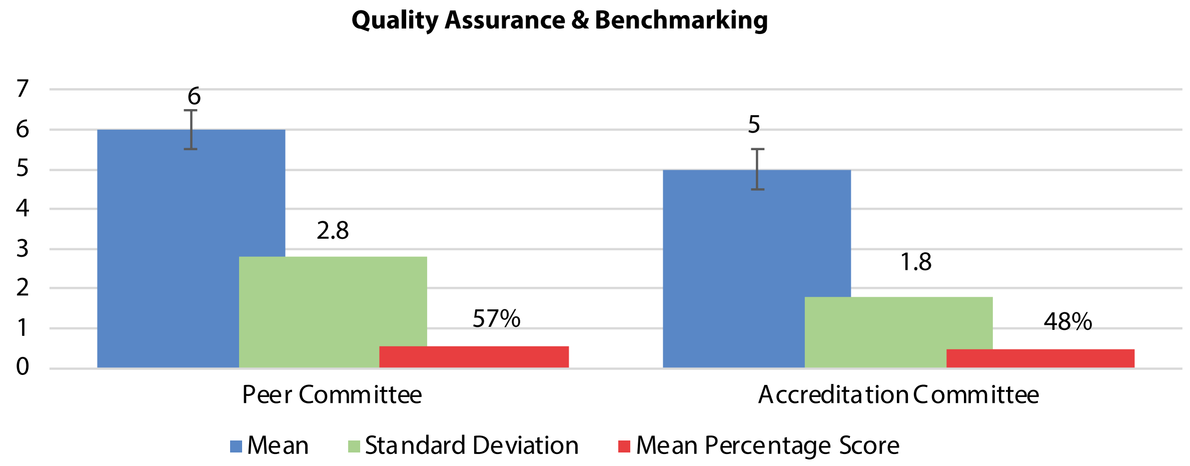


Figure 31: Combination Outcomes for Variables 1 and 2 Across 28 Reports: Quality and Benchmarking

Mean

The mean total weighting score for both the Peer Committee and Accreditation Committee is 10, indicating the maximum possible score under the quality and benchmarking criteria. The mean score for the Peer Committee is 6, while for the Accreditation Committee, it is 5. This indicates that, on average, the Peer Committee scores slightly higher in evaluating quality and benchmarking criteria compared to the Accreditation Committee.

Standard Deviation (SD)

The standard deviation for the Peer Committee is 2,8, and for the Accreditation Committee, is 1,8. While the peers recorded a slightly higher value, their scores are slightly spread away towards the left from the mean, unlike the accreditation committee scores which show that their scores are concentrated within the mean range. However, these values show a smaller dispersion even though the scores of the accreditation committees appear to be less varied.

Mean Percentage Score (MPS)

The MPS values (Peer: 57%, Accreditation: 48%) represent the percentage of the maximum possible score achieved by each committee in evaluating quality and benchmarking criteria. These values reveal that the peers scored more favourably on quality and benchmarking criteria, as compared to the accreditation committees. The average scoring of the two committees translates to 53%.

Analysis of Variance (t-Test)

The t-test was conducted, hypothetically with the assumption that the variance of values of the Peer Committees is equal to the values of the Accreditation Committees. In this regard, the t-test table below summarises the results between-group variation.

Source of Variation	Observation	df	t-Stats	P(T<=t) one tail	t-Critical two-tail
Between Groups	28	54	1,442303	0,077496	2,004879

The score results of the Peer Committee show:
- Mean = 6
- Standard deviation = 2.8
- N = 28

Hypothetically, it is assumed that the results are greater than the scores of the Accreditation Committee reflected as:
- Mean = 5
- Standard deviation = 1.8
- N = 28

The analysis shows that the difference was **not** significant with a p-value of greater than 0,05, reflected as, t(54) = 2,004879, p = 2 = 0.077496 (one tail).

7.3. Objective 3: Establish Practices and Learned Experiences

To improve the accreditation process for science centres, two distinct groups, Group A and Group B, were convened in April 2023. Consisting of members from both the peer evaluation and accreditation committees, these groups were assigned the task of reflecting on their collective experiences within the accreditation process. The primary aim was to stimulate open dialogue, share insights, and collaboratively propose solutions to the challenges encountered during their respective assessments. By harnessing the diverse perspectives and expertise of committee members, the objective was to refine and optimise the accreditation framework to ensure greater effectiveness and fairness in evaluating science centres.

Within any complex system, challenges may arise across its various functions. During these sessions, the intricacies of the accreditation process were examined; focusing on the challenges encountered and subsequently allocated to each function:

- The secretariat function.
- Verification function.
- Peer Evaluation Committee function.
- Final Accreditation Committee function.
- Science Centre Representative function.

By pinpointing and addressing these challenges, SAASTA aims to enhance the overall effectiveness, fairness, and reliability of the accreditation process. The summary findings are presented as follows:

SECRETARIAT FUNCTION

Challenge:
Delays in Capturing Meeting Discussions

Meeting discussions take longer to capture and share with committee members, leading to delays in the review process.

Challenge:
Inadequate Online System Accessibility

The online system used by the secretariat is not easily accessible to all committee members before meetings, hindering effective participation.

Challenge:
Harsh Tone in Report Language

Reports produced by the secretariat contain language perceived as harsh by committee members, affecting the overall tone and collaboration.

SCIENCE CENTRE FUNCTION

Challenge:
Lack of Clarity on Document Requirements and Eligibility Criteria

Document requirements and eligibility criteria for participating science centres are not clearly defined, causing uncertainty and potential disqualification issues.

Challenge:
Absence or Limited Structured Job Shadowing Program

There is no or limited structured job-shadowing programme for science centres not meeting accreditation minimum requirements, hindering capacity building and improvement opportunities.

VERIFICATION FUNCTION

Challenge:
Lack of Standardised Template and Formal Meetings

There is no standardised template for the verification process, and formal meetings with science centre leadership to clarify expectations are lacking.

Challenge:
Absence of Experienced Verifiers

Verifiers lack experience and comprehensive knowledge about science centres, affecting the thoroughness and accuracy of verification procedures.

PEER EVALUATION FUNCTION

Challenge:
Discrepancies in Templates and Required Documents

Inconsistencies between online templates and required documents lead to confusion and discrepancies in evaluation tasks.

Challenge:
Discrepancies in Templates and Required Documents

Inconsistencies between online templates and required documents lead to confusion and discrepancies in evaluation tasks.

Challenge:
Accessibility Issues with Online System

Committee members encounter difficulties accessing materials and participating effectively in the online system used for peer evaluations

FINAL ACCREDITATION FUNCTION

Challenge:
Undefined Distinction Between Strategic and Sustainability Plans

There is a lack of clarity regarding the differences between strategic and sustainability plans submitted by science centres, leading to confusion in the accreditation process.

Challenge:
Absence of Accreditation Members during Site Visitations

Accreditation members are not present during site visitations by peer evaluators, affecting the consistency and reliability of assessments.

Figure 32: Visualisation of Qualitative Outcomes


8

8. ANALYSIS OF FINDINGS

The analysis of findings yields a comprehensive summary of the operational state of science centres, accreditation scoring patterns, and insights garnered from committee discussions. This synthesis offers a holistic view of strengths, areas for improvement, and common deficiencies, informing strategic initiatives to enhance science centre performance and accreditation processes effectively.

8.1. Objective 1: Investigate the overall performance of science centres against key evaluation indicators

Evaluating the operational performance of science centres is important to ensure their effectiveness and sustainability in promoting scientific literacy and engagement with the public. Through comprehensive assessments across key indicators, such as governance, service delivery, human resources, communication, and quality management, valuable insights are gained into areas of strength, areas needing improvement, and common deficiencies. Any score of 80% and above is assumed that the area is effectively addressed whereas when the scores that are from 50% to 79% it is assumed that the area requires attention.

Governance and Planning*:* The assessment of governance and planning reflected a total of 15 evaluation indicators as a criterion for assessment. The analysis shows that only 4 representing 33% were found to be a strength at selected science centres that achieved a score of 80% and above. In cases where the science centres achieved high scores 91% were able to produce 'proof of registration' of their organisations.

Common Science Centre deficiencies of ≤50% were found in the area of "sustainability and future relevance" - inability to produce a five-year sustainability plan and 'regulatory environment - best practices in compliance'.

It is indicative that most science centres are lacking in the area of governance and planning. The absence of proper governance structures, if not addressed, can result in poor management practices, as well as financial losses and reputational damage. In this regard, it is incumbent that the science centres are capacitated in this area to elevate their good governance practices. It is within this context that the aim of accreditation is not only to validate the quality and integrity of science centres' operations but to also enhance its credibility, recognition, and ability to prove its relevance to realise its vision and mission in line with science engagement strategic goals.

Service Offering: With regard to service offerings, 12 evaluation indicators were used as a criterion for assessment. It is indicative that 7 of these representing 58% achieved a score of ≥80%. It is an area that could be seen as Common Science Centre's strengths. The highest score recorded was 100% and it was the evaluation indicator of, 'teaching and learning programmes - programmes listing completed', whereby their programmes were well documented. Clearly, this is an indication that the science centres understand the importance of making a list of their programmes as part of raising awareness of their programmes to the targeted audiences.

Common Science Centre deficiencies of ≤50% were found to be in the area of 'maintenance plan' and 'insurance plan'. Science centres must be encouraged to ensure that their exhibits have maintenance plans that should be monitored for necessary servicing as and when required. Similarly, with an insurance plan for their exhibit, it is critical to avoid a situation of losing all their exhibits due to unforeseen circumstances, such as fire, theft or damages due to weather conditions, especially during this time when the country is experiencing adverse weather conditions due to climate change.

People: Under this key evaluation indicator, 14 evaluation indicators were used as a criterion for assessment. Of these, 9 representing 64% were found to be the Common Science Centre strengths with scores of 80% and above with the highest score of 100% whereby science centres were able to prove that "staff role descriptions exist". This appears to reflect an area in which science centres are performing well. People management remains a very critical area that can destroy or build an organisation, depending on how people are managed and thus important for the science centres to keep building up on this strength.

Common science centre deficiencies of ≤50% were reflected in the area of staffing whereby most science centres were unable to provide 'proof of existing HR policy with succession plan verified'. The absence of requisite succession planning efforts is a risk to business continuity and thus important for the science centres to put measures in place to ensure smooth and seamless leadership changes in the event of staff exits.

***Communication*:** The area of communication has seven evaluation indicators. According to the analysis, it is only in four cases representing 57% where the scoring of science centres performance was ≥80%. The highest score recorded was 95%, the indicator of availability of 'effective communication channels'. It means there is an understanding that communication is key to information dissemination and the science centre community should be commended for this. As this area is a common science centre strength, the community should build on this.

Overall, the analysis of findings showed no anomaly where common science centre deficiencies ≤50% could be found.

***Quality Management and Benchmarking*:** In terms of quality management and benchmarking, there is a total of seven evaluation indicators. The analysis of findings established that two indicators representing 29% were found to be Common Science Centre strengths where an achievement of ≥80% was recorded with the highest score of 85% and this was in the area of procurement and manufacturing – the 'existence of procurement processes'. This is an indication that science centres do recognise the importance of regulatory compliance as far as cost-effectiveness in the procurement of goods and services.

Common Science Centre deficiencies of ≤50% were found to be in areas of 'health and safety', specifically on "safety officer confirmed" and "adherence to occupational health", the latter recorded the lowest of 45%.

In conclusion, the comprehensive evaluation of science centres' operations not only identifies areas for improvement and common deficiencies, but also offers valuable insights for developmental planning and awareness campaigns for science centres that have not yet undertaken the accreditation process. By leveraging strengths and integrating identified areas for improvement into developmental plans, science centres can strategically enhance their effectiveness and sustainability in science engagement. Moreover, the recognition of common deficiencies underscores the importance of standardisation as the next logical step towards achieving excellence in science engagement. In doing so, science centres can further solidify their impact on society, fostering a culture of continuous improvement and advancing the promotion of excellence in science centres nationally.

8.2. Objective 2: Comparative analysis of scoring between the peer and accreditation committees

The comparative analysis between the Peer and Accreditation Committees is crucial as it evaluates the consistency and fairness of the accreditation process. It is assumed that, given the objectivity of the evaluation criteria, divergent scores by the two groups of evaluators should be minimal. The first set of evaluators, having direct access to the documentation, premises, and individuals under evaluation, is expected to provide scores based on first-hand observations and interactions. The second set of evaluators, relying on documentation and findings from the first set, is assumed to apply their experience and perceptions in conjunction with insights gained from interviews to formulate their scores. The assumption rests on the belief that both sets of evaluators, guided by the same objective criteria, will interpret and assess the information consistently, resulting in a convergence of scores that reflects the inherent objectivity of the evaluation process.

Governance and Planning: While the Peer Committee tends to score higher in evaluating governance and planning criteria as compared to the Accreditation Committee, statistically, the difference is significant with a p-value lower than 0,05 [t-Test: $t(54) = 2{,}004879$, $p = 2 = 0{,}033722$ (one tail)]. It means, there is a divergence of opinions between the two committees in terms of their scoring in this area.

Service Offerings: Similarly, for service offerings, the mean score of the Peer Committee is greater than Accreditation Committee and the analysis suggests that the difference is not statistically different with a p-value greater than 0,05 [t-Test: $t(54) = 2{,}004879$, $p = 2 = 0{,}07$ (one tail)]. In this regard, there is convergence of ideas between the two committees, meaning that there is agreement on the findings.

People: The findings reveal that the mean score of the Peer Committee is greater than the Accreditation Committee, meaning that their opinions differ in evaluating this area. This is substantiated further by the analysis which shows the p-value of less than 0,05 reflected as, [-Test: t(54) = 2,004879, p = 2 = 0.008015 (one tail)]. This amplifies the divergent opinions of the two committees and clearly indicate inconsistencies in the scoring.

Communication: Both the Peer Committee and Accreditation committees exhibited similar mean scores. It means both committees share the same sentiments in terms of their evaluation of communication across the board. This argument is further supported by the analysis of findings which corroborate and suggest no difference of opinions between the two committees given the p-value greater than 0,05, reflected as, [t-Test t(54) = 2,004879, p = 2 = 0.224135].

Quality Management and Benchmarking: According to the mean score the Peer Committee scored higher than the Accreditation Committee. It would appear that the committees committees do not agree based on their evaluations. According to the analysis, it is indicative that the difference is not significant with p-value greater than 0,05 [t-Test: t(54) = 2,004879, p = 2 = 0.077496 (one tail)]. Given the results, it can be concluded that while there is divergence of ideas between the two committees, their views are largely consistent.

The findings suggest that while there are tendencies for the Peer Committee to provide slightly more positive evaluations, which is unprecedented. Nevertheless, in three of the cases, the differences are not statistically significant. This indicates that variations in evaluation standards between the two committees may not be substantial. Considering the Accreditation Committee's limitations in accessing information, the analysis underscores the importance of ensuring fairness and consistency in the accreditation process, despite the inherent differences in committee access and composition.

Furthermore, the result findings revealed that it is in the areas of governance, planning and people, where the scores between the two committees were substantially different. In a normal distribution of values, particularly scores in this case, this is unexpected and may prompt further investigation into potential sources of variation. Whether this is due to interpretation or application of the evaluation criteria is yet to be established.

8.3. Objective 3: Establish practices and learned experiences

From the challenges outlined within each function of the accreditation process, several key insights are presented:

Communication and Accessibility: The challenges related to communication delays and inadequate accessibility highlight the critical importance of efficient communication channels and accessible platforms for committee members. Improving communication infrastructure can facilitate timely reviews and ensure active participation from all stakeholders.

Standardisation and Training: The absence of standardised templates and formal meetings, coupled with the lack of experienced verifiers, underscores the need for standardised procedures and comprehensive training programmes. Standardisation can enhance consistency and accuracy, while proper training can ensure that evaluators have the necessary expertise to conduct thorough assessments.

Clarity and Consistency: Challenges such as accessibility issues, discrepancies in templates, and ambiguity in evaluation criteria emphasise the need for clarity and consistency in the evaluation process. Clear guidelines and standardised templates can help mitigate confusion and ensure more accurate assessments of science centres.

Transparent Guidelines and Criteria: The lack of clarity on document requirements and eligibility criteria highlights the importance of transparent guidelines and criteria for participating science centres. Providing clear guidance can minimise uncertainty and promote transparency, fostering trust in the accreditation process.

Support and Oversight during Evaluation Visits: The absence of accreditation members during site visits, along with the lack of structured support programmes, indicates the need for more robust support mechanisms and oversight during evaluation visits. Ensuring the presence of accreditation members and establishing structured support programmes can enhance the reliability of assessments and provide opportunities for capacity building and improvement.

In summary, addressing these challenges requires a concerted effort to improve communication, standardise procedures, clarify guidelines, and enhance support mechanisms throughout the accreditation process.


9

9. CONCLUSIONS AND RECOMMENDATIONS

9.1. Conclusions

Based on the results findings and discussions on key evaluation indicators, it can be concluded that overall, there are weaknesses in all operational areas. The top two areas where science centres are lagging are quality management and benchmarking, as well as governance and planning. These were followed by people, service offerings and lastly, communication all needing corrective action.

The peers were found to be more modest in their scoring which could be attributed to their accessibility to documents and the science centre itself, however, there is no dispute between the two committees that the areas as reflected above, require attention. This is corroborated by statistically analysing data, which suggested that in almost all cases, the scoring variability between the two committees is statistically not different except in the operational area of Governance and Planning and People.

The governance and planning, as well as people key evaluation indicators were found to be an area where the science centre community was doing fairly well according to the peers, contrary to the scoring by the Accreditation committee. This disjuncture is corroborated by the analysis that the difference between the two committees is statistically significant. The argument is supported by the results findings of the MPS of the two committees, which in both KEIs recorded two-digit difference of 13 and 16 respectively. It means, there are discrepancies in scoring between the two committees.

The fact that in most instances, the scoring by the peers revealed a larger variability of scores as compared to the Accreditation committees cannot be discounted and thus the need to consider this in reading the results findings in this study.

In addition, it was only in two areas of communication, as well as quality management and benchmarking where the scores of both committees were within the mean range, otherwise, in all other areas most data (scores) fell outside the mean range. The implications could be that the instrument is not clear in certain areas, needing a review and/or that the interpretation and/or application thereof is problematic necessitating capacity building of committees on the instrument. Another concerning observation is the understanding of the role of an exhibit in science communication. It seems as if the existence of interactive exhibits at science centres in some instances were not considered in their scoring. Against this backdrop, the role of exhibits in science communication has been articulated under section 7.1 of this report and the committees are urged to investigate this area.

It should also be mentioned that certain parts of the instrument are a bit confusing and not clear. This is a matter that was raised over time and during the post-mortem meeting held with the committees in 2023. At the same meeting, both the Secretariat, the South African Agency for Science and Technology Advancement (SAASTA) and the Arbiter in the process, the Department of Science and Innovation (DSTI) held that the committees should also view the framework as a guiding document and not necessarily a casting stone. In this regard, it is within the committees' powers to use their discretion and apply their minds as objectively as possible in their assessment, and most importantly, in consideration that this process is not intended to be a punitive punishment, but rather developmental.

Based on the analysis of the preliminary findings of this study and rigorous discussions that ensued between the DSTI and SAASTA, a decision was undertaken that in the meantime while the draft report is being refined, certain recommendations such as the review of the instrument should begin. This was to ensure that in the new financial year, 2024/2025, when the digitalised accreditation process would be celebrating its fifth anniversary of operation since implementation in 2018/2019, science centres that acquired their certification levels can be encouraged to start with their re-evaluation.

The results findings in this study provide sufficient data and evidence that the implementation of the Framework for the Promotion of Excellence in a National Network of Science Centres has yielded positive results in building a network of science centres that share a common vision and mission, and that the process has had its own challenges and thus the next section which provides for proposed recommendations that should be considered for implementation.

9.2. Recommendations

Based on the findings and conclusion a series of recommendations have been formulated to address areas for improvement and leverage strengths identified within the evaluation process. These are also designed to guide all stakeholders in enhancing effectiveness and fostering continuous improvement.

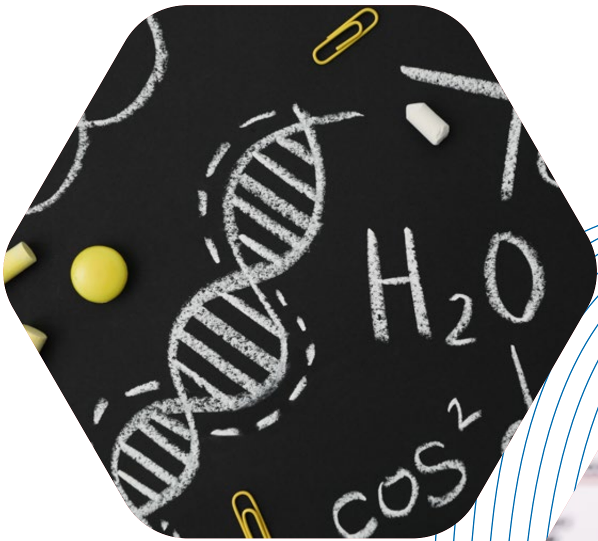
The recommendations are as follows:

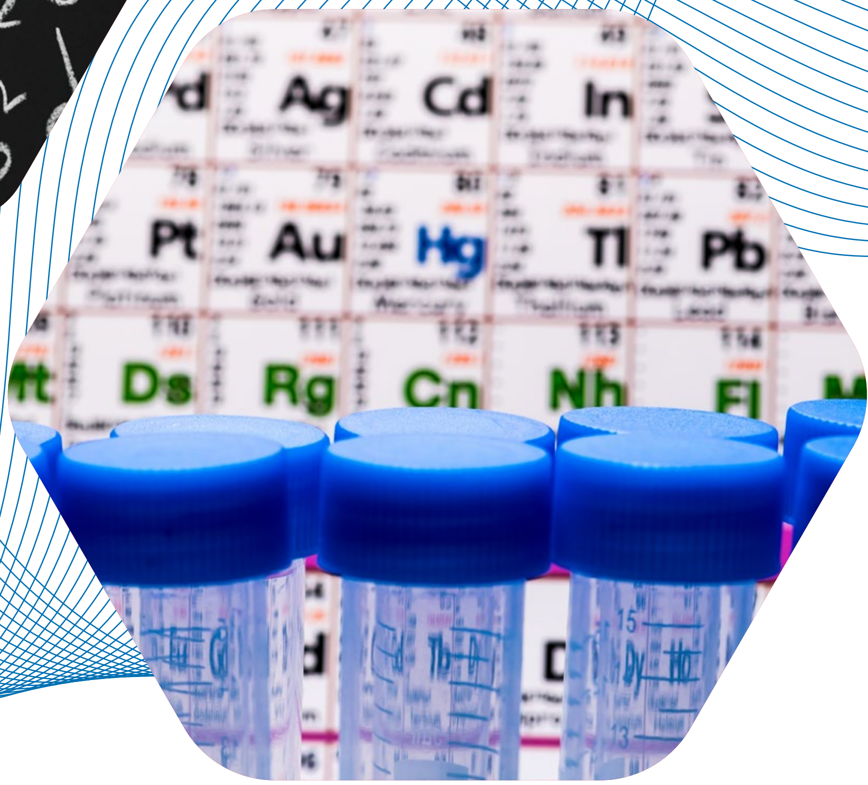
Table 1: Recommendations for Continuous Improvement

Reference	Functional Area	Focus Area	Recommendation
SCQA_PA01	Project Administration	**Establish Clear Evaluation Criteria Guidelines**	Develop and communicate detailed guidelines for evaluation criteria to both committees, ensuring a common understanding of the expectations for each criterion. This will help standardise the assessment process and minimise subjective interpretations.
SCQA_PA02	Project Administration	**Clarify the Weighting of Evaluation Components**	Clearly define the weighting assigned to different evaluation components, including premises inspections and interviews. Ensure that both committees are aware of the importance placed on these components or consider incorporating these elements into the accreditation committee's evaluation process to align with the peer review committee's approach.
SCQA_PA03	Project Administration	**Clarity on Evaluation Criteria for Different Science Centre Types**	Formulate a task team comprising applicable stakeholders to create a comprehensive guide tailored to the governance structures of various science centre categories, ensuring consistent and accurate assessments.
SCQA_PA04	Project Administration	**Clarify Eligibility Criteria and Accreditation Process Timing**	Develop eligibility criteria documents outlining the prerequisites for science centres to participate in accreditation and establish clear timelines for their application and evaluation processes to provide clarity and guidance.
SCQA_PA05	Project Administration	**Conduct Pilot Programmes**	Initiate pilot programmes to test and refine the evaluation process before full-scale reimplementation. This allows for the identification of potential issues and the implementation of necessary adjustments to improve alignment between committees. While pilot programmes are beneficial, ensure that they specifically address the areas of variability identified in the analysis. Tailor pilot programmes to test adjustments aimed at improving alignment between committees and facilitate feedback sessions.
SCQA_PA06	Project Administration	**Programme Advocacy**	Effectively advocate the project by actively engaging stakeholders on areas identified as common strengths, common areas for improvement and common deficiencies. Develop supporting materials and guidelines that area aligned to best practices for distribution.
SCQA_SF01	Secretariat	**Promote Collaboration and Knowledge Sharing**	Facilitate regular interactions and knowledge-sharing sessions between the peer review and accreditation committees. Encourage open discussions on evaluation methodologies, interpretation of criteria, and the significance placed on various assessment components.
SCQA_SF02	Secretariat	**Implement Calibration Sessions**	Conduct calibration sessions where members from both committees collectively review and score a subset of science centres. This exercise can help identify and address discrepancies in interpretation, ensuring a more consistent and harmonised evaluation process.
SCQA_SF03	Secretariat	**Provide Training on Evaluation Methodologies**	Offer training sessions to committee members, focusing on the specific methodologies employed in the evaluation process. This can include workshops on effective interview techniques, standardised inspection procedures, and consistent documentation practices.
SCQA_SF04	Secretariat	**Enhance Communication Channels [1]**	Establish efficient communication channels between the two committees to foster ongoing dialogue and information exchange. Regular meetings and updates can help bridge gaps in understanding and align evaluation practices.
SCQA_SF05	Secretariat	**Enhance Communication Channels [2]**	Schedule stakeholder engagement meetings with science centres to communicate the purpose, expectations, and process of accreditation, ensuring clarity and alignment from the outset. In addition, provide an information pack before evaluations that provides a procedural record.

SCQA_SC01	Science Centre	**Addressing Document Creation During Peer Evaluations**	Prioritise the availability of key management staff during peer evaluation visits and emphasise the importance of authenticity and accuracy in documentation to facilitate meaningful assessments.
SCQA_SC02	Science Centre	**Providing Guidance for Self-Evaluation**	Assign an experienced mentor to support science centres undertaking self-evaluation, ensuring they understand the evaluation process and complete templates effectively while maintaining autonomy.
SCQA_VC01	Verification	**Standardising the Verification Process**	Develop a standardised verification template and establish a science centre briefing process to ensure mutual understanding of verification expectations, enhancing the thoroughness and accuracy of the verification process.
SCQA_PC01	Peer	**Record Interviews and Submit as Part of Documentation**	Introduce a practice of recording interviews during the evaluation processes and include these recordings as part of the comprehensive document pack. This addition ensures transparency and provides a verifiable record of the interview interactions.
SCQA_AC01	Accreditation	**Observer Presence from Different Committees**	Assign one observer from each committee to be present during both evaluation processes. These observers can monitor and report on the consistency of evaluation practices, criteria interpretation, and adherence to established guidelines. This promotes accountability and enhances mutual understanding between committees

(Department of Science and Innovation, 2015) (Department of Science and Innovation, 2020) (Department of Science and Innovation, 2021)



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NRF
National Research Foundation

SAASTA
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