



MANDELA MINING PRECINCT
MINDS FOR MINES

COLLABORATION GUIDELINE:

SATCAP2025 WP 2.1

(MQA-MMP Collaboration)



science, technology
& innovation

Department:
Science, Technology and Innovation
REPUBLIC OF SOUTH AFRICA



MINERALS COUNCIL
SOUTH AFRICA



CSIR
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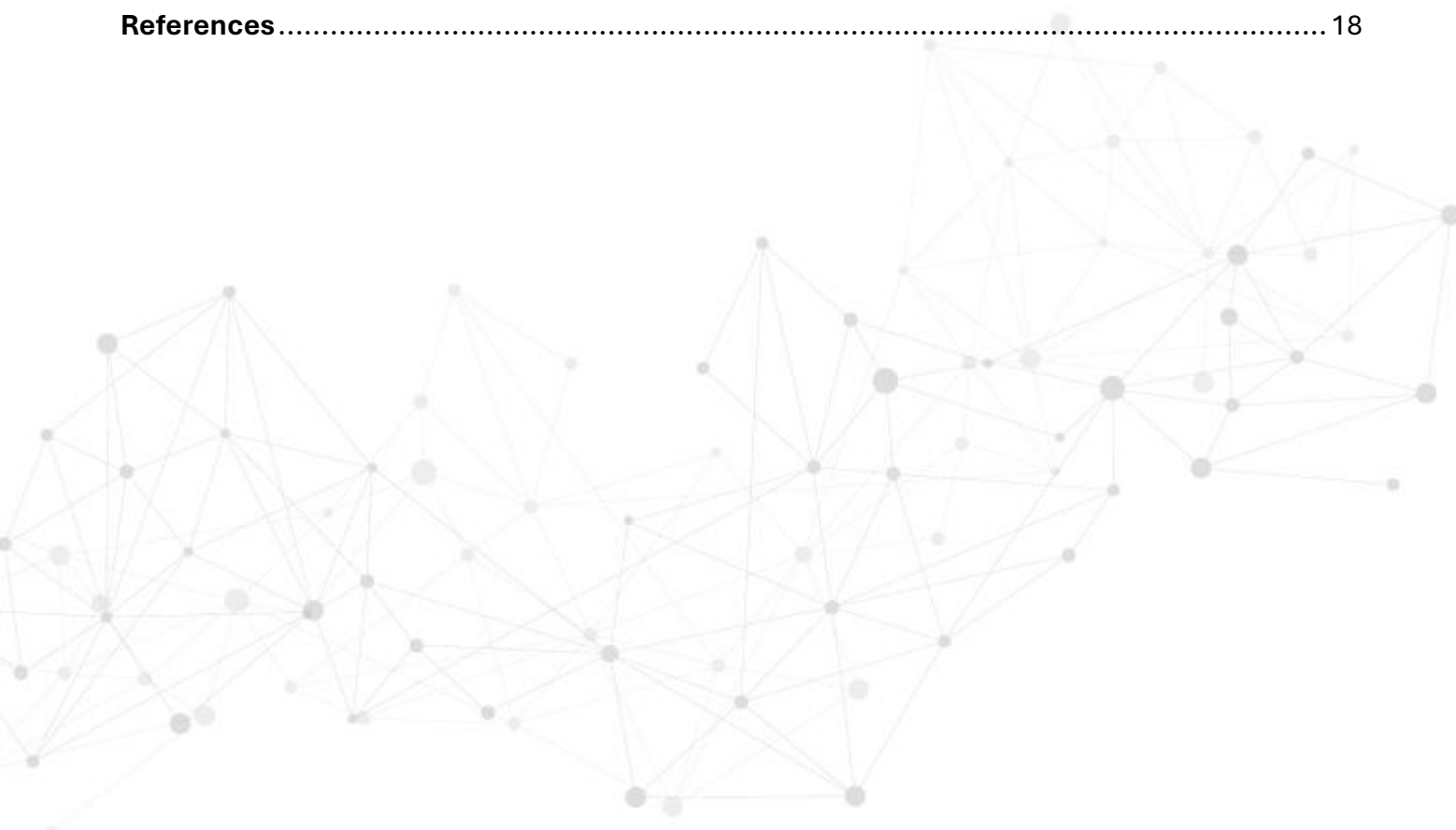
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Executive Summary

The Successful Application of Technologies Centred Around People (SATCAP) programme of the Mandela Mining Precinct (MMP) aims to understand the effects, impacts, and challenges of mining modernisation on people in the sector, exploring how stakeholders relate to technologies and to each other, whilst also supporting the Environmental, Social, and Governance (ESG) agenda. An intent of SATCAP is the inclusion of stakeholders in the mining modernisation journey. The Mining Qualifications Authority (MQA) is a key stakeholder with synergies to SATCAP around skills-related aspects for modernisation. Collaboration is being strengthened and extended with the MQA, as modern technologies and systems will have impacts on skills for people in the modernising mining sector. A memorandum of understanding (MoU) has been signed between the MMP and the MQA. As inter-organisation collaboration may be complex, through application of a case study methodology, learnings around such collaboration is unpacked.

This guideline outlines the **collaboration process** between the MMP and MQA to enable **project identification, project support and delivery**. **Learnings** around the MMP-MQA collaboration is **highlighted**. **The guideline may be applied for collaboration between entities with similar contexts**.

Findings indicate that an MoU was signed to enable collaboration for the alignment of goals between the MMP and MQA; and a Billateral Forum was established to identify projects of common interest, and to guide and manage project progress. A project was identified towards benefit for industry, and as a case study for collaboration. The case study project initiated for collaboration entailed the development of an exemplar Learner Management System driven by Artificial Intelligence methodologies, which will allow for the upskilling of assessors on Human Readiness Levels, Technology Readiness Levels and Change Management to support modern technology deployment in modernising mines in South Africa.

Learnings included identifying of gaps, strengths and enablers to collaboration. Also noting that best practices application was also considered for collaboration between the MMP and MQA.

Through the MMP-MQA collaboration, a best practice process map and approach for collaboration was developed/ confirmed which may be useful for application for entities with similar contexts. Key practices and processes for collaboration that were identified and applied included shared purpose, effective communication, relationship management, agility, digital engagement, and joint decision-making. Supportive collaboration tools may also include a Collaboration Effectiveness Framework and Stakeholder Interface Map.

1. Introduction

1.1. Background

There are synergies between the Mandela Mining Precinct (MMP) and Mining Qualifications Authority (MQA), particularly relating to skills of people in the modernising mining sector. The objective of the MMP is to maximise the sustainable returns of South Africa's mineral wealth through collaborative research, development, innovation and implementation of new mining technologies in a socially, environmentally and financially sustainable manner that is rooted in benefits for the local community and national economy. The MMP is funded by the Department of Science, Technology and Innovation (DSTI) and Minerals Council South Africa. One of the MMP's research programmes is the Successful Application of Technologies Centred Around People (SATCAP). The SATCAP programme focuses on the impacts of mining modernisation on people, and has a focus on jobs, skills, and stakeholder inclusion in mining modernisation, whilst also supporting the Environmental, Social, and Governance (ESG) agenda. Meanwhile, the MQA is a Sector Education and Training Authority (SETA), whose role is skills development, training and transformation in the mining sector.

The need for collaboration between the entities was highlighted for the following reasons:

- Avoid duplication and enable complementarity
- Synergise efforts through collaboration (projects of common interest)
- Leverage collaborator pools for expertise and skills in research work
- Enhance research capacity in the mining sector
- Build capacity/develop modernisation mining skills
- Enable successful technology adoption for mining sustainability

1.2. Project aim

The aim of the SATCAP Work Package 2.1 for 2025 was to outline a collaboration process between MMP and MQA, to enable project identification, project support, and delivery. Learnings from this collaboration needed to be highlighted.

To support collaboration between the entities, the case study project initiated for collaboration entailed the development of a Learner Management System (LMS) driven by Artificial Intelligence (AI) methodology/applications, which will allow for the upskilling of assessors on Human Readiness Levels (HRLs), Technology Readiness Levels (TRLs) and Change Management.

Project outputs needed to include a process map and approach for the collaboration, which reflects on the skills-related collaboration project identified and initiated, with learnings there from.

1.3. Methodology

The methodology considered:

- A desktop review of relevant collaboration documents, such as project templates, forum meeting documents and relevant project processes
- A review of related dependency aspects that may support or hinder collaboration
- A review of the project identification and initiation collaboration process (using the collaboration project as a case study), including barriers, successes, and what has worked
- Analysis to determine gaps, strengths, mitigation and best practices adopted in the existing process and approach
- Identification of a best practice collaboration approach which supports a collaboration project between key stakeholder partners
- Identification of a best practice process that enables the successful identification and delivery of a collaboration project of common interest
- Development of a guideline for collaboration

2. Key Findings

2.1. Collaboration practices and process

The underpinnings as related to the collaboration between the MMP and MQA are the MoU that has been signed and Bilateral Forum (BiLF) that was established. These support an alignment of goals and values as there is an agreement about the purpose of the collaboration, what the organisations will try to achieve together, with expectations and the principles by which the partners will operate. The MoU also details, for example, aspects such as confidentiality, intellectual property, and collaboration opportunities. Principles for collaboration consider the need for the collaboration, its purpose, commitment in areas of common interest, and outputs to benefit the industry. A BiLF was established for sustaining relationships, maintaining trust, clear collaboration arrangements, and for review and learning. BiLF meetings (per quarter and ad-hoc) allow for the practices described in Table 1.

The BiLF meets around four times a year, and as required. An independent chair is appointed to facilitate the sessions and three mandated members per organisation, with ad-hoc members are invited as needed. In the sessions, potential collaborative research projects are identified, and the conceptualisation and coordination of projects and initiatives are discussed. It was also agreed that each party would fund different components of the projects with separate agreements with respective third-party service providers. Each party would follow its own internal processes around project responsibility and delivery, including the call for proposals, proposal development, governance, contracting and procurement. It was noted that the members of the BiLF would review and sign off on the project terms of reference (ToR) and proposals prior to contracting, and also guide and track project progress; with project reports approved through the BiLF. To support project identification, initiation, progress and delivery, regular interactions are held through the BiLF, as per the interaction flow example provided in Figure 1. The interaction flow functions as a comprehensive collaboration map, guiding the identification of key engagement points, illustrating the logical flow of interactions, and highlighting specific stages at which collaboration activities could be observed, documented, and reflected upon.

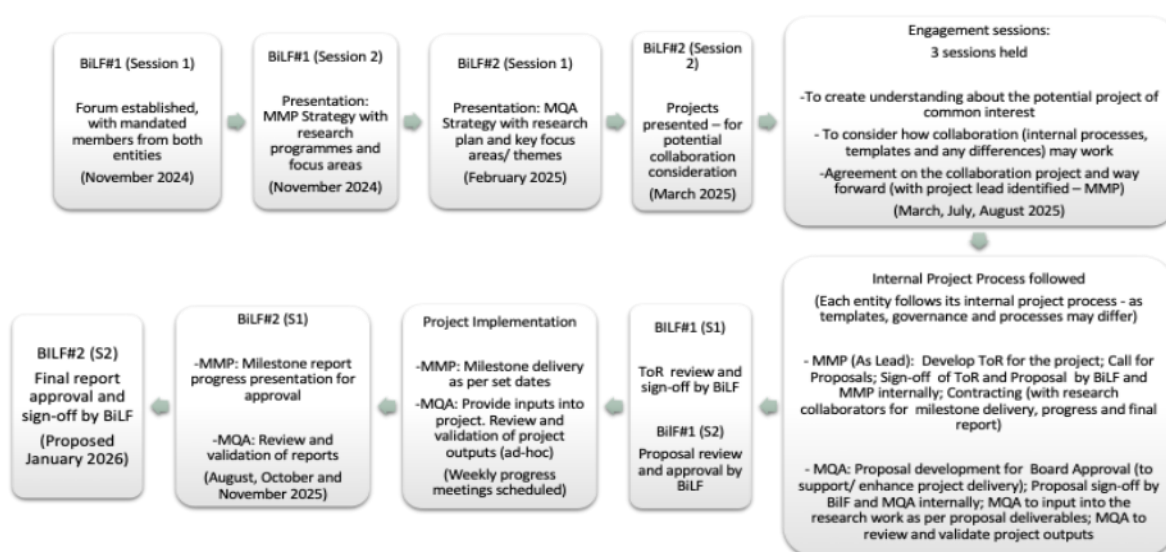


Figure 1: Illustration of the MMP-MQA process for collaboration to support project identification and initiation

Table 1: Practices for collaboration

Fostering Shared Purpose and Goals	- The BiLF as the inter-organisational team has a shared sense of purpose: What does the team want to get out of their work together? - With a shared sense of purpose in mind, the BiLF identifies projects that best suits organisations' common purpose. - An independent Chair facilitates the BiLF sessions. The BiLF signs off on ToR, proposals and then also guides and tracks projects progress.
Effective Communication	- To work together, collaborative communication is more than just talking and listening; it's about engaging, sharing ideas, providing feedback and hearing other perspectives in a way that fosters mutual respect and achieves results. Aside from BiLF scheduled meetings, ad-hoc engagement takes place as needed. - Communication involves empathy, open-mindedness and genuine interest in the contributions made by the BiLF members. Communication is not just about being heard, but also about being understood – understanding others processes and needs etc. The BiLF meetings with presentations, discussion, inclusive agenda points allows for open communication. Minutes and reports carry reflection of the sessions.
Relationship Management	There has to be a sustainable partnership over time, with the partner relationship based on communication, systems and processes to enable relationship management. Thus, the BiLF was established, with the inclusion of regular communication and engagement.
Identification of Common Needs	- Identifying synergistic/common/cross-practice needs/areas of common interest – recognising synergistic, common areas of need/interest brings benefit through inter-collaboration efforts, as it may avoid duplication etc. - ToR and proposals developed and signed-off signifies identification and ratification of projects of common interest.
Leveraging Team Strengths and Capacity Development	- The inter-organisation BiLF recognises team strengths and takes advantage of the teams' talents, competencies and strengths. Leveraging strengths means that the team members each have a role to play and considers how these may fit together towards achieving a broader common goal. - MMP is leading the project and will also leverage its collaborators to deliver the research work. The MQA is reviewing and validating outputs so that the so that outputs meets industry needs/benefits the industry. - Both teams provide technical inputs into the project as per their expertise/competence. - Sharing of knowledge, information, trends etc. supports capacity development. BiLF members are deep technical specialists, which allows for knowledge and information-share.
Digital Engagement	- The capacity for collaboration transcends organisational boundaries to foster a culture of shared knowledge and mutual growth. - Emphasis is also on the mechanisms and platforms to facilitate such inter-organisation collaboration efforts. In this digital age, there are platforms/digital tools that allow and enable seamless interaction making inter-organisation collaboration possible. This shift towards digitally-enabled collaboration reflects an effort to break down silos between organisations and cultivate a space where information flows freely and through which collective efforts are amplified. - MS Teams is used for BiLF meetings. Face-to-face meetings are ad-hoc. E-mails and WhatsApp communication are also used.
Agility	- Agility signifies the capacity to swiftly adapt and pivot in response to emerging challenges and opportunities, with the team composition allowing for enhancing responsiveness. - BiLF has research and technical experts, with industry experience, to be able to pivot as per industry needs.
Trust and Mutual Benefit	Through BiLF interactions, we build confidence that each organisation is looking out for the interests of the partner organisation and of the collaborative project – this builds and sustains trust in the relationship.
Processes and Decision-making	- Effective decision-making through the BiLF allows for inclusivity. It allows for collective, informed decisions, with open communication channels. - Internal organisation processes, per organisation, is followed, so that governance and processes are followed and adhered to. MMP follows its own internal processes for a call for proposals, approvals, contracting etc.; and the MQA follows its own internal processes and requirements. - The BiLF is also the forum for project approval matters.
Innovation	- Innovation underscores the freedom to explore which are essential for fostering creativity and new ways of working/ doing things. - The BiLF, inter-organisational approach, is something new, innovative and is being tried (between a PPP and Government entity).
Entity Contributions	Based on internal processes, funding is considered for the project. Contributions are made by each party (not necessarily financial – can be technical insights, through review/validation etc.).

2.2. Case study

The case study project identified in the 2025 financial year focused on the development an exemplar Learner Management System (LMS) for upskilling of assessors on assessing Human Readiness Levels (HRL), Technology Readiness Levels (TRLs) and Change Management, driven by Artificial Intelligence (AI) methodologies to support modern technology deployment in modernising mines in South Africa. The project is a multi-year project. In the first year (Phase 1), the main research and development took place, including sourcing of an applicable AI-driven solution and establishing the curriculum content. For Year 2 (Phase 2), a pilot of the programme will be designed and conducted. Year 3 (Phase 3) entails refinement and finalisation of the LMS for MQA potential roll out.

2.3. Learnings

Barriers to the collaboration were identified, along with mitigations for these, as described in Table 2.

Table 2: Initial barriers and mitigations

Barrier	Risk Mitigation
Training programmes certification, accreditation and roll-out is an MQA mandate; thus, MMP could be potentially dependent on MQA processes.	As the MQA is responsible for learning materials design and accreditation, this aspect of the project is assigned to the MQA and thus will not have direct bearing on MMP deliverables. MMP is focused on designing the LMS, with its four guides/modules.
Internal processes differ between parties. Funding (cycles/periods) are aligned, but each entity has their own internal approval processes to follow. Although the BiLF ensures progress and alignment between parties, the differing internal processes between each party may have an effect on final deliverables.	Each party needs to follow its own internal processes, and follow through internally for timeous approvals etc.
While co-created projects are supported by the parties' business plans and are of common interest between parties, parties may need more comprehensive understanding or capacity development of project concepts/ content etc.	On-going, continuous engagement for on-boarding, and discussion on concepts, content, capacity development etc.
Complexities and maturity levels of entities need to be considered, and need to be managed proactively.	On-going and continuous engagement for capacity development.

Based on the MMP-MQA collaboration, Figure 2 captures the dependencies, enablers, successes and what has worked – the case study learnings.

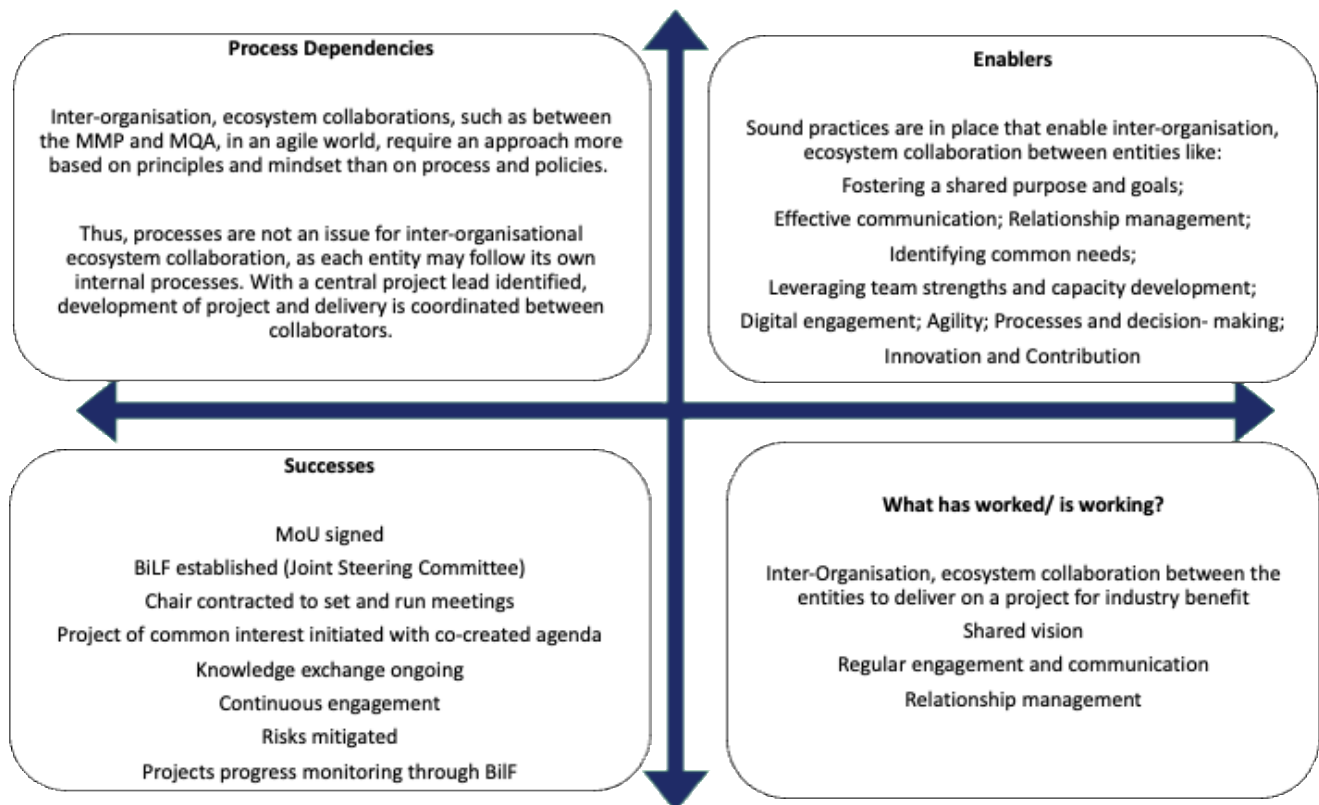


Figure 2: Case study learnings

3. Recommendations

3.1. Best practice collaboration approach

Best-practice approaches to research collaboration emphasise shared values, ethical commitments, and collective responsibility for societal benefit. Across disciplines, scholars highlight that effective collaborations are grounded in principles such as equity, transparency, reciprocity, and mutual accountability (Biracyaza & Habimana, 2025; Reaser *et al.*, 2025). These value foundations ensure that partnerships transcend institutional self-interest and promote broader public-good outcomes, particularly within the complexities of global crises and rapidly evolving knowledge systems (Byrne *et al.*, 2025). Research collaborations also increasingly recognise the distributed nature of expertise, encouraging institutions to co-develop agendas, share decision-making processes, and diminish power imbalances across geographic and organisational boundaries (Chankseliani *et al.*, 2025). Concurrently, scholarship on digital transformation indicates that the management of digital ecosystems, data infrastructures, and shared technological resources must be continually aligned with societal challenges and ethical standards (Braccini *et al.*, 2024).

Alongside these shared values, the literature highlights a set of human-centric, communicative, and process-oriented qualities that define effective research collaboration. High-quality communication (e.g., transparent, iterative, relational, and cross-disciplinary) is crucial for building trust, maintaining coherence across teams, and supporting the integration of diverse perspectives (Agada *et al.*, 2025; Ghimire, 2025). Human-centred collaboration also requires awareness of contextual, cultural, and structural inequalities that shape participation and influence within partnerships (Reaser *et al.*, 2025). Strong processes further enhance collaboration quality; governance mechanisms, clear escalation pathways, and integrated monitoring and evaluation systems help maintain alignment across institutions and over time (Byrne *et al.*, 2025). Lastly, the growing integration of generative AI into research workflows emphasises the importance of critical thinking, joint interpretation, and shared meaning-making as core collaborative skills (Lee & Low, 2024). Together, these values, human-centred considerations, communication practices, and process attributes establish a comprehensive foundation for resilient and socially responsive research partnerships.

Recommendations for a best practice collaboration approach are shown in Figure 3, and include research collaboration values, human-centric considerations, communication, processes, and attributes of strong collaboration.

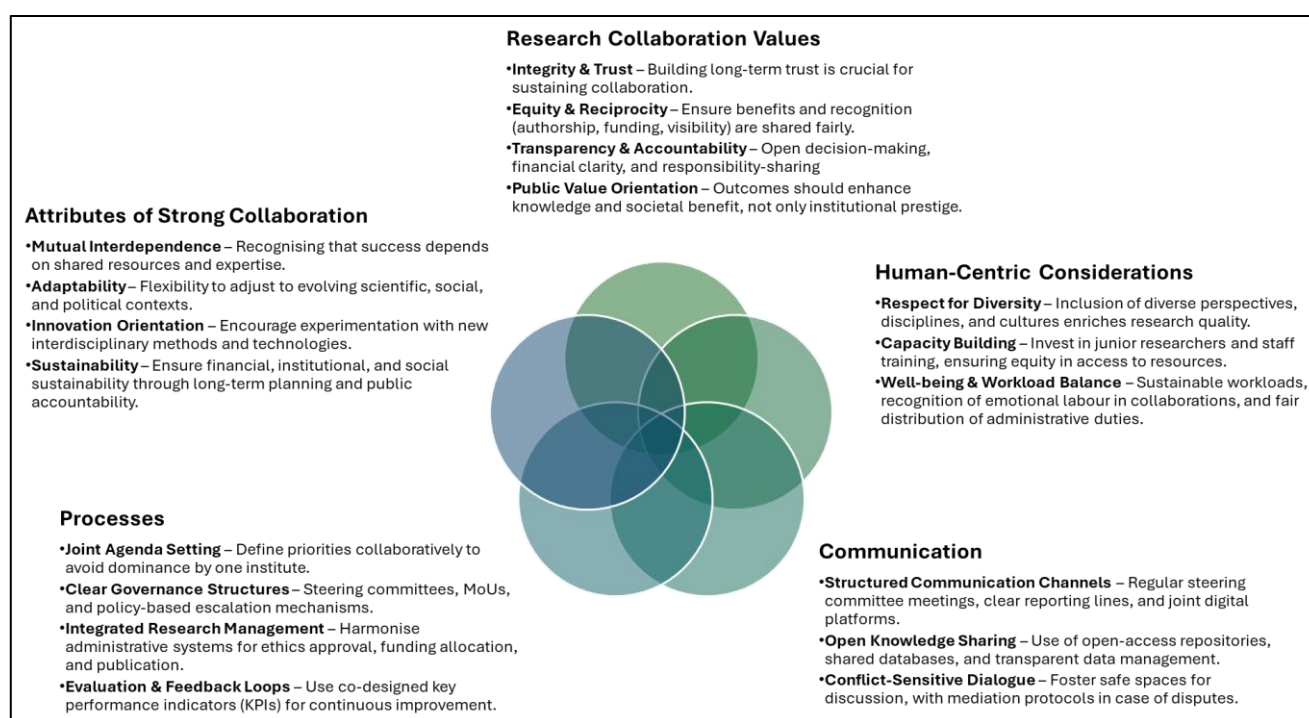


Figure 3: Best practice collaboration approach (Adapted from: Agada et al., 2025; Biracyaza & Habimana, 2025; Braccini et al., 2024; Byrne et al., 2025; Chankseliani et al., 2025; Ghimire 2025; Lee & Low 2024; Reaser et al., 2025)

3.2. Collaboration process

A best practice collaboration process was developed for public-private partnerships (PPP) in South Africa, and includes governance and structure considerations, principles of collaboration, and operational practices (Figure 4). The process may need to be tailored based on collaboration contexts.

The literature on collaboration across sectors underscores the need for structured, value-aligned processes that enable research entities and PPPs to operate effectively in increasingly complex social, technological, and policy environments. International evidence indicates that successful PPPs in sectors such as education, health, transportation, and environmental governance rely heavily on coherent governance mechanisms, unambiguous performance indicators, and aligned institutional objectives (Elhamalawy & Aly, 2025; Lumumba et al., 2025; Masouleh et al., 2024). Studies pertaining to platform governance and open research ecosystems highlight the importance of adaptable, transparent, and interoperable collaborative infrastructures; particularly those responsive to rapid technological change and conducive to equitable participation among partners (Comegna, 2025; Jenabi et al., 2025). Furthermore, environmental justice literature demonstrates that research collaborations must incorporate fairness, inclusivity, and power-aware decision-making to prevent marginalisation and to ensure that the benefits of collaboration are equitably distributed across communities and institutions (Reaser et al., 2025). Collectively, these insights emphasise the importance of a contextually sensitive, ethically grounded, and governance-oriented model for South Africa's research and innovation landscape.

Complementing these structural considerations, the literature also emphasises the human, operational, and security-oriented dimensions of collaboration that are crucial for an effective South African PPP and research entity model. Successful collaboration depends on interprofessional communication, clarity of roles, and shared interpretive frameworks. These attributes that are highlighted in sectors such as health, rehabilitation sciences, and interprofessional education (Ghimire, 2025; Kus et al., 2025). The field of

cybersecurity further enriches this perspective by indicating that collaborative networks increasingly necessitate secure knowledge management systems, collective risk monitoring, and shared protocols to sustain trust and safeguard national interests (James & Kimuyu, 2024; Vajjhala & Strang, 2025). Across these domains, scholars stress that strong collaboration processes must incorporate feedback loops, monitoring mechanisms, and adaptable governance structures capable of responding to sectoral changes, emerging technologies, and multi-sector policy directives. Collectively, this body of knowledge offers a solid foundation for the development of a Research Entities Collaboration and Generic PPP Model for South Africa; one that integrates governance rigour, human-centred processes, technological resilience, and cross-sector alignment. It is possible that the process will need to be tailored according to specific collaboration contexts.

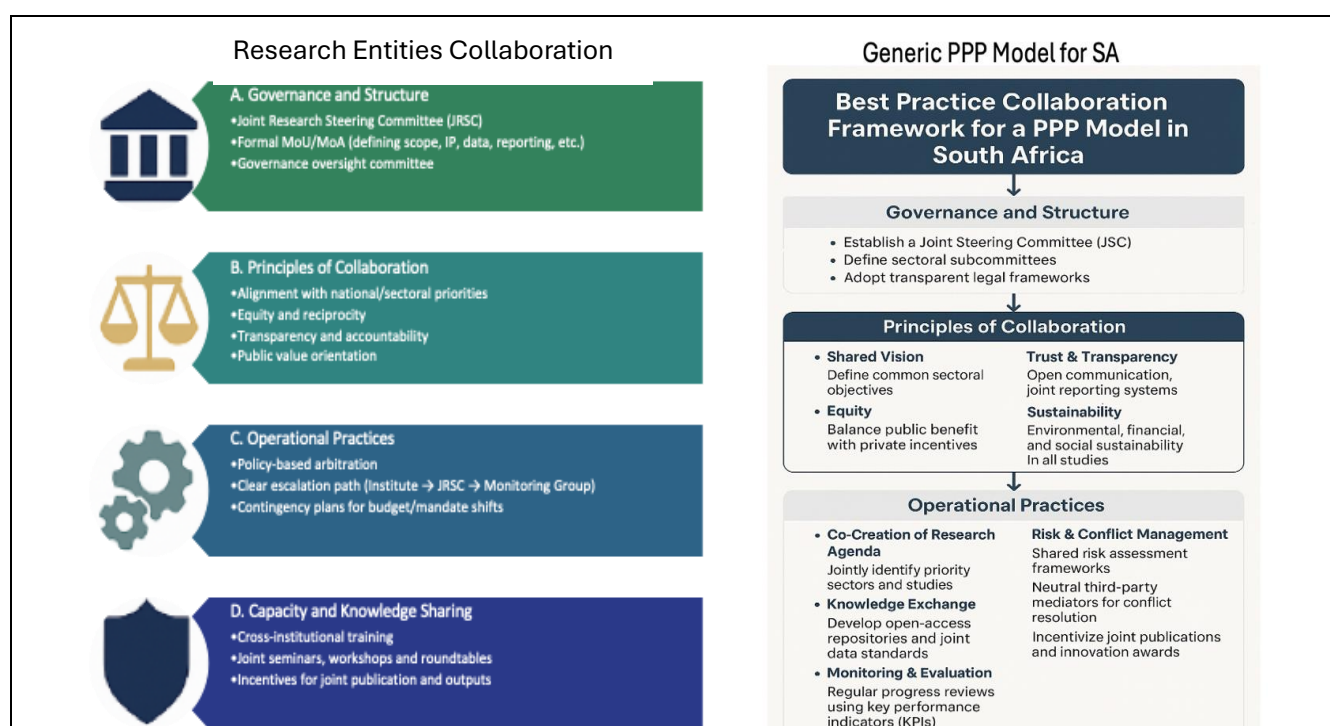


Figure 4: PPP vs. Government-to-government (G2G) Research Models

PPPs and Government-to-Government (G2G) research collaborations represent two distinct yet complementary models for advancing national development and innovation goals. While PPPs emphasise the integration of private-sector efficiency, investment, and innovation into public service delivery, G2G collaborations focus on harnessing the collective capacity of state-funded institutions to generate knowledge and policy-relevant research outcomes (Elhamalawy & Aly, 2025; Cole *et al.*, 2025). The comparative framework developed in this report (Table 3) illustrates the structural, operational, and governance differences between these models. The comparison highlights that PPPs are driven by contractual arrangements balancing profit with public value, whereas G2G research collaborations are anchored in shared mandates, open knowledge systems, and public accountability (Chankseliani *et al.*, 2025; Ghimire, 2025). Understanding these distinctions enables the MQA–MMP partnership to align its collaborative approach with best practice while maintaining alignment with South Africa’s national research and innovation objectives.

Table 3: Entity Model Comparison

Aspect	Public-Private Partnership (PPP) Model	Government-Funded Research Institutes
Funding	Mix of private industry investment and public funds	Fully government-funded (plus donor grants)
Goal	Positive impact and sustainability for the industry	Maximise public value through research, with positive impact for industry
Governance	Public and Private funders, and associated governance frameworks, policies and procedures	National oversight bodies (ministries, committees) with associated governance frameworks, policies and procedures
Accountability	To funders and industry	To government, sector and taxpayers
Risk	Financial risks shared Risk mitigation plans required	Political, financial, and duplication risks
Knowledge Sharing	IP rights as per legal rules	Mostly open access
Sustainability Focus	Driven by people, profit, planet and sector sustainability	Driven by national development and government priorities

3.3. Gaps, strengths, mitigation and best practices

As per the case study (MMP-MQA collaboration), it is evident that:

- A clear context for collaboration between the MQA and MMP has been identified.
- A collaboration project has been identified, with the project addressing the mandate and common interest of both parties.
- The internal processes were defined. This also included the principles for the collaboration, which aligns to best practices.
- A BiLF was established to manage, support, guide and track the identified project, with mandated members from the MMP and MQA.
- The practices and processes for collaboration between MQA and MMP, through the BiLF, were identified and tabled. Aspects such as shared purpose and goals, effective communication, relationship management, common needs, agility, digital engagement, decision-making and contributions were included in the practices and processes.
- As processes differ between entities, a process flow for collaboration was also developed.
- The research team identified and confirmed collaboration best practices, which included models for PPP and research institutes, which resonates with this collaboration effort.
- Overall, best practices were considered in the collaboration between the MMP and MQA.

Figure 5 captures the essence of the collaboration between the MMP and MQA.

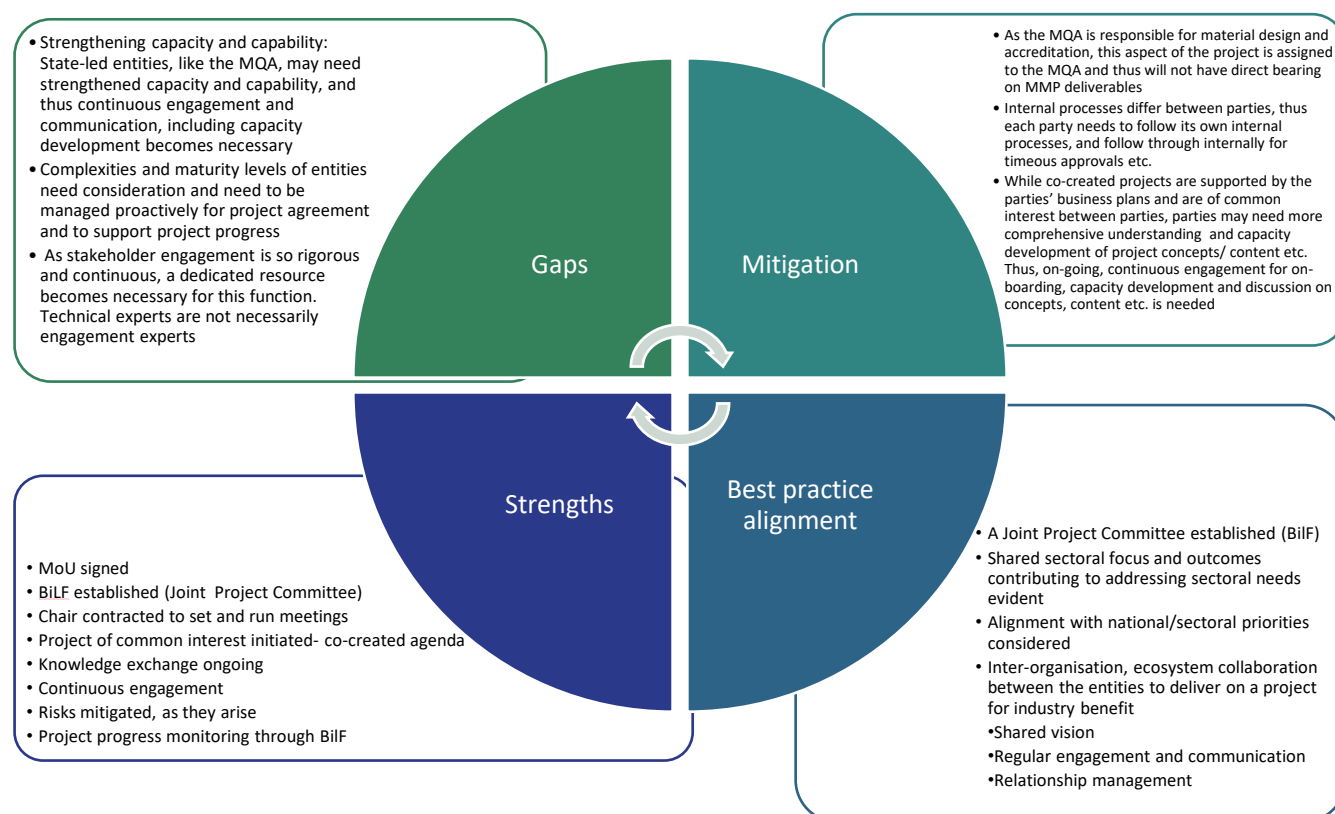


Figure 5: Gaps, Mitigation, Strengths & Best Practice Alignment

3.4. Supportive collaboration tools

Supportive collaboration tools may be considered for application including a Collaboration Effectiveness Framework and Stakeholder Interface Map (Figures 6 and 7).

An example of a Stakeholder Interface Map, as focused on the MMP-MQA collaboration is shown in Figure 7. The Stakeholder Interface Map provides a visual and structured representation of how the MMP, the MQA, research partners, governance structures and industry actors interact throughout the SATCAP collaboration lifecycle. It is designed to:

- Strengthen clarity of roles, responsibilities, and information flows
- Support best-practice collaborative governance
- Improve decision-making efficiency, transparency and accountability
- Reduce duplication and manage cross-organisational complexities
- Enable scalability for collaboration with other government entities in future

		Very Weak	Weak	Moderate	Strong	Excellent
Domain	Indicator	1	2	3	4	5
Shared Values & Vision	Alignment with institutional/national goals	1	2	3	4	5
	Mutual trust and respect between partners	1	2	3	4	5
	Equity & reciprocity in collaboration benefits	1	2	3	4	5
Human-Centric Considerations	Inclusivity & diversity in team participation	1	2	3	4	5
	Capacity building (training, mentorship)	1	2	3	4	5
	Well-being & workload balance	1	2	3	4	5
Communication & Knowledge Sharing	Frequency and quality of communication	1	2	3	4	5
	Transparency in data sharing and reporting	1	2	3	4	5
	Conflict sensitivity and openness in dialogue	1	2	3	4	5
Processes & Governance	Clarity of roles, responsibilities, and MoUs	1	2	3	4	5
	Efficiency of joint decision-making structures	1	2	3	4	5
	Monitoring & evaluation mechanisms in place	1	2	3	4	5
Attributes of Collaboration	Degree of interdependence and complementarity	1	2	3	4	5
	Adaptability to changing research and policy contexts	1	2	3	4	5
	Joint innovation and problem-solving capacity	1	2	3	4	5
	Long-term sustainability of collaboration	1	2	3	4	5

Determine the average for overall scores (Excel Average Calculation) and use the following as a guideline:

Scoring & Interpretation

4.5 – 5.0 (Excellent): Collaboration is highly effective; model for replication.

3.5 – 4.4 (Strong): Collaboration is effective but with areas for improvement.

2.5 – 3.4 (Moderate): Collaboration functions but requires significant strengthening.

1.5 – 2.4 (Weak): Collaboration struggles; urgent improvement needed.

1.0 – 1.4 (Very Weak): Collaboration is ineffective and unsustainable.

Figure 6: Collaboration Effectiveness Framework

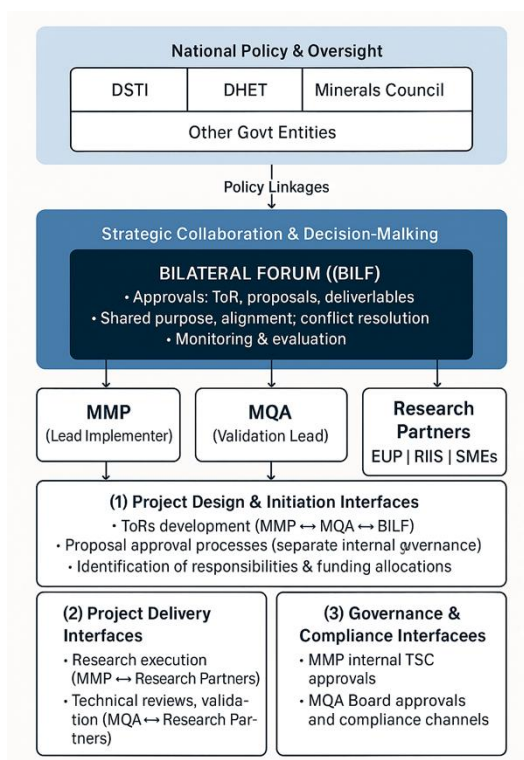


Figure 7: Stakeholder Interface Map

4. Conclusion

The study has indicated the following:

- A strong foundation for collaboration between the MQA and MMP has been established, with a clearly defined context and a project that directly supports the mandates of both institutions.
- Internal processes of MQA and MMP were compared and synthesised, with the BiLF structure embedding principles of collaboration that reflect best practices.
- Key practices and processes for collaboration are applied, including shared purpose, effective communication, relationship management, agility, digital engagement, and joint decision-making, were identified, formalised, and supported by a process flow.
- The study combined comparative insights from PPP and research institute models, enabling the collaboration to be assessed against best practice frameworks. Best practices were considered for this collaboration.
- A Collaboration Effectiveness Framework was developed to potentially serve as an ongoing tool for evaluating and enhancing collaboration performance.

In conclusion, the collaboration approach and process identified and highlighted through this guideline, may be used by entities with similar contexts.

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