



RESEARCH MANAGEMENT PROJECT

GRANTS MANAGEMENT DIGITALISATION FRAMEWORK

Rakeshnie Ramoutar-Prieschl



ASSOCIATION OF AFRICAN UNIVERSITIES
ASSOCIATION DES UNIVERSITES AFRICAINES
اتحاد الجامعات الأفريقية



The African
Academy of Sciences

Executive Summary	4
I. Purpose	4
II. Context.....	4
III. Overview of DGMS among SGCI partners	4
IV. Key considerations for effective deployment of DGMS.....	5
V. Key factors enablers for effective deployment of DGMS.....	7
Acronyms	8
Purpose.....	9
Key definitions and interpretation.....	10
1 Context and background	11
1.1 The role of SGCs	11
1.2 DGMS status within SGCI	11
1.3 Benefits of DGMS.....	14
2 Grants management process	17
2.1 Pre-granting (Developing CVs or setting up user accounts).....	18
2.2 Designing and creating a grant call.....	18
2.3 Application process	19
2.4 Peer review	19
2.5 Implementing grant awards.....	20
2.6 Conditions of Grant	20
2.7 Due diligence.....	20
2.8 Post-grant award (reporting and monitoring).....	21
2.9 Monitoring, evaluation and learning.....	22
2.10 Business intelligence reporting (success rates, etc.)	24
3 Guidelines for effective DGMS.....	25
3.1 Assessing institutional/national readiness	26
3.2 Enhancing institutional systems (IT infrastructure/system, governance, project management)	27
3.3 Human Resources	28
3.4 Training and re-skilling staff regarding digitalisation	29
3.5 Dealing with organisational culture and change management issues	29
3.6 Developing policy and framework documents	29
3.7 Raising awareness of digitalised platform	30
3.8 Developing networks, collaborations, and relationships with universities	30
3.9 Developing sustainability plans to manage digitalisation activities: Hub and spoke model.....	31
4 Key principles for effectively managing grants using a DGMS.....	32
4.1 Transparency	32
4.2 Equal treatment	32

4.3	Non-cumulation	32
4.4	Accountability.....	32
4.5	Relevance to national needs	33
4.6	Non-profit	33
4.7	Avoiding Conflicts of Interests	33
4.8	Safe and ethical research activities.....	33
4.9	Confidentiality and accuracy.....	33
4.10	Equal opportunity/non-discrimination.....	33
4.11	Promoting public understanding of R&D	34
5	Stakeholders	35
5.1	Roles of stakeholders.....	35
5.2	Roles and responsibilities.....	36
6	Conclusion.....	40
	Works Cited and Acknowledged.....	41
	Annex 1: Survey demographics	42
	Annex 2: DGMS workflow across the grants management lifecycle	46

EXECUTIVE SUMMARY

I. Purpose

This framework's purpose is to provide the basic set of grants management principles, processes and applicable rules aligned with the effective deployment, implementation, and management of a sustainable national Digital Grants Management System (DGMS) among the members of the Science Granting Council Initiative (SGCI) in sub-Saharan Africa.

II. Context

The SGCI in sub-Saharan Africa [1] seeks to strengthen capacities of SGCs in Eastern, Southern, Central and West Africa to support research and evidence-based policies that will contribute to economic and social development. At present, SGCs in the region use different systems for grants management. While some have advanced to fully virtual systems, most of the councils have not adopted the use of online systems, due to several challenges that include limited resources, infrastructure, technical skills, and uptake of online systems. This generic, online platform and supporting frameworks will provide a baseline to drive the adoption of virtual systems among African SGCs.

A well-functioning DGMS can be useful to entities such as SGCs, scientific research organisations, research universities, researchers and students. Having a platform that allows organisations to centralise all their grant applications and assist in navigating the grants management lifecycle, is incredibly helpful for organisations that rely on funding from grants. A DGMS also creates a platform wherein SGCs and researchers, as well as their institutions of employment, can have access to an online repository of all compliance and audit processes and documentation. The successful implementation of the DGMS by the SGCs will contribute toward integrated national data systems and facilitate the sharing and flow of data among diverse users and stakeholders.

III. Overview of DGMS among SGCI partners

A survey was conducted to better understand the status quo, readiness, and responsiveness to adopting DGMS determines among SGCI countries. Respondents from the survey highlighted the following elements as being key to an efficient GMS:

- **User-friendly:** Eighty-one per cent (81%) of respondents indicated that a user-friendly interface is important.
- **Skilling grant managers:** A digital system can only be effective if the grant managers are well trained in using the system. Eight four per cent (84%) indicated that with developing and deploying a DGMS, required upskilled and trained SGC staff in place.
- **Skilled IT Staff:** Eighty per cent (80%) highlighted that skilled IT staff are needed to support the system.
- **Accuracy of information:** Eighty-five per cent (85%) of respondents indicated that secure and accurate grants information is needed. The use DMS can simplify this need.
- **Responsiveness:** For an effective system 81% of respondents indicated the importance of quick turnaround times on grants-related matters.
- **Transparency:** About 77% of respondents supported the need for effective digital grants system that facilitated the awarding of grants using fair and transparent processes.

IV. Key considerations for effective deployment of DGMS

A. Assessing institutional/national readiness

Key to successfully implementing the DGMS is the readiness of the national system and institution to adopt the technology and use the system optimally. Some of the key questions to ask include:

- Do we have the requisite internet infrastructure to implement DGMS?
- Are there existing or upcoming laws, regulations or policies that could affect the implementation of the digital management system? For example, the Protection of Personal Information Act (POPIA) in South Africa.
- Will adopting the digital system result in substantive negative changes and biases in the granting process and turnaround times?
- What is the level of skills set of SGC staff to be able to easily adapt to the deployment of the DGMS?
- What are the cost implications of the above for the SGC?
- What are the data storage capabilities needed to support the DGMS e.g. virtual platforms and cloud computing?

B. Dealing with organisational culture and change management issues

Change management is an important strategy for ensuring successful transformation from manual to virtual grants management processes. One of the failures linked to the digital transformation of business processes, is the lack of communication and consultation of SGC staff and beneficiaries, including researchers, students and research performing institutions, such as universities. Some of the key considerations for organisational culture and change management are:

- Is there a chief information officer (CIO) position at the SGC?
- Is there a communication strategy in place for adopting the digital system?
- Has there been a needs assessment or gap analysis undertaken by the SGC, which informs the way the DGMS is tailored to a specific SGC's mandate?
- Is there a training plan in place for SGC staff and beneficiaries to effectively use the DGMS?
- Are staff performance agreements being updated to include the use of the DGMS?

C. Training and re-skilling staff regarding digitalisation

The SGC needs to train and/or employ staff with specific skills sets needed to operate and engage in the digital work environments. The opportunity cost of training and retraining SGC staff members must be planned for from the beginning. Some of the key considerations for deploying training programmes when adopting the DGMS include:

- Is there a mix of skills amongst personnel for the SGC to succeed in a technology-rich work environment using a DGMS?
- Is SGC management prepared for the opportunity cost of training and re-training personnel?
- Is the SGC undertaking a review of the qualifications, experience and skills sets required for working in the council?
- Will the SGC be able to support ongoing education and training in response to the changing needs of the council?

D. Developing policy and framework documents

Policies and frameworks shape the successful adoption of a DGMS. Multiple inter-related policy areas are required for the SGC to co-ordinate efforts to realise the promises of the digital transformation.

Several key areas that must be considered that have significant policy implications include [10]. Key considerations for the SGC:

- What data management policies are in place across the data management lifecycle at the SGC?
- Are technical enablers in place to enable access? e.g. connectivity, internet exchange points, etc.
- Are people communicated to, consulted and/or trained to optimally use the full capabilities of a digital system?
- Have there been adequate considerations for marginalised and minority groups, especially women?
- Have the costs linked to a fully compliant policy framework been considered and planned for by the SGC?
- Are clear roles and responsibilities assigned across the organogram of the SGC, from the Board, Chief Executive Officer (CEO), CIO to operational co-ordinators?

E. Raising awareness of digitalised platform

SGCs need to develop strategies to focus on raising awareness, addressing concerns, and defining the training interventions to support the integration of a DGMS into its operations. The following key areas must be considered:

- Are there platforms for personnel to express their concerns about the change management process linked to adopting a DGMS? e.g. HR one-on-one support sessions.
- Is a communication strategy in place to inform employees and the research enterprise of the roll-out of the technology?
- What are the time and cost implications linked to the above?

F. Developing networks, collaborations and relationships with universities

SGCs need to establish networks with other SGCs and foster collaborations and partnerships with institutions who will be using the DGMS. A smooth transition into a fully functional and optimally used digital system require consideration of the following dimensions:

- Is a support desk, help desk and/or call centre available for any queries by SGC beneficiaries with a 24-to-48-hour turnaround time to resolving system queries?
- Is there one-on-one consultation and training with each research performing institution such as universities planned?
- Is there a forum for universities to engage the SGC that allows for feedback on the usage of as well as the functionality and bugs of the DGMS?

G. Developing sustainability plans to manage digitalisation activities

Given that different SGCs are at different levels of readiness for deploying a DGMS, it is proposed that a hub-and-spoke model be considered for addressing the issues of sustainability. This links to long-term planning and consideration of shared or subsidised costs linked to research journal databases, as an example. Some of the key considerations include:

- Can convenient, secure access to the DGMS be delivered?
- Is the SGC exploring backup systems for data security, including access to cloud computing for themselves as well as their beneficiaries through a shared cost model?
- Are the DGMS able to support a national repository of performance data linked to outputs from grantees across the different research performing institutions in the country?

V. Key factors enablers for effective deployment of DGMS

Some of the key enablers for effective deployment and implementation of DGMS among the SGCI in Sub-Saharan Africa members, include:

- **Infrastructure:** ICT infrastructures e.g., servers, networks, cloud computing, security, uninterrupted power supplies.
- **People:** IT software developers, hardware specialists, cyber-security, technical and support personnel, users, etc.
- **Training:** Deploying the system to SGCs would require the training of the SGC staff, which may be an ongoing activity, dependent on the skills set of SGC staff and their ability to adapt to the DGMS.
- **Upgrades:** As the system is being used, additional features may be needed or reporting modalities added or built on, that may require an upgrade to the functionality of the system by the consultant. This may be accommodated at an extra cost with the digitalisation development consultant.

ACRONYMS

BIS	Business Information Systems
CIO	Chief information officer
CoG	Conditions of grant
CoI	Conflict of interest
CV	Curriculum vitae
DA	Designated authority
DGM	Digital grants management
DGMS	Digital grants management system
DMP	Data management plan
FAQs	Frequently asked questions
4IR	Fourth Industrial Revolution
HEI	Higher education institution
HR	Human resources
IP	Intellectual property
IPR	Intellectual property rights
MEL	Monitoring, evaluating and learning
NRF	National Research Foundation
OS	Open science
PI	Principal investigator
POPIA	Protection of Personal Information Act
R&D	Research and development
RPPRs	Research Performance Progress Reports
SA	South Africa
SMART	Specific, measurable, reliable and timeous
SGC	Science granting council
SGCI	Science Granting Councils Initiative
STI	Science, technology and innovation
UK	United Kingdom
UNCST	Uganda National Council for Science and Technology
US	United States

PURPOSE

In an increasingly digitalised world, developing and using online systems improve the efficiency and effectiveness of managing grants among the SGCs. This framework's purpose is to provide the basic set of grants management principles, processes and applicable rules aligned with effectively developing and managing DGMS.

This framework:

- Serves as a guide for the effective deployment and implementation of a sustainable national DGMS among the SGCI in Sub-Saharan Africa members;
- Provides a backbone for developing tailored grants management requirements and standards to help in the effective management of grants among SGC partners;
- Creates a space for shared learning among SGCs; and
- Provides processes to guide grant managers when designing, implementing, and monitoring funding instruments using DGMS.

The guide covers the grants lifecycle, from designing and preparing a call to implementing and monitoring and evaluating outcomes. The framework is informed by a comprehensive literature review and desktop survey. The survey was circulated to key SGCI stakeholders including a select sample of active SGCI participating institutions in southern, eastern, and western Africa. Annex 1 presents a detailed representation of the survey participants.

KEY DEFINITIONS AND INTERPRETATION

Term	Definition
CoG	A Conditions of Grant (CoG) is a legally binding contract signed between the funding entity and the grant beneficiary. It outlines the commitments of the funding entity and the responsibilities to which the institution must adhere to regarding the management of the grant funds
Grant	A grant is a direct financial contribution, by way of donation, to finance a project intended to support achievement of a specific objective aligned to national and global policies. It is made for an operation which is proposed to the contracting authority by a potential beneficiary (an “applicant”) and falls within the normal framework of the beneficiary’s activities.
Grant contract	A legally binding agreement between the contracting authority and the beneficiary (grant recipient) constituting all the rights and duties of both parties.
Grantee	A grant recipient or beneficiary, either a natural person or entity with whom a grant contract has been signed.
Grants management team	Officers in charge of the day-to-day implementation of grant procedures, provisions and policies.
IP	Means all IP, whether registerable, including but not limited to copyright, patents, proprietary material, trademarks, design, know-how, trade secrets, new proprietary and secret concepts, methods, techniques, processes, adaptations, ideas, technical specifications and testing methods relating to the project.
PI	The PI (i.e., the applicant) must be an active researcher who takes intellectual responsibility for the project, its conception, any strategic decisions required in its pursuit and the communication of the results. The PI must have the capacity to make a serious commitment to the project and cannot assume the role of a supplier of resources for work that will be placed in the hands of others. The PI will take responsibility for managing and administrating resources allocated to the grant award and for meeting reporting requirements.
Peer review	A piece of scholarly work (in this case is a research grant application), which is subjected to the scrutiny of others who are experts in the same field (peers) and is considered necessary to ensure academic scientific excellence.
Technical committee	A team of qualified S&T experts from an appropriate and diverse backgrounds, contracted for the evaluation of grant applications and generating a shortlist of successful applicants, using a peer review process.

CONTEXT AND BACKGROUND

1.1 The role of SGCs

SGC's play a key role within the scientific and innovative landscape by funding and catalysing research and innovation activities within the national system of innovation. SGCs are agents of government that also represent the interests of a country's scientific community. In addition to acting as an funders and innovation catalyst, SGCs engage with societies to demonstrate the value and benefits that scientific research provides, which in turn builds trust within the scientific enterprise.

Research funding agencies are responsible for:

- Investing public money in research to advance knowledge and innovations;
- Funding skills development;
- Implementing STI policy;
- Conducting research;
- Engaging society with science; and
- Monitoring research and innovation impact using analytics.

To respond to these responsibilities, SGCs should use effective research management practices and tools. At the core of their function is their granting obligation. Researchers therefore use various processes to submit grant applications to the SGC, which may include using one or a combination of the processes below:

- Manual postal services;
- Semi-virtual electronic mail; and/or
- Virtual DGMS to support the grant making processes.

With the advent of the digital revolution, SGCs have accelerated efforts toward using and adopting virtual platforms to support and monitor grants.

1.2 DGMS status within SGCI

The SGCI in sub-Saharan Africa [1] seeks to strengthen capacities of SGCs in eastern, southern, central and western Africa to support research and evidence-based policies that will contribute to economic and social development.

This framework will contribute to the SGCI's objectives of strengthening the abilities of participating SGCs to:

- Manage research;
- Design and monitor research programmes;
- Formulate and implement policies based on the use of robust STI indicators;
- Support knowledge transfer to the private sector; and
- Establish partnerships with one another and other actors within the science enterprise.

The DGMS plays a key role in attaining these objectives. At present, 16 councils are participating in the SGCI. They are Kenya, Rwanda, Uganda, Tanzania, Ethiopia, Cote d' Ivoire, Burkina Faso, Senegal, Sierra Leone, Ghana, Zambia, Mozambique, Botswana, Malawi, Namibia and Zimbabwe. SGCs in the region use different systems for grants management, as highlighted in case study 1.

While some have advanced to fully virtual systems, most of the councils have not adopted the use of online systems, due to several challenges that include limited resources, infrastructure, technical skills, and uptake of the online systems. This generic, online platform and supporting procedures will provide a framework that guides the adoption of the DGMS among African SGCs.

Case Study 1

Manual-semi-virtual: In Mozambique, the National Research Fund, uses a hybrid approach of manual and digitalised systems for applications to be completed by eligible researchers. This approach is based on the poor infrastructure platforms available to rural universities.

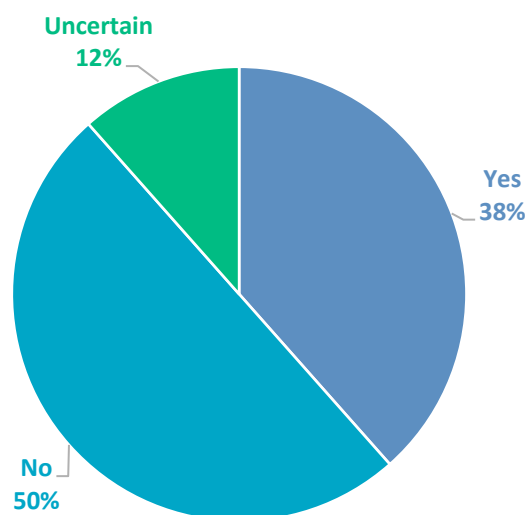
Semi-virtual: The National Commission for Science and Technology in Malawi and the National Science and Technology Council in Zambia mostly use electronic mail for submitting grant applications.

Virtual: SA's NRF and the National Council for Science and Technology in Uganda, have a fully DGMS that is used across the grants lifecycle. This implies that grantees and applying institutions use the system.

Based on the survey responses on the status of digitalisation of a grants management system within SGCs, it was found that 38% of the participants indicated that a DGMS was employed at the SGC at their respective institutions (see Figure 1). Fifty per cent (50%) of the respondents indicated that there was no system in place and about 12% indicated that they were uncertain about whether a digital grants system was in place.

Figure 1: Status of DGMS in select SGCI countries

DOES YOUR INSTITUTION HAVE A DIGITAL GRANT MANAGEMENT SYSTEM?



SGCs have a diverse digital system in terms of functionality and complexity. Figure 2 highlights insights on the effectiveness of institutional DGMS based on the survey responses. Most respondents (46%) indicated that they were not satisfied with the overall performance of the DGMS in their respective institution. Only 4% were satisfied with their grant management system. Regarding the availability of policies and procedures, 39% of the respondents indicated they did not have these in place. About 35% indicated that such policies and procedures were accessible only to staff members within the institutions while about 31% indicated that these institutional policies and procedures were made accessible to researchers. Considering the target service beyond the institutions, the non-accessibility policies and procedures raises concerns on the effectiveness and use the digital systems by the target community. Despite the critical role that IT expertise plays in supporting agile digital

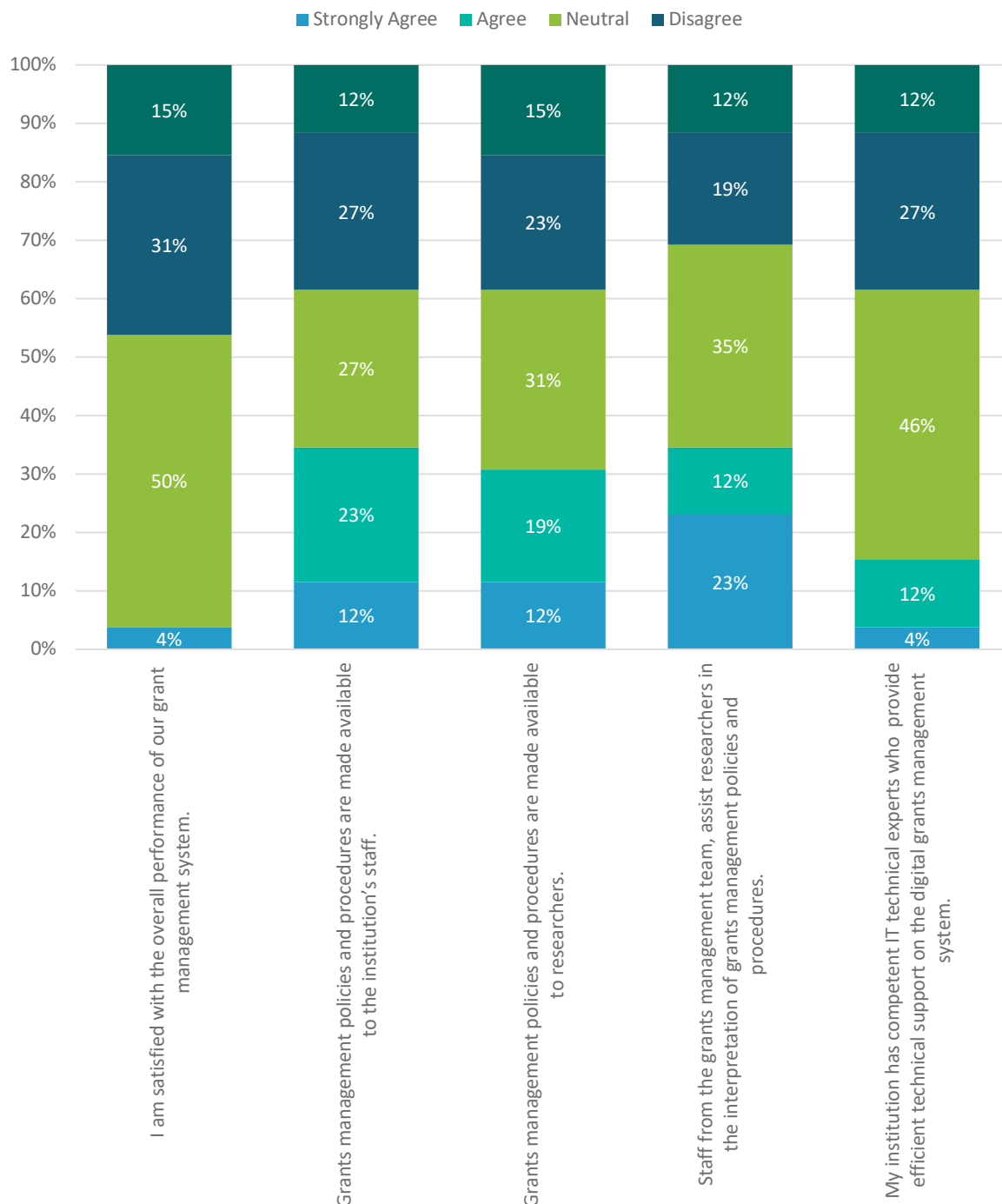
platform, 39% of respondents indicated that there were no competent IT technical experts who provided proficient support for the digital grants system. Only 16% indicated that they had competent IT technical experts. This implies the need for SGC's and other institutions to put together mechanisms, to attract and train IT experts who can respond to increasing demand of effective and user-friendly IT systems.

Case Study 2

US funding agencies provide guidelines for grantees to complete online progress reports - called RPPRs. These reports highlight grantee accomplishments, challenges, and compliance in terms of the award.

Source: <https://grants.nih.gov/grants/rppr/index.htm>

Figure 2: Perception of effectiveness of grant management systems, policies and procedures



1.3 Benefits of DGMS

In general, the grants management process involves several inter-linked processes including planning, grant design, programme development, programme implementation as well as monitoring and evaluating projects. Managing grants can be time-consuming especially in terms of administration, approvals, meeting deadlines and preparing written feedback and reports. However, with the right tools, processes, training and resources, organisations can create a conducive collaborative environment for grants management. Further, this process is simplified and streamlined by using a DGMS which results in effectiveness, efficiency, reliability and trustworthiness of the system by stakeholders and boosts its relevance in an ever-evolving digital economy. The sections that follow highlights some of the holistic principles associated with adopting a DGMS.

1.3.1 Effectiveness, efficiency, and reliability

Effectiveness, efficiency, and reliability in DGM are the three main thrusts in usability testing of the granting system. Effectiveness is measured using task completion as a measure. Efficiency is measured using time to complete a task. Reliability is measured by the captured using error rates. Strong grants management, with agile systems, clear leadership and well-defined roles and responsibilities, reduces inefficiencies as well as dishonest practices. SGCs spend less time chasing data and more time reporting the successes of their organisation, which leads to receiving more grants to fulfil their organisation's mission. An agile DGMS:

- Assists SGCs to avoid complications and penalties;
- Helps track grant performance;
- Keeps stakeholders in the loop;
- Improves the ability to collect data; and
- Compiles reports for government and other critical stakeholders.

1.3.2 Structured data capture

Centralisation is no longer a 'nice to have' when it comes to working with grants, nor is it going away. Funding initiatives should continue to push for the practical and efficient approaches for data capturing, data storage and transaction approvals in line with relevant policies, which is core in this age of rapid digitisation transformation. In some instances, decentralisation in grant management could potentially increase the risk of audit findings, improper processes for awarding grants and drawdown of funds and the inability to attract or retain awards. SGCs need to invest in agile and structured systems to sustain their missions and remain relevant in a rapidly evolving technological space. Taking note of the multiple elements within the granting cycle, managing them manually or in disparate systems introduces human error, the temptation to award grants without due process being followed, and the inability to communicate changes and/or important aspects relating to a grant award.

Case Study 3

In 2021, SA's NRF designed and launched a new GMS called the NRF Connect which aims to provide a seamless creation of grant opportunities with functionalities for both the external and internal users to work seamlessly and simultaneously with role integration at the various level of grants management.

Source: www.nrf.ac.za

To achieve an effective centralisation system, organisations should adopt a fit-for-purpose grants DGMS that:

- Gives the central grants office access to and visibility of the movement of funds;
- Has configurable reporting to filter for funds;
- Allows for tagging funds with meta-data for tracking down budgets to awarding funds to recipients;
- Supports linking all outputs to the meta-data and funds;
- Allows for report segmentation;
- Codes funding income for central tracking and reporting; and
- Integrates the reporting and monitoring of grant outputs over a long period beyond the grant life cycle to capture the impact.

1.3.3 Managing and analysing data

A major part of an effective DGMS is a data management plan (DMP), which describes the data one expects to acquire or generate during a research project. This extends to how one manages, describes, analyses, and stores the data and what mechanisms (including digital data storage) one will use at the end of the project to share and preserve the data generated.

With reliable DGMS all data entries should be from the appropriate source document(s). All data entries shall be validated and verified with the source documents. A system of checks and balances should be in place to ensure that all postings to the digital system result in the desired outcome. Managing the process for soliciting research grant applications through competitive calls, is one of the key functions of an SGC.

This encompasses a wide range of activities - from designing the call to managing the peer-review process and grant awarding to monitoring, evaluation and learning (MEL). A coherent and useful practice guideline has been developed as part of Phase 1 of the SGCI initiative. It guides the identification of criteria used to ensure that calls for research grants adhere to the dimensions of scientific excellence and quality [2]. In this work, the process is termed: research competitions. Several recurring conceptual elements and specific criteria emerge in assessing the quality of a research competition [1]. Additional elements were used to clarify the research grants management and funding cycles and its corresponding processes.

The conceptual elements include:

- Institutional arrangements: legislative mandate, policies and priorities, stakeholder engagement;
- Developing research programmes;
- Call announcement: all pre-call activities until the call has been closed; and
- Reviews and assessment: call closing, internal screening, reviewer identification, panels, and funding decisions.

1.3.4 Improved oversight for SGC

The workflow linked to a DGMS, allows for the highest level of adherence to processes, policies and controls. In the SGC context, this allows for performing, monitoring, evaluating and analysing transactions, with the objective of putting in place processes for managing risks across the enterprise. Such risks include fraud, wasteful expenditures, and misuse of public funds. Hence, a DGMS has the potential to prevent financial loss and optimise grant expenditures, while strengthening controls to improve compliance in line with good governance practices.

1.3.5 Data validation

Validating data allows for building several checks and controls into a digitalised system to ensure the logical consistency of input and stored data. This is a critical step that allows for a robust online system that adheres to the audit dimensions of accuracy, validity, verifiability, reliability and transparency of data and information from the DGMS.

There are several types of data validation checks that must be considered by SGCs – both by using researchers as well as SGC personnel:

- Data type check: Allows for data entered to have the correct data type, e.g., numeric or other special characters.
- Code check: Ensures that a field is selected from a valid list of values, e.g., verifying the postal code by checking it against a list of valid codes.
- Range code check: Verifies if input data falls within a predefined range, e.g., latitude or longitude associated with geographic data.
- Format check: Follows a predefined format, e.g., YYYY-MM-DD or DD-MM-YYYY.

- Consistency check: Allows for procedural accuracy and data inputs in a logistical manner, e.g., this would mean that the project cannot commence if the conditions linked to a grant award is not approved and signed off.
- Uniqueness check: Some data are unique by nature, e.g., identity or passport numbers and email addresses. This allows for accuracy, reliability and validity of data fed into a DGMS, by reducing errors in terms of multiple entries for the same researcher, which will lead to inaccurate reporting.

1.3.6 Quality control and standardisation

Over and above data validation, effective and efficient quality controls and standardisation systems that improve turnaround times, enhance data accuracy and validity are some of the features of a DGMS. Thus, SGC personnel spend less time double checking, verifying or confirming details on an online grant application. For example, verifying the budget – was the budget presented in euros, dollars, or a local currency? Did it include or exclude tax?

1.3.7 Accountability

Information technology and digitalised systems have had a significant impact on effective spending and creating greater accountability in the management of public funds. Digitalised systems have the potential to support accountability by increasing and improving the flow of information in a manner that supports accountability. For example, building a grant approval workflow that allows for the uploading of supporting documentation, linked to each transaction. Such a workflow must align with the SGC's delegation of authority policy, to increase and improve the flow of information after a decision is made.

1.3.8 Promotes OS principles and practices

Digitised systems create an enabling environment to support OS principles aligned with the FAIR [3] guiding principles for scientific data management and stewardship. FAIR [4] can be summarised as:

- **Findable:** Data have a globally unique persistent identifier, are described by metadata, data and metadata are findable in a search resource.
- **Accessible:** Data is retrievable through a standardised communication protocol; metadata remain accessible if data is no longer available.
- **Interoperable:** Metadata use a formal, accessible, shared language for knowledge representation, use vocabularies that follow the FAIR principles, include qualified references to other metadata.
- **Reusable:** Data have a clear data usage license; metadata are associated with detailed provenance and meet domain-relevant community standards.

GRANTS MANAGEMENT PROCESS

Grants management involves many interlinked processes (see Figure 3).

When developing calls or managing grants, organisations need to:

- Foster cross-functional communication;
- Be aware of activities occurring across all departments;
- Oversee various budgets; and
- Track performance goals.

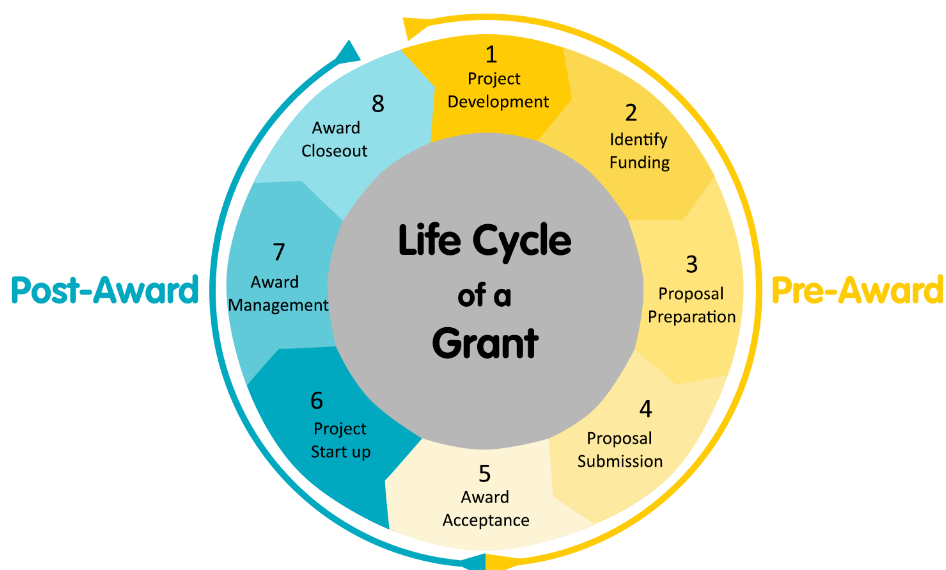
This, while remaining compliant with the various policies, legislation and best practices that informs the grants management lifecycle. For those with a slim grants portfolio, there remains an overwhelming amount of work, especially if all tasks are handled in a disjointed and manual manner.

Not managing the GMS effectively can have several consequences:

- The inability to share grants information with stakeholders;
- Unintended internal competition among researchers from the same institution for the same grant awards;
- Unaccounted funds; and
- In the most severe instance, loss of funding.

The centralisation of grants management processes, is not just a preferential choice anymore, it is a necessary or quintessential practice, given the increasing demand for accountability and reporting in public financial management. Hence, it becomes a non-negotiable requirement for SGCs to invest, develop and adopt well-designed DGMS with mature grants processes and workflows. This is deemed important for reducing the administrative burden linked to the increased accountability on institutions and funders. It maximizes grant funding and ensures the efficient management of grants and use of public funds, whilst also embracing the provisions of the Fourth Industrial Revolution (4IR).

Figure 3: *Grants management life cycle* [5]



This document aligns with the rollout of the DGMS, which encompasses the following functions:

- Calls for proposals (publishing and receiving applications);
- Reviewers database management;
- Pre-screening processes including proposals completeness check and establishing criteria;
- Technical peer review of proposals and establishing criteria;
- Grants awarding and contracting;
- Grants monitoring, progress reporting, evaluating and learning;
- Financial management and monitoring;
- Roll out and implementing the system;
- Knowledge transfer; and
- Ongoing support and improving the DGMS.

A detailed overview of the workflow for this process is presented in Annex 2.

2.1 Pre-granting (Developing CVs or setting up user accounts)

The CV of the PI form part of all research funding schemes and funding instruments. This consists of basic information, e.g., full names; addresses; contact details; current occupation, designation, employer; educational background; research area(s) and outputs. Where research teams and collaborators form part of a grant application, their CVs may be uploaded as attachments, following the necessary permissions being granted. A general guide for a CV section on the DGMS are as follows:

- Contact details
- Career profile
- Qualifications
- Research area and expertise
- Personal profile
- Gender
- Absence from research (for example, women take time off for child rearing)
- Disability
- ORCID (or ResearchGate Profile or GoogleScholar Profile)
- Knowledge Outputs: Books Chapters in books; Articles in refereed/peer-reviewed journals; Refereed/peer-reviewed conference outputs; Patents Keynote/plenary addresses; Articles in non-refereed/non-peer-reviewed journals; Conference proceedings; Technical/policy reports; Products; Artefacts; Prototypes and Research consultancy; and
- Human Capital Development: Student supervision and graduations at the Honours (H), Masters (M) and Doctoral (D) levels.

2.2 Designing and creating a grant call

The granting process starts with the issuing of a call for proposals which must include the following three key documents:

1. **Framework document:** A strategic document compiled in a prescribed format by the relevant department within the SGC. The framework presents the alignment of the funding instrument with the strategic alignment linked to SGC's annual performance plans and available funding. The framework must be endorsed by management before implementing it, to ensure compliance of the granting process.
2. **Funding guide:** Clarifies the pre- and post-award processes to the potential applicants and assures alignment with the administrative procedures. The guide must be aligned to the framework pertaining to the relevant call. Also, the funding guide defines the eligibility criteria for applicants and research performing institutions and defines the funding caps per grant award (Annex X: Example).

3. **Business process description or standard operating procedures:** Describes the financial arrangements applicable to the specific funding opportunity, with clear budget details, source(s) of funding, institutional eligibility for participation, conditions for the release of funds, amongst other criteria (Annex X: Example).

2.3 Application process

The process for soliciting competitive grant applications is rigorous. A call for proposals is an invitation to researchers to submit applications for funding that aligns with the framework document.

There are two distinct types of calls:

1. **Open calls:** Calls for applications where all eligible members within the scientific enterprise that are affiliated with a recognised research performing institution, e.g., a university, research council and/or a research institute.
2. **Closed calls:** Calls for applications are made to a select group/category of researchers, usually from a specific discipline, or as specified by the funding source.

There are factors that need to be considered before the call for applications can be opened:

- Lead programme managers must approve the contents of the call and the application template.
- All IT requirements linked to the opening of a call, must be documented, discussed, understood, and guided by the IT process.
- The system and application template together with all IT requirements should be tested to ensure that the online process is functional and effective.
- All documents pertaining to the call must be updated and endorsed before the call for applications is opened.
- Opportunities to orientate applicants to the online digital system must be created through well publicised webinars open to all potential applicants.
- The online application portal should have a section for Frequently Asked Questions (FAQs) and short videos to proactively address any user queries.

Before an application can be submitted for funding all relevant sections must be completed and validated by the relevant authority of the institution, which indicates that the institution is aware of the application. Thus, endorsing both the application and candidate.

2.4 Peer review

Peer review ensures that grant applications received by SGCs for research funding and research training are scrutinised by independent scientific experts who specialise in the areas of science that the applicant covers. Specially convened expert panels assess proposals, draw on external peer reviewers' comments and make funding recommendations.

Eligibility criteria in the funding calls are based on the SGC's strategic funding priorities and focus areas, which are defined in the call documents. Each research competition has its own assessment criteria which should be made available to all applicants. Reference [6] suggests a common approach for conducting peer review processes: panel review, postal review or both. The review processes are based on insights and recommendations of informed experts on various quality dimensions of research, as guided by a scorecard, which is usually presented in the call documents.

There are several other principles that must be followed for a quality review process to ensue. The review process must be underpinned on scientific excellence; and facilitate a fair process that is transparent and independent of biases at all stages. Further, the process must ensure that the experience, expertise, and

knowledge of the peer reviewers and their functioning as a review panel, supports and aligns to the goals of the funding agency or SGC. The peer review process must allow for participation from the research community whilst also subscribing to the values of impartiality and confidentiality, without any prejudices or conflicts. All deviation from the peer review process must be communicated and documented with endorsement from the relevant authorities, or as outlined in the SGC Delegation of Authority Policy. Annex X: Example of peer-reviewed guidance

2.5 Implementing grant awards

Once the SGC concludes the review processes and the final funding decision outcomes are approved by the SGC leadership the award phase of the grant lifecycle commences. The final award decisions rest solely with the SGC management, who assume fiduciary responsibility and legal authority to enter binding agreements. The SGC management team or executive reviews and makes award recommendations based on the peer reviewers' recommendations on the scientific excellence and financial feasibility of the proposed research. These recommendations are interrogated, queried or ratified by various levels of management within the SGC to ensure high-quality, fair and unbiased funding decisions. The final funding decision outcomes support the panel recommendations, the strategic objectives of the funding instrument and the mandate of the SGC. Once the final funding decisions are made, a notice or letter of award and the research contract, or Conditions of Grant (CoG) award, are sent to the applicants and/or their respective institutions of employment. These documents constitute the official, legally binding issuance of the award. Once the supported institution accepts the grant, by signing the research contract, the PI and the respective institution of employment, becomes legally obligated to carry out the full terms and conditions of the grant. The PI then can draw down funds, through the submission of claims and invoices on the DGMS. As a grantee, the PI is subject to the SGC's statutory and regulatory requirements and policies.

2.6 Conditions of Grant

The CoG is a research contract or a contractual agreement that must be concluded between the SGC and the grantee's employing institution. The CoG outlines the commitment of the funder and the responsibilities to which the institution must adhere to regarding managing the funds. The CoG contains the terms and conditions determined by the funder and attached to the award which funding is administered by the institution in terms of the agreement.

The CoG should stipulate the following:

- The details of the grant (grant holder name, host institution, grant number and duration of grant);
- The conditions pertaining to the grant; and
- A section with signatures indicating the acceptance of the award by the grantee's and the respective institution of employment.

All CoG must be legally approved and any special or additional conditions pertaining to the initiative should be explained, including but not limited to issues of IPR, ethics, etc. As far as possible, IPR arising from the funded research grant, in the form of research outputs, should be owned by the creators of the outputs. Detailed information on CoG is described by [6].

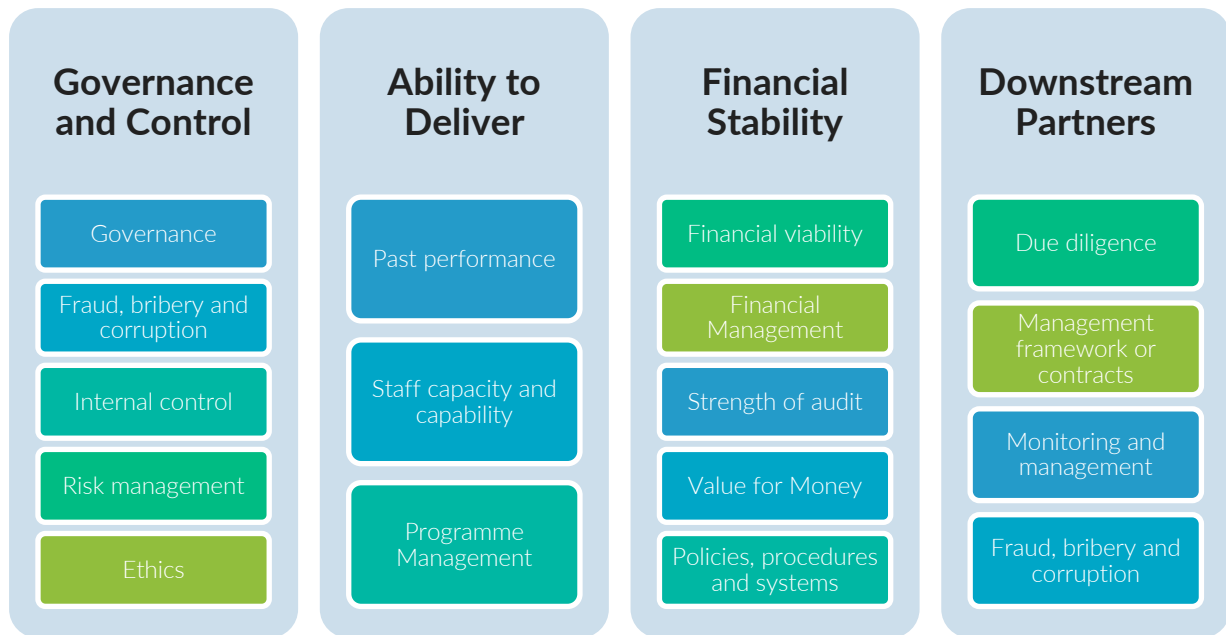
2.7 Due diligence

For large funding programmes, SGCs might consider conducting institutional due diligence of successful proposals as part of the CoG. Robust due diligence procedures aim to secure long term value for money from grant expenditure by identifying potential weaknesses and risks and considering opportunities to enhance institutional capacity of the potential implementation partner to manage grants in accordance with agreed objectives and conditions prior to transfers of funds. This process reduces the risk of funding being diverted

away from agreed development objectives, which inevitably reduces the desired impact. Some of the key pillars linked to due diligence processes, which is presented in detail in Figure 4, include:

- I. Governance and internal control;
- II. Ability to deliver;
- III. Financial stability;
- IV. Downstream delivery; and
- V. Ethics.

Figure 4: Due Diligence Assessment Pillars¹



2.8 Post-grant award (reporting and monitoring)

Post-award hinges on compliance, monitoring, evaluating, and reporting, in accordance with the approved grant application as well as the CoG from the SGC. This phase links to several activities, including processing of payments on the DGMS, compiling, and submitting annual reports by the grantee to the SGC. Also, a grantee can view at any stage the financial expenditure on their grant on the system. The digitalised grant system allows submitting closeout financial and performance reports, reconciliation of unspent or overspent funds and project closure (see Figure 5). Should external audits be required; then, these can be prepared and the outcomes and/or findings uploaded onto the digitalised system.

Figure 5: Summarised workflow of post-award process



¹ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/365186/Due-Diligence-framework.pdf

2.9 Monitoring, evaluation and learning

Monitoring is an important activity for public accountability, steering the programme in the desired direction and supporting teams or projects to succeed. Monitoring tends to be more demanding for partnered research programmes or jointly funded programmes than for a research funding programme funded by only one SGC. A key decision point for monitoring is the link between defining aims and expectations on the one hand and monitoring outcomes and impacts on the other. If programme aims and expectations are defined, relevant monitoring data (qualitative and quantitative) can be identified.

A monitoring, evaluation and learning (MEL) system linked to the post-award phase of the grants system, allows for a set of organisational structures, management processes, standards, strategies, plans, indicators, information systems, reporting lines and accountability relationships. This enables an institution to discharge its MEL functions effectively. Monitoring involves collecting, analysing, and reporting data on inputs, activities, outputs, outcomes and impacts, as well as external factors, in a way that supports effective management. It provides the institute and other stakeholders with regular feedback on progress in implementation and results, and creates a space for flagging early indicators of problems that require remedial action or need to be corrected. It usually reports on actual performance against what was expected or planned as targets.

The MEL business process document will assist in developing the MEL framework. From the various tools used for MEL, it is proposed that the log frame be used as a tool for improving the planning, implementing, managing, monitoring, and evaluating of projects. The log frame is a way of structuring the main elements in a project and highlighting the logical linkages between them.

The evaluation process is a time-bound and periodic exercise that seeks to provide credible and useful information to answer specific questions to guide decision-making processes by staff, managers, and policymakers. It may assess the relevance, efficiency, effectiveness, impact, and sustainability of the programme.

The key elements of an effective MEL include:

- Evaluating a funding programme after a specific funding cycle or years (e.g., medium-term expenditure framework which spans three years);
- Assessing performance over that period; and
- Reviewing decisions on whether the funding should be renewed (further investments), the impact of the funding programme, upscaling, prototype development and where applicable, funding programme redesign. All review documents which may include, a self-assessment report by the PI which defines actual performance against set target and prescribed criteria, postal review reports, and letters of support from the institution's DA must be attached onto the DGMS.

These dimensions must link to the national legislative MEL framework. For example, in SA, the National Research Foundation (NRF) must abide by the Policy Framework for the Government-wide Monitoring and Evaluation System [7].

Over and above the key responsibilities highlighted, the core focus must relate to covering the following critical elements of a robust MEL framework, which are shared in detail in Table 1:

- Inputs: All the resources that contribute to producing quality outputs that either directly or indirectly impacts on the SGC's mandate. Inputs are "what we use to do the work". They include finances, personnel, equipment, and buildings, etc.
- Activities: The processes or actions that use a range of inputs to produce the desired outputs and outcomes. Activities describe "what we do?"
- Outputs: The final products, goods and services produced. Outputs may be defined as "what we produce or deliver".

- Outcomes: The medium-term results for specific beneficiaries which are the consequence of achieving specific outputs. Outcomes should relate clearly to an SGC's strategic goals and objectives set out in its plans. Outcomes are "what we wish to achieve". Further, outcomes are often categorised into immediate or direct outcomes and intermediate outcomes.
- Impacts: The results of achieving specific outcomes, such as reducing poverty and creating jobs. Impacts are "how we have actually influenced communities and target groups".

This requires that the DGMS collect data the subscribes to the SMART (Specific, Measurable, Achievable, Realistic and Timeous) principles.

Table 1: MEL indicators and source data for SGCs

MEL reporting	SMART indicator	Source data from digitalised system
Inputs	Funding allocation to SGC approved	<ul style="list-style-type: none"> ▪ Funding secured for opening a call; ▪ Approved call documents; and ▪ Call opened.
Activities	Grant application process	Completed grant applications submitted on the digitalised system.
	Peer review processes undertaken	<ul style="list-style-type: none"> ▪ Completed review reports; ▪ Conflict of Interest (Col) form completed by reviewer; ▪ Confidentiality agreement completed by reviewer; and ▪ Minutes of peer review recommendations.
Outputs	World class systems and processes in place.	<ul style="list-style-type: none"> ▪ Funding decision that aligns to minutes and review reports; ▪ Award letters to successful grant applicants. ▪ Signed CoGs; and ▪ Completed annual reports: ▪ Financial reporting; and ▪ Performance reporting.
Outcomes	Direct knowledge and human capital gains.	Number of: <ul style="list-style-type: none"> ▪ Grants awarded; ▪ Female grantees; ▪ Publications; ▪ Patents; ▪ Students (H, M, D) graduated; ▪ Postdocs (national versus international) trained; ▪ Early career researchers trained; ▪ Critical skills developed; and ▪ Other.
Impacts	Socio-economic benefits accrued either directly or indirectly	How has the funding in the form of grants advanced: <ul style="list-style-type: none"> ▪ The knowledge economy; ▪ Creating jobs; ▪ Access to healthcare; ▪ Access to clean energy; ▪ Access to clean water; ▪ Improved infrastructure; and ▪ Other.

2.10 Business intelligence reporting (success rates, etc.)

Business intelligence (BI) reporting is the process of gathering data by using different software and tools to extract relevant insights. The data one collects may come from any of the tools and platforms available within the institution, including marketing automation systems, customer relationship management systems, finance platforms and HR management systems. Furthermore, by centralising those data sources in a data warehouse, one can query and manipulate the data and present it in a report form. It provides suggestions and observations about business trends and empowers SGC leadership and other decision-makers to act.

The main goal of BI reporting is to deliver comprehensive data that can be easily accessed, interpreted, and allows for adequate information that informs actionable insights. Apart from providing the right information, one should also consider the type of BI report that will be more useful for each stakeholder. With traditional means of reporting, it is difficult to use and comprehend the vast amount of data gathered. Creating a simple presentation out of voluminous information can challenge the most experienced managers. Reporting in business intelligence is a seamless process since historical data is provided within an online reporting tool that can process and generate all the business information needed. Another crucial factor to consider is the possibility of using real-time data. The amount of sophistication that reporting using BI can achieve cannot be compared with the traditional reporting.

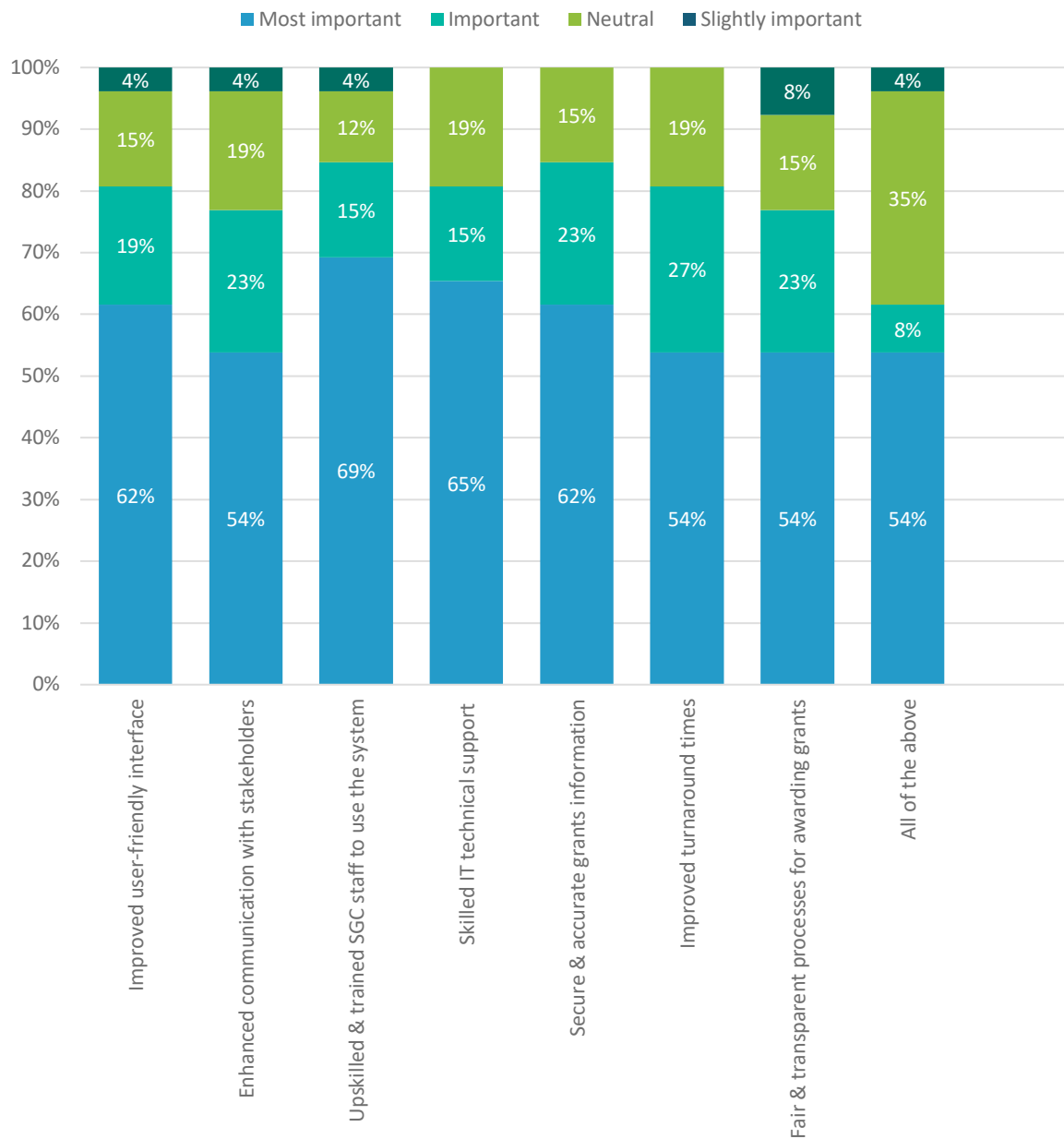
The BIS system is critical to implementing a robust MEL strategy as it provides an evidence-based approach to SGC decision-makers relating to:

- Revising or closing the grant opportunity or funding instrument; or
- Continuing support for the investment in the grant opportunity.

As Section 3 highlights, each of the SGCs work in a unique environment. Assessing the national and institutional readiness and responsiveness to adopting DGMS determines how effective the organisations are in delivering better services supported by a mix of robust processes, resources, infrastructure, and agile systems. As Figure 6 highlights, respondents from the survey for SGCI Phase II, highlighted the **following elements as being key to an efficient DGMS**:

- **User-friendly:** Eighty-one per cent (81%) of respondents indicated that a user-friendly interface is important.
- **Stakeholder communication:** Eighty-seven per cent (87%) of respondents agreed that increased communication with stakeholders is important for effective grant management.
- **Skilling grant managers:** A digital system can only be effective if the grant managers are well trained in using the system. Eighty-four per cent (84%) indicated that with developing and deploying a DGMS, required upskilled and trained SGC staff in place.
- **Skilled IT Staff:** Eighty per cent (80%) highlighted that skilled IT staff are needed to support the system.
- **Accuracy of information:** Eighty-five per cent (85%) of respondents indicated that secure and accurate grants information is needed. The use of DMS can simplify this need.
- **Responsiveness:** For an effective system 81% of respondents indicated the importance of quick turnaround times on grants-related matters.
- **Transparency:** About 77% of respondents supported the need for an effective digital grants system that facilitated the awarding of grants using fair and transparent processes.

Figure 6: Key areas to consider for an effective DGMS



These elements are aligned with global benchmarks and best practices on effective application of digital grant management systems, as presented in the sections below.

3.1 Assessing institutional/national readiness

Key to successfully implementing the DGMS is the readiness of the system and the institution to adopt the technology, adapt the system as well as ensure adequate training is provided for staff to be upskilled to optimally use the system. Also, it is important to have holistic consultations with all stakeholders. It is recommended to have a phased approach such that at the initial stages there is allowance for manual, semi-virtual and virtual application processes to integrate.

Some of the key questions to ask include:

- Do we have the requisite internet infrastructure in place to implement DGMS?
- Are there existing or upcoming laws, regulations or policies that could affect the implementation of the DGMS? For example, in South Africa the launch of the Protection of Personal Information Act (POPIA) limits access to personal information.
- Will adopting the DGMS result in substantive negative changes and biases in the grants lifecycle and subsequently impact turnaround times?
- What is the level of skills set of SGC staff to be able to easily adapt to the deployment of the DGMS?
- What are the cost implications of the above for the SGC?

3.2 Enhancing institutional systems (IT infrastructure/system, governance, project management)

Enhancing institutional systems requires analysing:

- Data storage capabilities needed such as virtual platforms and cloud computing;
- Access to bandwidth and Wi-Fi™ capabilities; and
- Enhanced security.

Since the advent of Sarbanes–Oxley (SOX)², there has been a widespread push for increased accountability in both government and corporate spending. Thus, both management and IT professionals in SGCs must focus on designing, implementing, and assessing IT governance strategies to ensure that technology serves the organisation's needs. The release of the latest King IV Report in 2016 outlines IT governance in detail and refers to the advances in technology and digitalisation as the 4IR and its impact on organisations [8].

The following key areas are emphasised, with particular attention to the way boards are held accountable for the governance related to DGMS:

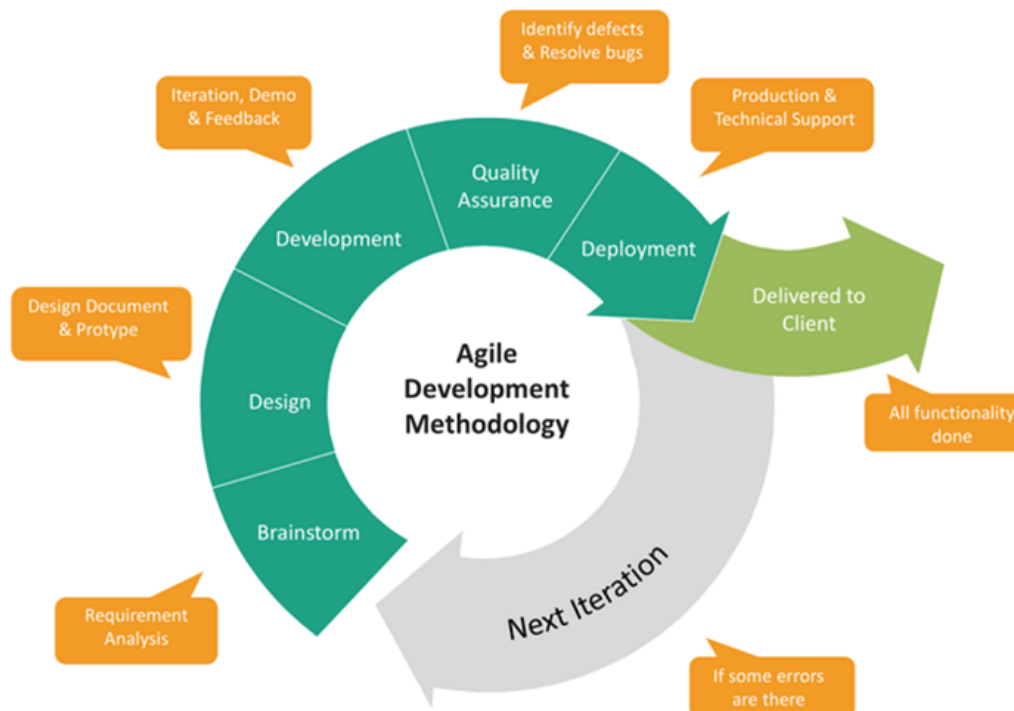
- Integrating people, technologies, information, and processes across the organisation;
- Integrating technology and information risks into organisation-wide risk management;
- Arranging for business resilience;
- Proactively monitoring intelligence to identify and respond to incidents, including cyber-attacks and adverse social media events;
- Managing the performance of, and the risks pertaining to, third-party and outsourced service providers;
- Assessing value delivered to the SGC through investments in technology and information, including evaluating projects throughout their life cycles and operational expenditure(s);
- Responsibly disposing of obsolete technology and information in a way that takes cognisance of issues relating to data management policy, environmental impact and information security;
- Using technology and information ethically and responsibly; and
- Complying with relevant laws.

² As a result of SOX, top management must individually certify the accuracy of financial information. Also, penalties for fraudulent financial activity are more severe. SOX increased the oversight role of boards of directors and the independence of outside auditors who review the accuracy of corporate financial statements.

A few additional considerations must be made:

- Is there a diverse and strong board composition that will foster better understanding of compliance requirements, especially on the rapidly evolving and fast-growing technology and innovation fronts?
- Are there adequate infrastructure provisions in the financial and business planning processes?
- Are there adequate planning and considerations for adopting the agile development methodology? (Figure 7)

Figure 7: Agile development methodology [9]



3.3 Human Resources

The role of skilled human resources (HR) in navigating the digital transformation is important.

- First, teams need to transform business processes and use automation and digital, data-led activities. These are users of technology and digitalised systems.
- Second, there are developers of the systems, which ensure that the system works optimally and that necessary upgrades, feature enhancements and security measures are in place, as well as bugs being timeously fixed, that may impact the seamless functionality of the system.
- Third, there are support and training personnel that provide first-line diagnostic and maintenance support to users.
- Fourth, there are testers who ensure rigor and quality assurance measures are in place for a fully functional, user-friendly and secure digital system.

Consideration must be afforded to identify, recruit, and retain critical skills sets to support and use the fully developed DGMS.

To adopt to the constantly evolving digital economy, consideration of the following questions is necessary:

- What training is needed to upskill and support SGC staff to optimally use the DGMS?
- What additional skill sets are needed to continue to support integrating the technology into the SGC?
- What level of support is needed from the service provider and for what duration of time?
- What are the cost implications of the above for the SGC?

3.4 Training and re-skilling staff regarding digitalisation

Over the last decade, demand for cognitive skills such as written and oral expression, numeracy, reasoning and complex problem-solving has increased, while the demand for routine and physical abilities has decreased [10]. Thus, for the SGC, specific skills sets are needed in the digital work environments. This would mean all personnel would need access to training interventions to learn to use and adapt to the DGMS. However, not all staff will be able to transition into the virtual space using a digitalised system. Highly-skilled workers may be better able to adapt, while others may need more hands-on support and training. Thus, the opportunity cost of training and retraining SGC staff members must be planned for from the beginning.

Some of the key considerations for deploying training programmes when adopting DGMS are:

- Is there a mix of skills in place at the SGC to succeed in a technology-enriched work environment using a DGMS?
- Is SGC management prepared for the opportunity cost of training and re-training personnel?
- Is the SGC undertaking a review of the qualifications, experience and skills sets required for working in the council?
- Will the SGC be able to support ongoing education and training to personnel in response to the changing needs of the council?

3.5 Dealing with organisational culture and change management issues

Change management is an important strategy for ensuring successful transformation from manual to virtual grants management processes. SGC staff may initially be reluctant to “*try new processes*” or “*change the way they work*”. This motivates the need for a Chief Information Officer (CIO) who will manage the process of introducing new technologies and shifts in the way staff and beneficiaries will feel consulted. In addition, the technology solutions will allow staff and beneficiaries to choose, interact, apply, manage, and report on grants in a manner that is understood by the CIO. One of the failures linked to the digital transformation of business processes, is the lack of communication and consultation of SGC staff and beneficiaries, including researchers, students and research performing institutions, such as universities. Some of the key considerations for organisational culture and change management are:

- Is there are CIO position at the SGC?
- Is there a communication strategy in place for adopting the DGMS?
- Has there been a needs assessment or gap analysis undertaken by the SGC, which informs the way the DGMS is tailored to a specific SGC's mandate?
- Is there a training plan in place for SGC staff and beneficiaries?
- Are staff performance agreements being adapted to include the use of the digital systems?

3.6 Developing policy and framework documents

Policies and frameworks shape digital transformation and the way in which digital systems are adopted within an organisation. Multiple interrelated policy areas are required for the SGC to co-ordinate efforts to realise the promises of the digital transformation.

Several key areas that must be considered that have significant policy implications include [10]:

- Access;
- Use;
- Digital risk management;
- Innovation;
- Job security;
- Inclusion;
- Developing trust; and
- Fostering transparency and openness.

Key considerations for the SGC are summarised as follows:

- What data management policies are in place across the data management lifecycle at the SGC?
- Are technical enablers in place to enable access? e.g. infrastructure, connectivity, internet exchange points, etc?
- Are people communicated to, consulted and/or trained to optimally use the full capabilities of a DGMS?
- Have there been adequate considerations for marginalised and minority groups, especially women?
- Have the costs linked to a fully compliant policy framework that supports the SGMS been considered and planned for by the SGC?
- Are clear roles and responsibilities assigned, across the organogram of the SGC, from the Board, CEO, CIO to operational co-ordinators, for the adoption of the DGMS?

3.7 Raising awareness of digitalised platform

There are numerous fears that are linked to adopting technology into the workplace, which is a major concern, when organisations move from the manual to the virtual working environment. Thus, it is natural for personnel to assume that there may be job losses linked to adopting a DGMS. In curtailing and managing such mistrust, raising awareness, and empowering people assumes priority status, and must be led by the CIO. This implies that SGCs need to invest in a communication strategy, as defined in Section 5.4., which allows for consultation engagements with SGC staff and beneficiaries. This may be a lengthy process. The strategy must focus on raising awareness, addressing concerns, and defining the training interventions in place to support the integration of a DGMS into the SGC.

Therefore, the following key areas must be considered:

- Are there platforms for personnel to express their concerns about the change management process linked to adopting a DGMS (e.g., HR one-on-one support sessions)?
- Is a communication strategy in place?
- What are the time and cost implications linked to the above?

3.8 Developing networks, collaborations, and relationships with universities

In line with the mandate of the SGC and the push for more inclusive management that embraces diversity, a collaborative and consultative approach between the SGC and its beneficiaries is critical, both for the sustainability of the council as well as its journey into a digital economy. This implies that the SGC must establish networks with other SGCs and foster collaborations and partnerships with institutions such as universities and researchers who will be using the DGMS. This may require SGCs to develop short learning videos for SGC personnel and beneficiaries to be able to access and use the DGMS optimally.

A smooth transition into a fully functional and optimally utilised DGMS require consideration of the following dimensions:

- Is a support desk, help desk and/or call centre available for any queries by SGC beneficiaries with a 24-to-48-hour turnaround time to resolving system queries?
- Is there one-on-one consultation and training with each research performing institutions such as universities, planned?
- Is there a forum for universities to engage the SGC that allows for feedback on the usage of as well as the functionality and bugs of the DGMS?

3.9 Developing sustainability plans to manage digitalisation activities: Hub and spoke model

Given that different SGCs are at different levels of readiness for deploying a DGMS, it is proposed that a hub-and-spoke model be considered for addressing the issues of sustainability. This is motivated by the fact that SGCs operate within sprawling networks of institutions and as the hub in the proposed model, SGCs can support the needs of the spokes, which are research performing institutions –in terms of identity federation, collaboration and sharing of information and resources – refer to Figure 8. This links to long-term planning and consideration of shared or subsidised costs linked to research journal databases, as an example. Such a hub and spoke model empowers research performing institutions to obtain and retain access to distinct systems while also sharing access to cloud computing, directories, databases, and servers [11]. Also, such a model, facilitates access and compliance to the national legislative environment, governance principles and best practices. A hub and spoke model allow for the SGC to have a bird’s-eye view of the performance of research performing institutions nationwide.

Some of the key considerations include:

- Can convenient, secure access to the DGMS be delivered?
- Is the SGC exploring backup systems for data security, including access to cloud computing for themselves as well as their beneficiaries through a shared cost model?
- Are the DGMS able to support a national repository of performance data linked to outputs from grantees across the different research performing institutions in the country?

Figure 8: Proposed hub and spoke model for SGCs



KEY PRINCIPLES FOR EFFECTIVELY MANAGING GRANTS USING A DGMS

The awarding of research grants is subject to the principles of transparency, confidentiality and equity as core values. Funding should be implemented according to national, regional, and international best-practice rules for the competitive allocation of resources. The rules governing the way in which grants are awarded must be fair and transparent. Some of the key imperatives presented in [12] relate to the fundamental principles that are adopted when awarding, managing, and monitoring grants. Some of these principles are also expanded further for the context of SGCs and are highlighted below.

4.1 Transparency

Project rules and procedures will be widely and readily disseminated and information on the awarded grants will routinely be made publicly available in a timely manner. The grant award process is impartial, with the call for proposals and guidelines published on the internet or through other appropriate media channels (bulk email campaigns, print, radio, and television) ensuring wide national coverage. The availability of funding opportunities in the form of grants must be publicised widely and in an accessible way. All grants awarded in a financial year will be published annually with due acknowledgement and cognisance of the principles of confidentiality and security; as well as written research agreements or CoG with the beneficiary being concluded.

4.2 Equal treatment

The grant award process must be impartial. Thus, proposals must be evaluated by peers or a review committee. The SGC needs to monitor and ensure equal and fair application of processes and systems.

4.3 Non-cumulation

Grantees are chosen according to defined criteria disseminated in all published calls. Proposals are evaluated and reviewed by an independent technical peer evaluation or review committee comprising of qualified scientific experts who provide substantive feedback on grant applications. No single beneficiary may receive more than one grant financed by the SGC for a given funding instrument. The applicant shall immediately inform the authorising officer of multiple applications and multiple grants relating to the same project.

4.4 Accountability

All grantees are accountable for scientific and technological results, progress toward objectives and the use of resources. Regular reporting to the SGC in pre-determined formats is mandatory for all grant recipients. As a rule, grants may only cover costs incurred after the date on which the grant contract or CoG is signed. A grant may be awarded for a project which has already begun only where the applicant can demonstrate the need to start the project before the contract is signed. In a case wherein prior approval has not been received, expenditures incurred prior to the deadline for submission, will not be eligible for financing by the SGC. No grant may be awarded retroactively for projects already completed. The amount eligible for financing, as specified in a grant contract, may not be exceeded.

4.5 Relevance to national needs

The awarding of grants ought to be founded not only on scientific excellence but also relevance to national needs. As a rule, grants may not finance the entire cost of the project or the entire operating expenditure of a beneficiary. Financing a project in full may be authorised if the applicant can demonstrate that financing in full is essential to carry out the project in question and substantiates the budget accordingly. The applicant therefore needs to also supply evidence of the amount of the co-financing brought either with his/her own resources, from their institution of employment, or financial transfers from third parties. The SGC may accept co-financing in kind, if considered necessary or appropriate. This possibility must be mentioned in the SGC call documents and guidelines for applicants. In certain instances, the SGC may choose to regard in kind contribution as a non-eligible contribution. Either way, these stipulations must always be included in the SGC call documents and the applicant must prepare a budget to prove the operational capacity and feasibility of the project, in line with the SGC-specified permissible and non-permissible line items.

4.6 Non-profit

Grants may not produce a profit. Profit is defined as a surplus of funds that is not committed to different line items and activities linked to the project. Lump-sums, interest earned on grants, and flat-rate financing should be established in such a way as to exclude a profit.

4.7 Avoiding Conflicts of Interests

Immediately after opening calls, all SGC staff are required to declare any personal interest that may affect or may be deemed as such, by others which in turn affects their impartiality in executing their duties. An additional mechanism to be considered at the time of commencing employment, is that all SGC staff sign non-disclosure, Col and confidentiality agreements which are logged with their HR profile.

4.8 Safe and ethical research activities

Funded researchers shall adhere to appropriate programme-specific and national guidelines on safe and ethical conduct of research. Grantees who anticipate conducting special experiments or tests on human or animal subjects while delivering on the project activities, must obtain clearance from the responsible authority within their institution of employment and/or national body.

4.9 Confidentiality and accuracy

A reviewer of grant applications must respect and adhere to the appropriate guidelines for confidentiality of proposals and related information. In this regard, members of the technical peer evaluation and review committee must sign a declaration of non-disclosure, confidentiality and Col. All SGC staff shall respect confidentiality of information accessed in the course of duty and shall not use such information for personal gain or for the unfair benefit of any applicant. Information made available to SGC staff in the course of duty shall be treated with respect, fairness and confidentiality without any prejudice or attempts to mislead decision-makers.

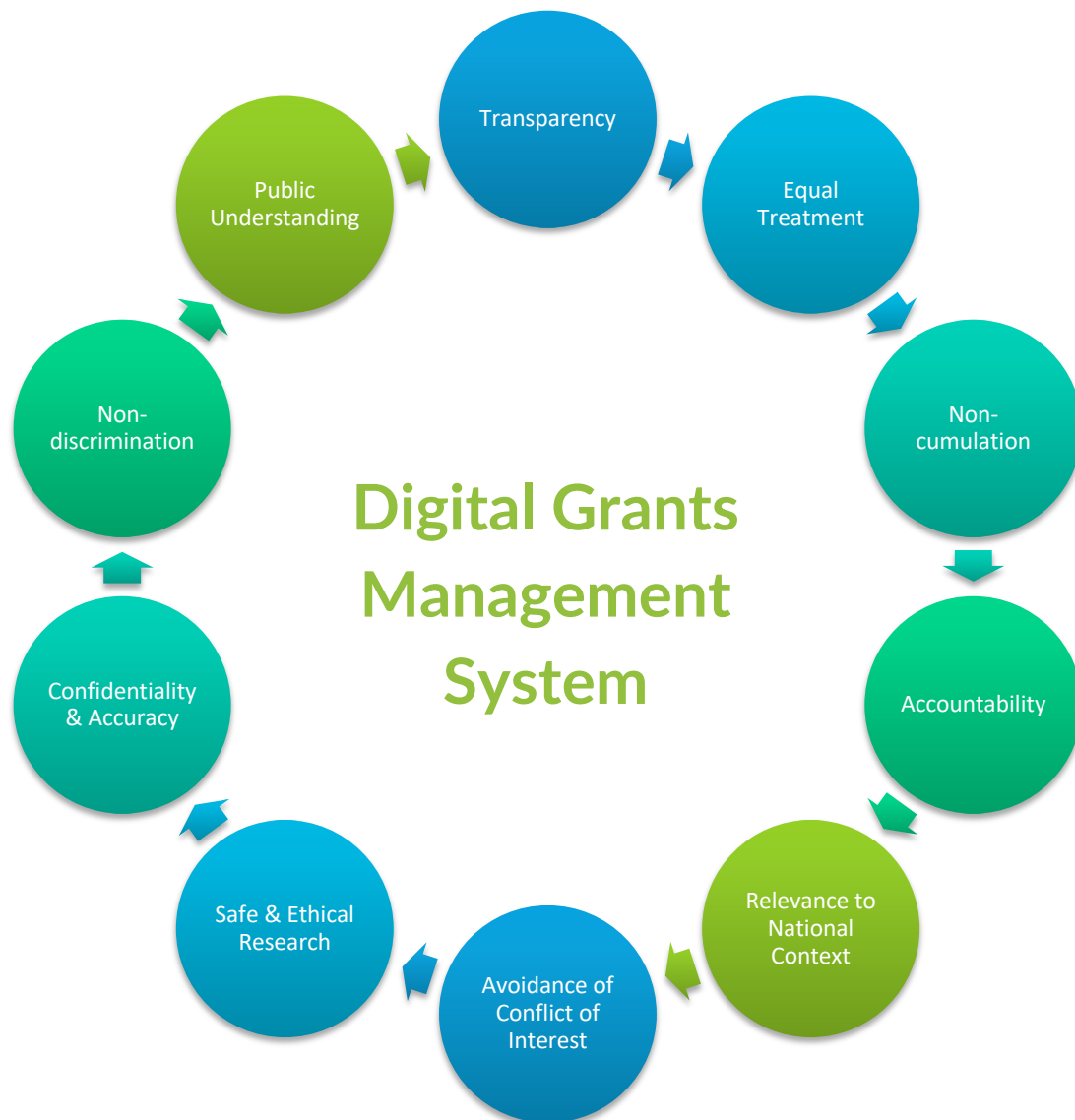
4.10 Equal opportunity/non-discrimination

Grantees shall not engage in any discriminatory practices or those deemed to be discriminatory whether by tribe, gender, race, religion, or socio-economic status in accordance with the applicable national laws and in-line with international conventions. The grantees shall provide equal opportunity to all potential beneficiaries of the grant.

4.11 Promoting public understanding of R&D

As much as possible, the grantees will promote widespread understanding of and appreciation of the contribution of science and technology to national development. This shall form the gist for the SGC's outreach strategy wherein the outputs from the grants awarded are showcased or exhibited for public consumption and benefit. Guidelines in support of outreach and communication activities are detailed in the Research Excellence Framework.

Figure 9: Underlying principles of a DGMS



Several key stakeholders are involved in successfully implementing a DGMS within the SGC context:

- Government;
- Research performing institutions;
- Partner institutions;
- Industry partners;
- Researchers; and
- Students.

5.1 Roles of stakeholders

The process of managing research grants involves several stakeholders including professional service teams and departments at a university or another research performing institutions e.g., central research office. Fundamental stakeholders in the DGMS are the external users (researchers) and internal users (grant administrators). In both environments there are several key stakeholders that considered vital for a successful grants management process.

These include:

- **Government:** The role of the ministries or departments of STI is to appropriate funds through ministerial policy statements and parliament to support the SGC mandate, which includes the awarding of research grants.
- **Research performing institutions:** Research endeavours across the innovation value chain are vital building blocks for advancing the nation's research agenda. Research performing institutions may include research facilities, research and teaching hospitals, research laboratories, science councils and universities. Grant applicants submitted by such institutions, can be submitted by a single PI or a collaborative network of researchers from either the same institution or several different institutions (either national or international).
- **Partner institutions:** Include collaborative networks that advance the research profile of a particular researcher and/or institution and may extend further than research performing institutions located either nationally or internationally.
- **Industry partners:** The academic-industrial partnership may include any number of participants and organisations necessary to assemble a critical mass of expertise and know-how for effective execution. The level of participation is expected to vary among the partners as necessary to reach the specific translational research goals of the proposed grant application. The strategic alliance is expected to combine research strengths, infrastructure facilities such as laboratories, and other resources unique to each group to advance the translational research goal(s). Industrial involvement from the beginning is expected to facilitate efficient transfer of IP to the commercial setting.
- **Researchers and students:** Researchers, including PIs, mid-career and emerging researchers as well as students, are all key stakeholders in the process of grants management. The PI is the primary individual responsible for the preparing, conducting, and administering a research grant, completing and abiding by the CoG, training students, and contracting third parties in compliance with applicable laws and regulations as well as institutional policies governing the conduct of sponsored research.

5.2 Roles and responsibilities

Stakeholders deemed critical for their roles in the effective deployment and implementation of a DGMS. are presented below and summarised in Table 2.

5.2.1 SGC senior leadership

During the development, implementation and management of projects, the primary offices that may be involved are SGC grants and financial administrators, managers, directors, and executives. The project manager is the primary individual responsible for co-ordinating with all these offices. Also, this individual is responsible for facilitating communication about the project, soliciting support from the appropriate offices when needed and participating in regularly scheduled grants compliance meetings with the grants office staff. The senior leadership needs to ring-fence funding for investing in the key resources for: infrastructure, people, training, maintenance, and upgrades.

- **Infrastructure:** ICT infrastructures such as servers, networks, cloud computing, security, uninterrupted power supplies.
- **People:** IT software developers, hardware specialists, cyber-security, technical and support personnel, users, etc.
- **Maintenance*:** Managing and maintaining ongoing risk is needed to ensure that the DGMS is safe and secure and that there is no mismanagement of funds, nor any security breaches. Also, ongoing training may be necessary as SGC staff become more familiar with the system and require the use of additional features. As new SGC staff join, they would also require training. This may be accommodated at a negotiated minimal ongoing or recurring cost with the digitalisation development consultant.
- **Training:** Deploying the system to SGCs would require training of the SGC staff, which may be an ongoing activity, dependent on the skills set of SGC staff and their ability to adapt to the DGMS.
- **Upgrades*:** As the system is being used, additional features may be needed or reporting modalities built in, that may require an upgrade to the functionality of the system by the consultant. This may be accommodated at a negotiated extra cost with the digitalisation development consultant.

** Maintenance and upgrade costs can be discussed and negotiated upfront with the digitalisation development consultant to ensure that the necessary funding is secured at the planning phase.*

5.2.2 SGC grants office

The grants officer at the SGC fulfils the role of providing grants development and management services for all grants across the grants lifecycle. The grants officer directs the specifics of any grant, including its structure, communication with other departments in the organisation and any regulatory compliance requirements. Also, the grants officer may train junior staff about compliance issues and processes. The officer works with the manager and executive leadership to develop funding opportunities and guides the application process. The grants office will support, guide, and advise all successful grantees through the full life cycle of grants from pre-award to post-award and closeout. The grants office also informs unsuccessful grant applicants of the outcomes and shares with them the recommendations from the panel, as prepared and approved by the reviews and evaluation office.

5.2.3 SGC reviews and evaluation office

The reviews and evaluation office at the SGC manages the peer review processes used to evaluate the merit of grant applications. The review officer at the SGC fulfils the role of ensuring that all declarations are signed off by appointed reviewers. Also, they ensure that all reviewers have access to all the grant applications and supporting documents, available on the online DGMS. The reviews manager verifies the funding decision outcomes against the panel recommendations before the executive endorses it. This office also prepares the outcomes recommendations for the grants office to communicate and liaise with all applicants, both successful and unsuccessful.

5.2.4 MEL officer

The MEL officer will provide support, advice, and oversight on programme-level MEL to the SGC including the institutional experiences. This will include implementing and updating the MEL framework for SGCs, systematising grants management results frameworks for greater consistency, scaling up and refining grants monitoring systems to allow efficient tracking of programme results to inform reflection processes and compliance with reporting requirements.

The key responsibilities of the role include but are not limited to:

- **Results monitoring:** Conducts and oversees data collection efforts, including baseline studies and analysis for each SGC project; prepare quarterly monitoring reports and synthesise data at country or programme level and contribute to annual reflection workshops, case studies and documentation of results. The critical requirement is that the data collected adheres to the audit requirements of datasets being: *“complete, transparent, reliable, valid and accurate”*.
- **Training and capacity building:** Contributes to developing and finalising the MEL indicator framework and data collection plan for SGCs and participating countries or institutions. Also, this role provides guidance in developing tools, templates and training on key M&E concepts, data collection tools and processes.
- **Evaluation and learning:** Provides oversight of external mid-term and final evaluations of funding programmes; develops terms of reference for external evaluation and conducts desktop studies. In addition, this role is responsible for compiling results or output data and synthesises information as and when requested by SGC leadership.

The MEL officer assesses and reports on a set of MEL indicators, as laid out in Table 2. The MEL report will allow for evidence-based decision-making processes within the SGC.

5.2.5 Chief Information Officer

The CIO develops the strategic intent for the investment in digital infrastructures that align to the SGC's mandate and priority investment areas. Furthermore, the CIO provides technical support in the operations and maintenance of the ICT infrastructure of the DGMS under the guidance and direction of key role-players within the SGC and the various countries or institutions. Duties include but are not limited to:

- Negotiating the best ICT hardware and software packages and support for the SGC;
- Developing a resourcing strategy to attract and retain skilled IT personnel;
- Installation and support of personal computers and related software;
- Procurement, installation, and monitoring of the operations of the SGC and institutional IT and networking infrastructures;
- Developing a DGMS framework for the SGC that includes a data management plan and communication strategy;
- Technical assistance and support with the installation of the computer room and networking infrastructure;
- Monitors and logs the actual ICT services provided to users, compared to that required by service level agreements and liaises with relevant personnel in the resolution of any breaches;
- Assists professional staff with the release and deployment of changes and updates to the live IT environment by administering the recording of activities and results;
- Assisting with early support activities such as providing support advice to new users;
- Responding to and addressing IT incident reports and requests for help;
- Receiving and handling service desk and incident management requests for IT and networking infrastructure support in line with approved protocols and procedures; and
- Maintaining relevant records.

5.2.6 Developers

Developers are the creative and innovative technical experts behind computer programmes of all sorts. While some developers may focus on a specific programme or app, others create giant networks or underlying systems that help trigger and power other programmes. A developer will analyse the needs of the user and then create, test, and develop digital solutions that will solve a problem, provide efficiency or simply make life easier for its intended user.

5.2.7 Designated Authority (grants manager) at research performing institutions

In some countries, for instance South Africa, the Designated Authority (DA) is usually a manager based at the university (or research performing institution) that provides grants development and management support services to all university researchers that apply for a grant. The DA typically approves the content of the application, provides all institutional letters of support, including financial co-investments where necessary. This requires that the DA creates an institutional account on the DGMS and is the contact person linked to all SGC funded grants. This implies that the DA's role focuses on approving specifics relating to a grant awarded to the researcher at the institution, including its structure, reporting, communication, audits, and any other regulatory compliance matters. The DA may also train junior staff about compliance issues and processes. The DA works with the director and senior leadership of the research performing institution to support, guide and advice faculty and staff through the full life cycle of grants from pre-award to post-award and closeout.

Table 2: Summary of key stakeholders and their roles in a GMS digitalisation project

Stakeholder	Roles
Senior Leadership	<ul style="list-style-type: none"> ▪ Setting the vision and walking the talk; ▪ Leading the change processes related to digital transformation; and ▪ Identifying and finding financial resources needed to support a DGMS; ▪ Investing in the key resources for: (i) infrastructure; (ii) people; (iii) training; (iv) maintenance; and (v) upgrades.
Grants Office	<ul style="list-style-type: none"> ▪ System owner; ▪ Explaining the user requirements; ▪ Testing the system during the development phases; ▪ Training others to use the system; and ▪ Advising management on the DGMS.
Reviews & Evaluation Office	<ul style="list-style-type: none"> ▪ System user; ▪ Access to call documents; ▪ Access to grant applications; ▪ Developing funding decision outcomes based on peer review recommendations; ▪ Updating review outcomes and feedback on each application; and ▪ Training others to use the system such as reviewers.
DA/Grants Manager	<ul style="list-style-type: none"> ▪ System user; ▪ Testing the system during the development phases from a user perspective; and ▪ Providing feedback on the MEL reporting and monitoring requirements.
MEL Officer	<ul style="list-style-type: none"> ▪ System co-owner; ▪ Testing the system during the development phases; and ▪ Explaining the MEL reporting and monitoring requirements.
ICT Technical Officer	<p>Technical maintenance for:</p> <ul style="list-style-type: none"> ▪ the servers; ▪ cloud infrastructure; ▪ system back-ups; and/or ▪ other technical ICT matters.
Software Developer (might be an external party)	<ul style="list-style-type: none"> ▪ Customizing the system as per the changing technological trends, researcher and/or SGC needs; ▪ Handling integration with other systems; ▪ General software maintenance; and ▪ Provide the necessary training, maintenance, and upgrades to a grants management digitalisation system.

A DGMS is used by SGCs to assist the funder and researcher in managing the granting process efficiently, effectively, and seamlessly. The system assists researchers to find suitable funding opportunities, complete their application and manage their grants, if and when they are awarded. A well-functioning DGMS can be useful to entities such as government funding agencies such as SGCs, scientific research organisations, research universities, researchers and students.

Public funding is a critical enabler for the SGC success. Having a platform that allows organisations to centralise all their grant applications and assist in navigating the grants management lifecycle, is incredibly helpful for organisations that rely on public funds.

A DGMS also creates a platform wherein SGCs and researchers, as well as their institutions of employment, can have access to an online repository of all compliance and audit documentation. A DGMS typically allows for the following features: compliance management, contract management, document management, financial reporting, grant application management, grant award tracking, grant discovery, proposal creation and task reminders. The implementation of the DGMS by the SGCs will contribute toward integrated national data systems and facilitate the flow of data among diverse users and stakeholders.

The information captured on any digitalised system, even a DGMS, lends itself to fraud, dishonesty, misuse and misappropriation of funds. This therefore is a risk that must be managed from the onset, by having a workflow approval process that aligns to the SGC's Delegation of Authority Policy Framework and the National Public Finance Management Act(s). This would mean checks and balances need to be developed at the onset that allows for several approval processes to be built into the workflow to mitigate unforeseen financial errors and other financial risks. For the SGC, integrity, ethics, accountability, and transparency form the basis of business principles – hence all SGC staff must act with honesty and probity.

WORKS CITED AND ACKNOWLEDGED

- [1] SGCI (2022). The science granting councils initiative. Available: <https://sgciafrica.org/en-za/participating-councils>
- [2] Jackson-Malete, J., Dyason, K., & Mpye, D. (2017). Good practice guideline on the quality of research competitions. SARIMA, Pretoria.
- [3] Wilkinson, M., Dumontier, M., Aalbersberg, I. et al. The FAIR Guiding Principles for scientific data management and stewardship. *Sci Data* 3, 160018 (2016). <https://doi.org/10.1038/sdata.2016.18>. Available: <https://www.nature.com/articles/sdata201618>
- [4] NBIS (2020). What are FAIR principles. Available: <https://nbisweden.github.io/module-open-science-dm-practices/02-fair/index.html>
- [5] CHLA (2020). Grants administration. Available: <https://www.chla.org/research/grant-administration>
- [6] Ramoutar-Prieschl, R., & Hachigonta, S. (2020). Management of research infrastructures: A South African funding perspective. https://doi.org/10.1007/978-3-030-37281-1_1
- [7] The Presidency (2007). Policy framework for the government-wide monitoring and evaluation system. Available: https://www.gov.za/sites/default/files/gcis_document/201409/complete2.pdf.
- [8] Institute of Directors of Southern Africa (IoDSA). (2016). King IV: Report on corporate governance for South Africa. Accessible at: https://cdn.ymaws.com/www.iodsa.co.za/resource/collection/684B68A7-B768-465C-8214-E3A007F15A5A/IoDSA_King_IV_Report_-_WebVersion.pdf
- [9] CherCherTech (2020). Agile methodology. Accessible at: https://chercher.tech/jira/agile-methodology_
- [10] Organisation for Economic Co-operation and Development (OECD) (2019). Going digital: Shaping policies, improving lives. Accessible at: <https://www.oecd.org/going-digital/going-digital-synthesis-summary.pdf>
- [11] Identity and Access Management (IAM) (2020). Choosing open-source IAM for higher education. Accessible at: <https://wso2.com/library/solution-briefs/guide-choosing-open-source-iam-for-higher-education/#01>
- [12] NIH (2019). Grants and Funding. Accessible at: <https://grants.nih.gov/grants/rppr/index.htm>

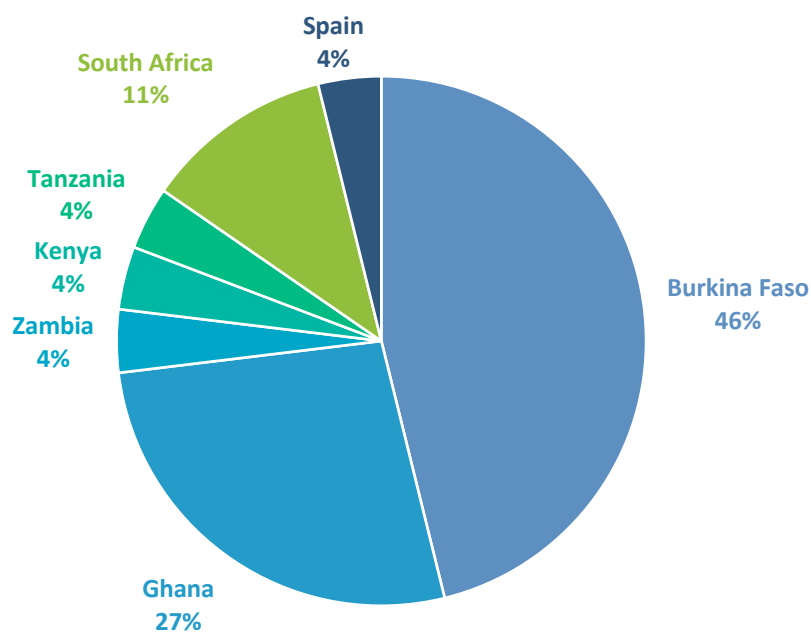
ANNEX 1: SURVEY DEMOGRAPHICS

The survey was developed using Google Forms and was opened for a month, spanning 7 April to 10 May 2022. The survey was translated in French by the AAU for French speaking participants on the continent. The survey was circulated to key SGCI stakeholders including a select sample of active SGCI participating institutions in southern, eastern and western Africa. The engagement process with SGCI was led by SA's NRF; University of Sussex in the UK; and the Association of African Universities (AAU) in Ghana. A total of 26 responses were received: 12 from French-speaking and 14 from English-speaking countries were received. A summary of the key findings is presented in this document.

1. Participation by country

Responses were received from seven countries, namely: (i) Burkina Faso (46%); (ii) Ghana (27%); SA (11%); Spain (4%); Tanzania (4%); Kenya (4%); and Zambia (4%). Figure A presents the details.

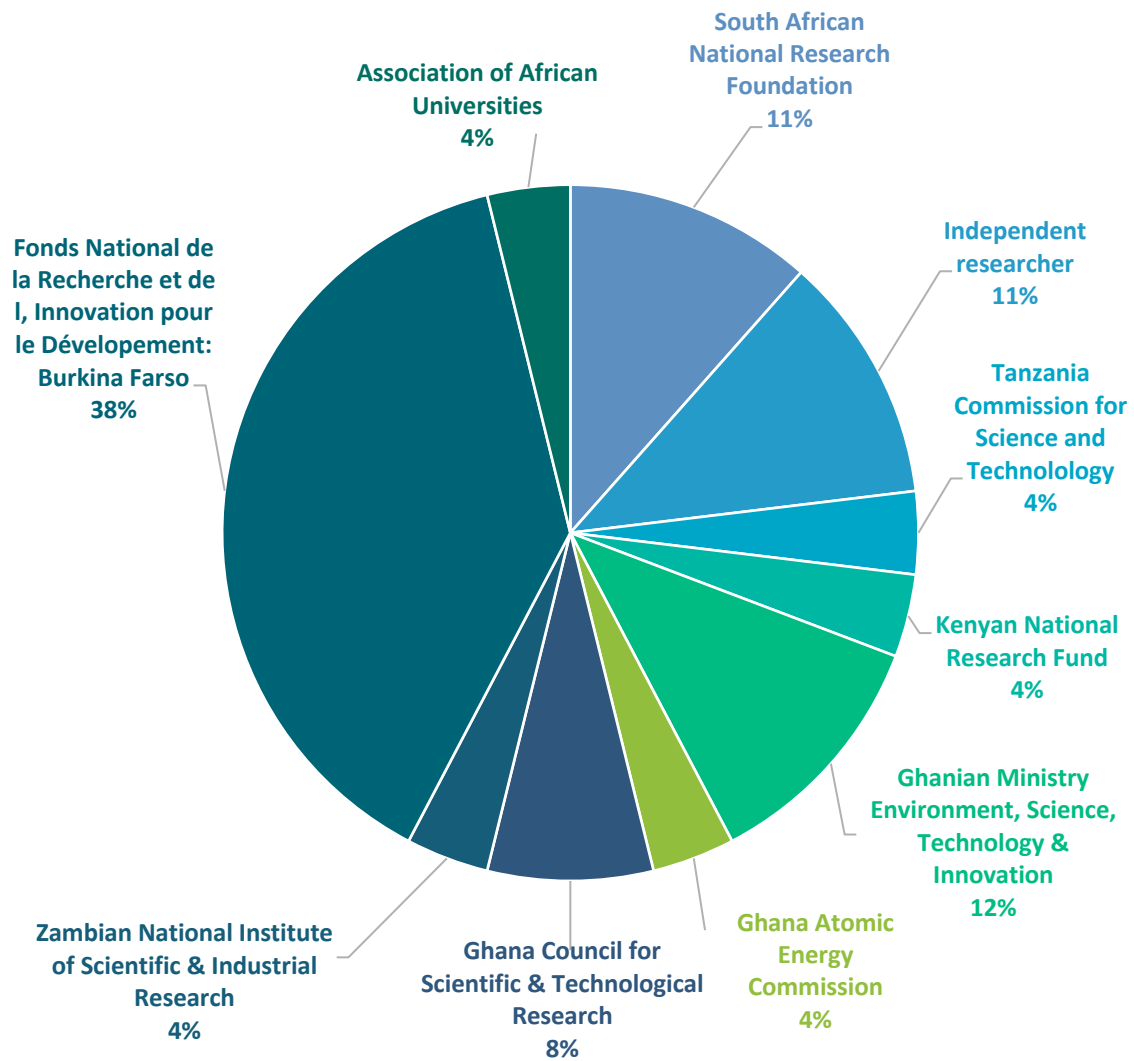
Figure A: Percentage participants per country



2. Institutional representativity across countries

Across the seven countries, the following institutions participated in the survey (see Figure B).

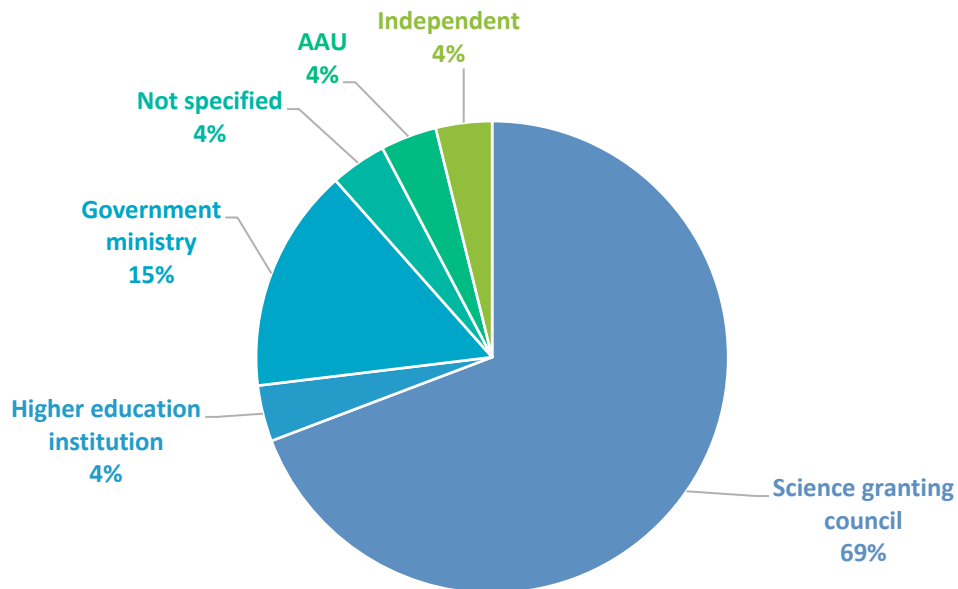
Figure B: Organisations participating in the survey



3. Organisations represented in survey

Furthermore, the survey participants represented the following six (6) types of organisations: (i) SGCs (69%); (ii) Government Ministries (15%); (iii) HEIs (4%); (iv) Association of African Universities (AAU) (4%); (v) Independent entities (4%); and (vi) Unspecified organisations (4%). Figure C depicts these.

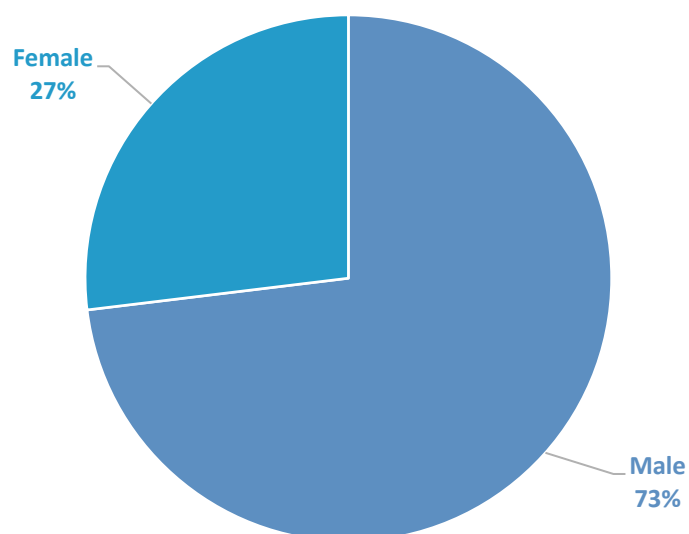
Figure C: Type of organisations represented by survey participants



4. Gender representation

There was about 73% of the participants of the survey being male and the remaining 27% female (Figure D).

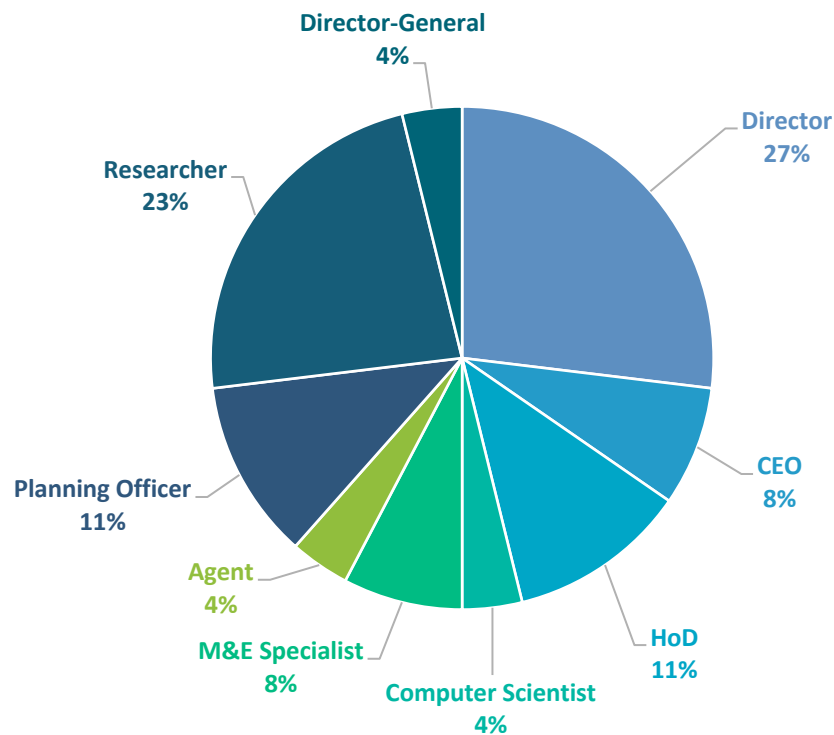
Figure D: Gender representativity



5. Survey respondents' designations

As Figure E indicates, Directors (27%) comprised the largest designation group that participated in this survey followed by researchers (23%); head of departments (11%); planning officers (11%); M&E specialists (8%); and chief executive officers (8%). Director-General, Computer scientists and agents comprised 4% of the total number of survey participants each.

Figure E: Survey participants' designations



ANNEX 2: DGMS WORKFLOW ACROSS THE GRANTS MANAGEMENT LIFECYCLE

