



UNIVERSITY OF
KWAZULU-NATAL
INYUVESI
YAKWAZULU-NATALI



HSRC
Human Sciences
Research Council

EPD
Economic Performance
and Development



SOUTH AFRICAN LOCAL
GOVERNMENT ASSOCIATION
SALGA
Inspiring service delivery

Municipal Innovation Maturity Index (MIMI) – Phase 2: *Towards a Digital Platform*

Report on Refining and Aligning MIMI

Work packages 1 & 2

December 2019

This report is prepared by the Economic and Performance and Development (EPD) research programme,

On behalf of the Project Team: University of Kwa-Zulu Natal (UKZN); Human Sciences Research Council (HSRC); South African Local Government Association (SALGA);

For the Department of Science and Technology (DSI)



science & innovation

Department:
Science and Innovation
REPUBLIC OF SOUTH AFRICA

Executive Summary

The Municipal Innovation Maturity Index (MIMI) is a tool for assessing the capabilities of municipalities to innovate, or support innovation, for improved municipal services, products, and processes. The MIMI is a self-reflective tool which captures perspectives on the individual and organisational outlook, behaviour, capabilities of municipalities to learn, share and implement new and improved service delivery solutions.

MIMI Phase 1

The earlier version of the tool was developed by the Economic Performance and Development (EPD) programme at the Human Sciences Research Council (HSRC), during Phase 1 of the project, in response to the general lack of appropriate instruments for assessing the innovation capabilities of municipalities in South Africa. The tool aimed to investigate the extent to which municipalities develop their innovation capabilities as a result of exposure to innovations demonstrated at distressed municipalities as part of the Innovation Partnership for Rural Development Programme (IPRDP). The tool was found to be a valid, strong and powerful instrument for understanding learning capabilities at local municipalities to support innovation for improved basic service delivery. The results generated using the tool revealed a marginal increase in the overall innovation maturity of the municipalities that were surveyed, suggesting that learning was taking as a result of exposure to the IPRDP. The MIMI results further showed that even though municipalities are aware of and understand basic service delivery innovations, they have yet not reached a stage where innovation principles are entrenched in their organisations. The organisational enablers to foster an enabling environment for innovation maturity were generally lacking.

MIMI Phase 2

Against the backdrop of the success of the MIMI pilot phase, the Department of Science and Innovation (DSI) has contracted the University of Kwa-Zulu Natal (UKZN), the HSRC and the South African Local Government Association (SALGA) to facilitate a sector-wide scale up of MIMI, across municipality tiers, via an online platform. As part of the process, users (municipalities) and other relevant stakeholders have been engaged to refine the tool both conceptually and methodologically. Several learning forums have been conducted, and many more will be conducted in future, so that stakeholders share their experiences and be encouraged to think of innovative solutions towards developing a culture of continuous improvement in service delivery. MIMI is an important knowledge management tool that bears relevance for innovation in the public sector more broadly.

The scope of the work in phase 2 consists of work packages in relation to

1. Refine and improve the tool;
2. Align the tool with existing instruments;
3. Package, market and brand MIMI 2;
4. Develop the digital platform for MIMI 2;
5. Develop a MIMI 2 accreditation system;
6. Roll-out of the revised tool to a sample of municipalities; and
7. Institutionalise the tool

About this Report

This report outlines two areas of refinement and alignment as delineated in work packages (WP) one and two of the MIMI phase two project, i.e.

WP1: MIMI Refinement & Improvement	to identify gaps and outline recommendations for improving and refining the existing version of MIMI
WP2: Alignment with Existing Instruments	to assess other existing innovation tools and understand the relationship with other tools, and areas for refinement

Background information about MIMI phase 1 is provided in the introduction. Section 1 includes what informed the development of the tool, a summary of key findings and what was learnt from phase 1 towards the refinement of the tool in phase 2. Considerations for MIMI refinement (WP1) are outlined in section 2 and alignment with other innovation tools are provided in section 3 (WP2).

The revised MIMI questionnaire is a separate document, but the changes made are detailed in this report. The revision is informed by detailed inputs received from SALGA and UKZN, and also the HSRC team along with inputs from two questionnaire workshops with the project teams, roundtable sessions with stakeholders and the Learning Forum 1. The questionnaire is ready for testing in 2020 and for conversion into an online version.

The MIMI questionnaire has 25 questions (items), three constructs and 6 levels, these changes are detailed in this report. Definitions which needs to be embedded in the online version of the questionnaire have been added and are indicated on the questionnaire. The notion of institutional governance has been added to the constructs, especially in Construct A.

Through this refining phase we can say that we are confident that the MIMI measures what we want it to measure and that there are no other equivalents which take a detailed look at innovation capabilities (organisational and individual) at municipalities. MIMI is unique and comprehensive in this respect. The tool has been sharpened through an extended literature, document and policy review in addition to the stakeholder engagements conducted thus far. There is potential for integrating MIMI with other initiatives especially those of SALGA, see part three of this report.

Contents

Executive Summary	3
List of Abbreviations.....	8
List of Tables and Figures.....	9
1. Introduction: about MIMI (Phase 1).....	10
1.1 Conceptual Development of MIMI 1	11
1.2 The MIMI 1 Framework.....	12
1.3 Summary of MIMI 1 Findings	14
1.4 Learning from MIMI 1.....	15
2. MIMI Refinement and Improvement (Work Package 1).....	17
2.1. On Public Sector Innovation Research and Measurement	17
2.2 Revisiting Conceptual Issues for MIMI	19
2.2.1 Conceptual Framing of MIMI Phase 1	19
2.2.2 Broadening the Framework for Phase 2.....	21
2.3 On Governance in Local Municipalities.....	23
2.3.1 Local Government Governance Framework	24
2.3.2 Governance Challenges facing Local Government.....	25
2.3.3 Review of Governance Indicators.....	27
2.3.4 How Governance Impacts on PSI	35
2.4 Index Construction: Methodological considerations for MIMI	37
2.5 Summary of Changes for the MIMI 2 Tool	40
2.5.1 Recommended Changes to the MIMI Framework	41
2.5.2 The Revised MIMI 2 Tool.....	43
2.5.3. Initial Considerations on Governance Indicators for MIMI 2	46
2.5.4 Recommendations Regarding Governance Indicators for MIMI 2.....	48
3. Alignment with Existing Instruments and Policies (Work Package 2).....	50
3.1 International Public Sector Innovation Tools	50
3.2 South African Innovation Indices	51
3.2.1 Innovation Measurement Tools and Frameworks	51
3.2.2 Smart Cities Framework	54
3.3 Other Local Government Tools	56
3.3.1 Greenbook, Council for Scientific and Industrial Research	56
3.3.2 South African Cities Open Data Almanac (SCODA).....	56

3.4	Government Policies, Frameworks and/or Tools	57
3.4.1	SALGA Strategies and Tools	57
3.4.2	Department of Science and Innovation.....	58
3.4.3	Department of Cooperative Governance and Traditional Affairs	59
3.4.4	The Department of Planning, Monitoring and Evaluation	60
3.4.5	The Presidency	61
3.4.6	The National Treasury	62
3.5	Innovation by Municipal Councils: Strategic Focus and Tools	63
3.5.1	Tshwane Metro Council.....	63
3.5.2	City of Cape Town Metro.....	65
3.5.3	eThekweni Metro Municipality.....	66
3.5.4	City of Joburg Metro.....	67
3.6	Conclusions.....	67
References		70
Appendices		75
Appendix A. Summary of selected global innovation indexes		75

List of Abbreviations

COGTA	Department of Cooperative Governance and Traditional Affairs
CSIR	Council for Scientific and Industrial Research
EPD	Economic Performance and Development
CeSTII	Centre for Science, Technology and Innovation Indicators
DCG	Department of Cooperative Governance
DPME	Department of Monitoring and Evaluation
DSI	Department of Science and Innovation
HSRC	Human Sciences Research Council
ILED	Innovation for Local Economic Development
IPRDP	Innovation Partnership for Rural Development Programme
KPA	Key Performance Area
MIMI	Municipal Innovation Maturity Index
NACI	National Advisory Council on Innovation
PSI	Public Sector Innovation
SACN	South African Cities Network
SALGA	South African Local Government Association
SCODA	South African Cities Open Data Almanac
SCF	Smart Cities Framework
STI	Science, Technology and Innovation
UKZN	University of Kwa-Zulu Natal

List of Tables and Figures

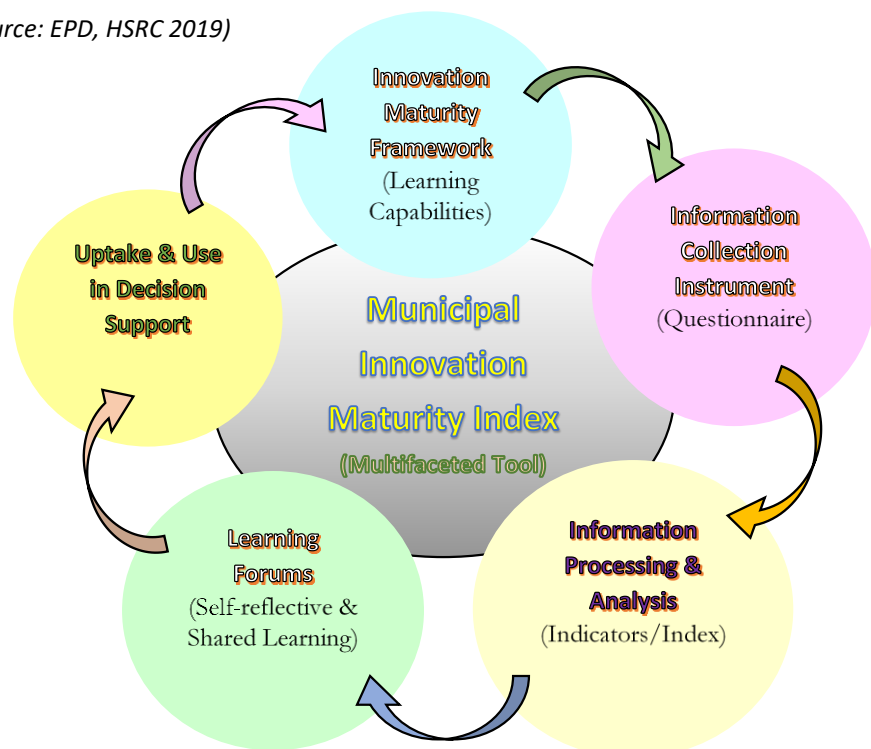
Figure 1: The MIMI Tool (<i>Source: EPD, HSRC 2019</i>)	10
Figure 2: The Working definition of the innovation in MIMI phase 1.....	12
Table 1: MIMI Maturity Level Descriptions (<i>source: EPD, HSRC 2016</i>)	12
Table 2: MIMI 1 Framework: Constructs and Items (<i>source: EPD, HSRC, 2016</i>)	13
Figure 3: Average (mean) scores per MIMI construct (<i>source: EPD, HSRC, 2018</i>)	14
Table 3: List of selected international governance indicators	28
Table 4: Selected governance indicators at the municipal level in South Africa	29
Table 5: Municipal Government Indicators.....	34
Table 6: Recommendations (Conceptual) for Refining the MIMI Framework - update	42
Table 7: Innovation Maturity Levels for MIMI 2.....	44
Table 8: MIMI 2 Framework: Revised Constructs and Items	45
Table 9: Definitions of Municipal Innovation	46
Table 10: Recommended Governance Indicator Matrix	48
Table 11: Extant Public Sector Innovation Tools	50
Table 12: South African Innovation Tools and Frameworks	52
Table 13: LGMIM Maturity Score Criteria	60
Table 14: LGMIM Maturity Levels	61

1. Introduction: about MIMI (Phase 1)

The MIMI is a self-assessment and learning tool which measures innovation capabilities at the local municipal level. The tool seeks to determine the ‘innovation readiness’ of local municipalities and capabilities of individual employees to learn towards adopting and implementing innovation aimed at improving service delivery and municipalities themselves. The process of developing the MIMI instrument involved several steps. The first step was to design the tool based on literature regarding innovation capabilities, government maturity, public sector innovation, and capability maturity models. The instrument was then tested by interviewing 18 officials at six local municipalities, not participating in the IPRDP, after which the instrument was revised. The final instrument was then used to undertake two surveys. Officials involved in the IPRDP, and their managers, were interviewed in a sample of IPRDP districts. The first round data was collected in November 2016 and included interviews with 34 municipal officials from six municipalities. The second round survey was completed in November 2017, and 30 municipal officials from four of the original six municipalities were interviewed.

It should be stressed that MIMI is not a questionnaire only, it is a decision support tool which is supported by a framework (outlined in section 1.2) informed by two concept papers developed in phase 1 (see Mhula-Links et al., 2017; Ramoroka et al., 2017). Moreover, the MIMI tool with the refinements which will form part of phase 2 includes indicators, learning forums and uptake and use (see Figure 1).

Figure 1: The MIMI Tool (Source: EPD, HSRC 2019)



1.1 Conceptual Development of MIMI 1

The framework is informed conceptually by literature concerning learning capabilities which focuses on learning to enhance the capability and absorptive capacity of government agencies for innovation (see EPD HSRC 2017; Ramaroka et al. 2017). In addition to literature on public sector innovation, literature on capability maturity models (or simply maturity models) proved to be of particularly valuable for the development of the MIMI. Maturity models have been applied to assess the maturity of people, processes and also the maturity of innovations (products or technologies) themselves. Of importance for this assignment are the applications to measure the innovation capabilities of people and organisations. In this regard, the work of Essmann (2009) and Visser (2011) on the measurement of organisational innovation capability maturity was especially useful. Both of these studies focus on organisational, as well as individual innovation capability dimensions to determine overall capability maturity. The Open Innovation Maturity Framework of Enkel et al. (2011) also provided insights, both at a conceptual and methodological level.

Most maturity models make use of employee self-assessments using Likert-type scales which rate a range of items or indicators categorised into a number of constructs. It is noted that the Australian and UK public sector innovation instruments both make use of Likert scale questions which require respondents to i.e. agree or disagree with statements depending on the number of scales included (see Mhula-Links et al., 2017). This said, there are examples of studies that make use of questions instead of statements and provide responses per maturity level for each question (see Enkel et al., 2011; Essmann, 2009; Visser 2011). The MIMI follows this approach which is considered to be more nuanced. The aim is to get more accurate responses by ensuring that responses are understood well by respondents.

It should be understood at the onset that MIMI does not measure innovation outputs in the public sector, i.e. look at types of innovation or other innovation 'artefacts' like patents for instance as common in the measurement of innovation also in the public sector. Instead, as indicated, innovation and learning capabilities of individual officials and municipalities as organisations are measured. Nonetheless, a definition of innovation is needed to underscore what is meant by innovation when asking questions about innovation maturity.

1.2 The MIMI 1 Framework

For phase 1, the following working definition was adopted since the focus was on basic services, i.e. water, sanitation and energy technologies or improvements demonstrated through the IPRDP.

Figure 2: The Working definition of the innovation in MIMI phase 1

*New or improved approaches and/ or technologies
to improve the operations of the organisation
and/or basic public services (EDP, HSRC 2017)*

The MIMI instrument consists of questions which ask municipal officials to rate the extent to which their own activities and their municipal environment are innovation ready or mature. Table 1 presents the overall maturity level descriptors, which were adapted for each question (i.e. item) in the MIMI 1 framework. The MIMI framework captures two broad dimensions:

1. The organisation innovation capability in terms of creating an enabling environment and providing leadership support for innovation
2. Individual innovation capabilities which consider the learning of individual official to find new and improved ways of doing things

The framework further consisted of 33 items (or indicators) and four constructs (see Table 2).

Table 1: MIMI Maturity Level Descriptions (source: EPD, HSRC 2016)

Maturity level 1	Maturity level 2	Maturity level 3	Maturity level 4
<i>Limited, if any</i>	<i>Define & apply</i>	<i>Manage & entrench</i>	<i>Share learning externally</i>
Limited, if any, awareness or evidence of innovation on the part of individual officials or the organisation.	Innovation is defined, applied and repeatable. Officials understand innovation principles, but innovation activities occur irregularly.	Innovation is managed and innovation principles are entrenched in the organisation. Officials seek to optimise and evaluate solutions, and improve on these for internal benefit.	Innovation is open and outward looking. New knowledge is applied creatively, based on evidence, in different contexts and shared with others outside of the organisation.

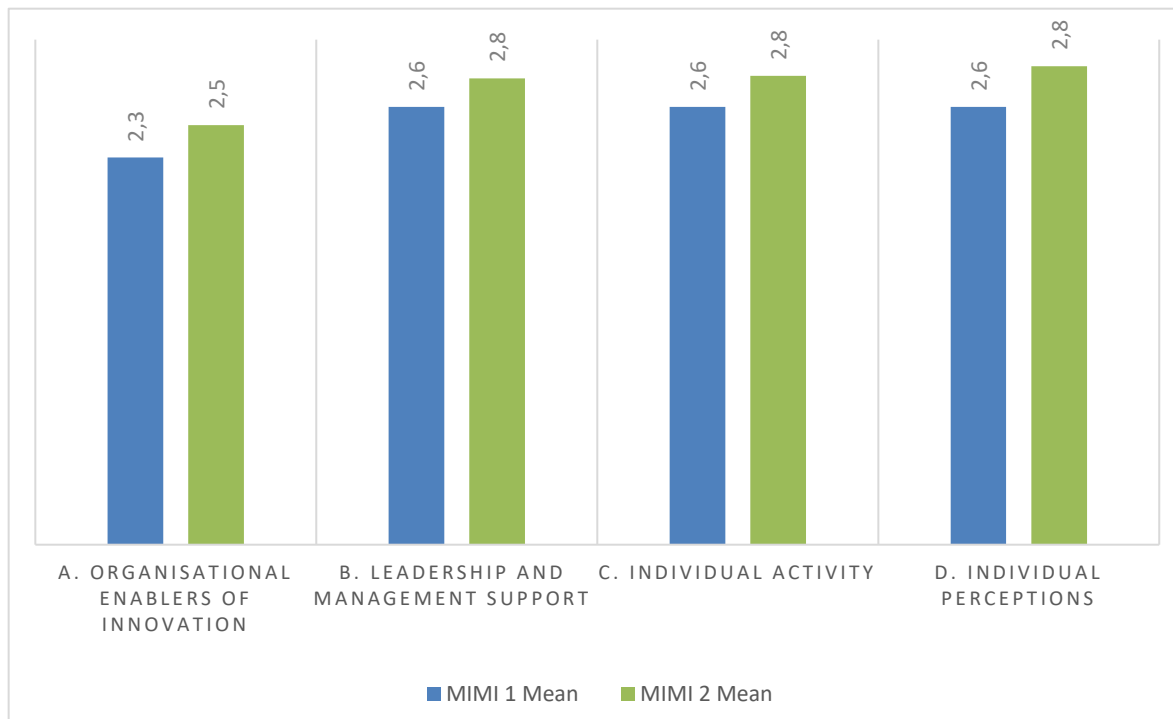
Table 2: MIMI 1 Framework: Constructs and Items (source: EPD, HSRC, 2016)

Dim.	Construct	Item
I. ORGANISATIONAL INNOVATION CULTURE	A. Organisational enablers of innovation	A1. Innovation linked to strategy A2. Innovation linked to performance A3. Financial resources for innovation A4. Physical resources for innovation A5. Human resources for innovation A6. Hiring and aligning staff skills for innovation A7. Staff incentives for innovation A8. Inter-departmental collaboration for innovation A9. Collaboration and partnerships for innovation
	B. Leadership and management support	B1. Openness to new ideas B2. Encouragement of learning B3. Communication by management B4. Innovation awareness B5. Understanding of innovation processes B6. Support for testing innovations B7. Risk taking attitude in relation to innovation B8. Assessment of community needs B9. User participation in innovation B10. Innovation diffusion
II. INDIVIDUAL INNOVATION CAPABILITY	C. Individual knowledge seeking and learning	C1. Idea screening C2. Considering of alternative options C3. Internal knowledge use C4. External knowledge use C5. Knowledge management C6. Formal networking behaviour C7. Informal networking behaviour C8. Innovation collaboration C9. Idea sharing C10. Tools for managing knowledge
	D. Individual perceptions about knowledge	D1. Value of innovation for improved services D2. Willingness to learn D3. Skills for innovation D4. Potential for innovation to enhance quality of life

1.3 Summary of MIMI 1 Findings

In terms of the simple average scores for both survey rounds, a marginal increase in the overall innovation maturity of municipalities is observed. In round one of the survey, the total average score amounted to 2.5, increasing to 2.7 in round two (both rounds were part of phase 1). Figure 3 shows the average scores for the MIMI constructs.

Figure 3: Average (mean) scores per MIMI construct (source: EPD, HSRC, 2018)



Overall, the MIMI results reveal that the innovation maturity levels have increased incrementally between round one and two of the surveys. This suggests that the municipal officials that have been exposed to notions of innovation in relation to improving public services and the specific technologies demonstrated through involvement in the IPRDP are enhancing their innovation capabilities. Despite this, none of the municipalities surveyed reached maturity level three or four. When maturity level three is achieved, innovation principles and practices will be truly entrenched in the organisation, and an organisation at maturity level four will actively share knowledge about innovation with other organisations and stakeholders to encourage the diffusion of innovation for wider impact.

Identified issues impacting on organisation and individual innovation capabilities, which need to be addressed in order to foster and enhance the maturity at local municipalities for innovation, include:

- Organisational capacities in terms of creating an enabling environment for innovation score lower than the other constructs.
- A lack of financial and physical resources for innovation.
- Staff members are not recognised and rewarded (i.e. incentivised) for being innovation – this is an important motivator.
- Knowledge management tools, practices and systems are lacking at municipalities.
- Managers need to do more in terms of encouraging staff to learn about innovation and also to encourage an understanding of innovation processes overall.
- Moreover, more can be done to encourage innovation-networking behaviour among staff members to seek out innovation collaboration opportunities.

1.4 Learning from MIMI 1

MIMI is a Robust Tool

Phase 1 has shown that the tool or instrument is valid, in addition to being a strong and powerful tool for the intended purpose i.e. understanding innovation capabilities at local councils. The Cronbach Alpha and PCA analyses used during round 1 and 2 of data analysis indicated that the tool is statistically valid and reliable (see phase 1 reports). Against the background that the purpose of the pilot phase was to develop an appropriate instrument for understanding and measuring innovation capabilities in municipalities, the groundwork has been done and the MIMI can now be rolled out on a larger scale with the necessary adjustments to measure the innovation maturity of other municipalities and public sector organisations.

Further Conceptual Development

Additional conceptual development of MIMI is further required in order to adapt the instrument to measure innovation maturity more broadly, and to refine the tool.

Stakeholder and User Input

Stakeholder and also user input are required to refine the tool in keeping with open innovation approaches to PSI. It is also observed that the language of MIMI should be adjusted according to the understanding of municipal officials. In phase 2, multiple platforms are included for stakeholder input and as part of the testing of the tool before bigger roll-out, the research team will work closely with a group of users.

A Larger Sample

A larger sample size is needed to construct an index. The analysis from phase 1 has demonstrated that Principal Component Analysis (PCA) can be successfully used, and round 2 results have improved compared to those of round 1. The main advantage of PCA is that it determines the weights endogenously, removing the need for arbitrary selection of these weights. However, the basic requirements of successful factor extraction were not adequately met, due to a small sample that was used. The PCA results improved significantly when dealing with fewer items during the construction of the sub-indexes. In fact, the best result was found for sub construct D, which has only 4 items. This indicates that increasing the sample size would result in better and more robust indexes, which can be used to adequately measure the innovation maturity levels of the municipalities. The scale-up of MIMI to more municipalities with more responses will allow the next level of analysis.

Secondary Indicators

The Scientific Round Table held after the MIMI testing was done highlighted the need to introduce objective variables in the MIMI instrument to balance the subjective ratings from officials. The Learning Forums also highlight that variables such as good governance, leadership, accountability and political stability are crucial in creating an enabling environment to foster innovation at the local government level. As such, the MIMI should be developed further in a way that allows for such variables to be incorporated into the MIMI tool. During a second phase of the MIMI, the research team needs to identify indicators from secondary data sources to use as weights. The following databases can potentially be consulted i.e. the Citizen Scorecard on Municipal Performance (National Treasury); the financial viability of local municipalities (StatsSA); the Municipal Barometer and other governance indicators from SALGA; Auditor General reports for local municipalities; municipal Integrated Development Plans to see if innovation is incorporated; reports on service delivery protests per area, etc. Additional conceptual development of MIMI is further required in order to adapt the instrument to measure innovation maturity of innovations more broadly (other than service delivery which was the focus of the pilot phase). More observations (that obtained during the pilot phase) are moreover required in order to refine the instrument via statistical methods i.e. PCA analysis.

Continuation of Learning Forums

Learning forum 4 participants expressed a need for the Learning Forums to continue and for municipalities who have been part of the IPRDP who have successfully implemented and adopted innovation to report and share their experiences.

2. MIMI Refinement and Improvement (Work Package 1)

The first section outlines an updated review of the research on Public Sector Innovation (PSI) research and measurement, this is followed by considerations for revisiting the conceptual framework of MIMI and outlining areas where the framework can be broadened. A key consideration for broadening the framework deals with issues considering the broader environment in which municipalities find themselves and the governance issues that go along with this as outlined in section 2.4. Section 2.5 takes a closer look at the methodological refinement of MIMI. A summary of recommendations follow in Section 2.5.

2.1. On Public Sector Innovation Research and Measurement

Within the wider discipline of innovation studies, PSI has historically been neglected in the mainstream literature and there is a dearth of research on PSI in developing countries as determined in MIMI phase 1 (see Ramoroka et al., 2017). This said, a review of recent literature reveals a rapid growth of PSI research particularly in Europe, Canada and Australia; and also in middle-income and/or developing countries like China, Russia and Jordan (Al-rawahna et al., 2018; Arundel et al., 2015; 2019; He and Li, 2019; Jäkel, 2019; Miao et al., 2018). In addition, literature has also been identified with deals with PSI within the local municipalities which is being integrated into phase 2 (Walker, 2006; Walker et al., 2016). However, a review confirms that hardly any research has been done on measuring innovation maturity in the context of PSI. There are some examples of maturity models in the public sector particularly around e-governance and smart technologies in developed and developing contexts (see Andersen et al., 2011; Eom and Kim, 2014; Faisal and Talib, 2016; Haini et al., 2017; Liang et al., 2017), but we have not found examples of maturity models dealing with the learning capabilities of public sector employees and organisations. This said, there is research that underscores open innovation and maturity in organisational and government contexts which informed the MIMI conceptually (see Enkel et al., 2011; Ham et al., 2015).

Studies on innovation in the public sector draws strongly on the experience of measuring innovation in the private sector, informed by public management imperatives as observed in phase 1 of MIMI (see Mhula-Links et al., 2017; Ramoroka et al., 2017). Public sector innovation surveys in Europe and also Australia follow the Oslo Manual methodology for collecting and reporting data on innovation (Arundel et al., 2019). While it is argued that the Oslo Manual covers innovation types in all sectors of the economy, including the government (or public) sector, and that its definitions can be applied to measure

public sector (Gault, 2012; 2015; OECD, 2018); it is pointed out that its guidelines for measuring public sector innovation are insufficient (see Arundel et al., 2017).

Before continuing it is worth noting that the MIMI is not concerned with measuring public sector innovation per se. Instead, the MIMI seeks to determine the innovation maturity of public officials and also organisations. It is important, however, to consider the international literature on public sector innovation to inform MIMI conceptually and to ensure the tool has a firm scientific grounding in the international experience. An understanding of what innovation in the public sector entails needs to underscore the MIMI tool, and the international public sector innovation literature are therefore considered along with specific recommendations for the refinement of the tool in phase 2. Moreover, it should be remembered that in phase 1 of MIMI the focus was on specific (i.e. IPRDP) technologies for improving basic service delivery. A key learning from phase 1 is that the concept of innovation needs to be broadened for wider use in the public sector with an emphasis on municipalities in phase 2.

What can be learnt from the PSI research about what innovation in the public sector looks like are outlined below with updated references. These considerations are useful for informing the conceptual framework of MIMI and how MIMI can be refined based on readings of new literature as outlined in section 2.2.

Innovation in the public sector concerns new and improved ways to solve problems, improve administration and deliver beneficial community-based outcomes (Arundel et al., 2019; Bernier et al., 2015). The emphasis is on ‘how to improve public services through innovation’ (Korac et al., 2017:4). However, it needs to be understood that public sector innovations are principally services or processes that are introduced over a long period of time (Arundel et al., 2019). An emphasis on processes is significant for understanding innovation in the public sector, as is strategic management to enable innovation and its governance (Arundel et al., 2019).

Bernier et al. (2015), after Gow (1994), allude to innovation in the public sector as imitation rather than invention. Incremental innovation, therefore, is prevalent in the public sector (Arundel et al., 2019; Bernier et al., 2015). Incremental innovation in the context of services often refers to small improvements which add value to or enhance the efficiency of services (Gallouj and Weinstein, 1997; Skuras et al., 2008). Thus, innovation in the public sector is not necessarily novel as understood in the context of private sector innovation. While innovation should be new or significant improvements as per the Oslo Manual definitions, there is no requirement for public sector innovation to be a market novelty (Arundel et al., 2019).

Bernier et al. (2015) underscore that a focus on innovation by the public sector is pertinent in contexts where there are few resources and organisations are under pressure. These are considered to be motivating factors for transformation and change whereby innovation is directed towards doing things better and utilizing resources in a smarter way. In Canada, Bernier et al. (2015) stress that the ‘urgent need to do more with less’ stimulated innovation. In fact, their analysis suggests that a surplus in resources reduces the need for innovation, and argue accordingly that ‘limited resources may have forced them [public sector organisations] to find new ways’ (p. 30). This is not dissimilar from circumstances in South Africa, particularly at local government level where resources (financial and human) are constrained (Jacobs and Hart, 2012). Accordingly, innovation networks are particularly important in the context of public sector innovation since innovations do not happen in isolation, but come about through the efforts of multiple stakeholders which include collaboration between tiers of government, and also with knowledge generators, NGOs and private sector partners (Arundel et al., 2019; Bernier et al., 2015). Therefore, innovation networks and collaboration is pertinent in contexts where resource constraints are evident.

In broad terms, innovation refers to the creation of new products, services, processes and organisation methods, or the capturing of new markets (or adaptations of those that exist), based on new knowledge (OECD, 2018). The Oslo Manual makes provision for product, process, organisational and marketing innovations. In the public sector, it needs to be understood that innovation takes the form of services rather than products, and strategic and policy innovations should also be considered (Arundel et al., 2019; Korac et al, 2017). This needs to be considered in a broad definition of innovation adopted from MIMI 2.

2.2 Revisiting Conceptual Issues for MIMI

2.2.1 Conceptual Framing of MIMI Phase 1

As observed in phase 1 of MIMI, debates on innovation in developing countries take a ‘distinct trajectory’, which differs from the emphasis in more developed countries, with regard to the role of STI in addressing challenges associated with under-development, inequality and poverty (Ramoroka et al., 2017). This said, limited work has been done on measuring PSI in the developing countries (Ramoroka et al., 2017). In addition, we could not find examples of innovation maturity models in the public sector which emphasises innovation learning and capabilities in government as mentioned.

MIMI is concerned specifically with measuring learning capabilities in PSI in the context of an aspirational development state within the sphere of local government. We could not find any research which speaks to these issues directly. We need to emphasise that MIMI therefore is a novel approach based on fit-for-purpose research carried out in MIMI phase 1. Also, we emphasise the objective of PSI in a developing country context to contribute to the public good, and the prerogative and need of local councils in South Africa to improve their delivery of public services (Ramoroka et al., 2017). The South African White Papers on Science and Technology emphasise that research, technology and innovation should not only be directed at scientific breakthroughs which are commercially viable, but also at addressing the basic needs of communities. In particular, “vulnerable sectors of society, particularly the poor and unemployed” should benefit (Hart et al., 2015:2). This statement provides the policy rationale for this research with its focus on enhancing the capabilities of local councils, through network partnerships and collaboration, to conceptualise, develop and implement new or improved approaches and technologies, in order to enhance organisational operations and/or basic public services. This research brings together notions of STI as a public good and the concepts of ‘learning capabilities’, ‘open innovation’ and ‘networked learning’ within the sphere of local government (Lundvall, 2009; von Hippel, 2005). Learning is of central importance for open, interactive or networked approaches to innovation (Bland et al., 2010; Korac et al., 2017; Lundvall, 2009; von Hippel, 2005). The concept of learning by municipalities and individuals underpins the MIMI as developed in phase 1 (Ramoroka et al., 2017; Mhula-Links et al., 2017). The above-mentioned imperative also informed MIMI.

Within the context of public sector innovation and service delivery, the significance of continuous and networked learning for enhancing the capabilities of public sector organisations to innovate, in cooperation with other actors, is underscored (Arundel et al., 2015). Accordingly, MIMI phase 1 emphasised:

“Vital imperatives for enhancing the performance and innovation capabilities of local government include a focus on strong leadership, governance and accountability; learning and network relations to enhance capabilities; an open organisational culture which embraces innovation; the view of innovation as part of a broader collaborative network of agents; and appropriate technologies to improve the delivery of basic public services within communities” (Ramoroka et al., 2017:17).

The above-mentioned imperatives fit within the open and networked governance approaches for innovation in the public sector. These approaches bring together notions of learning, networking, collaboration, open innovation and user innovation (Ramoroka et al., 2017).

2.2.2 Broadening the Framework for Phase 2

Factors which impact on maturity in the context of PSI are unpacked here. A review of recent literature informs the recommended changes for phase 2 as offered in Table 3.

Leadership, the experience of top managers and also accountability are critical for public sector innovation (Al-rawahna et al., 2018; Bernier et al., 2015; Korac et al., 2017; Lewis and Ricard, 2014; Miao et al., 2017). Leadership goes along with a strategic orientation and creating an enabling environment for PSI. Leadership also is closely linked to governance, organisational culture and service orientation in public sector organisations. Previous experience with innovation by officials is also critical (Boyne et al., 2005).

Miao et al. (2017), based on research in China, argue that leadership and public service motivation shape innovative behaviour among civil servants. However, Arundel et al. (2019) observe that under the traditional governance model, top managers take decisions to innovation, often through top-down technology push, which leaves little room for lower level officials to innovate. The networked and open innovation models are important to foster innovation in local government as stressed in phase 1 of MIMI (Ramoroka et al., 2017). Hence, within such models autonomy and self-determination (or efficacy) among employees to stimulate learning and innovation behaviour, whereas overly bureaucratic environments are perceived to stifle innovation as confirmed by recent studies from China and Russia (He and Li, 2019; Jäkel, 2019; Miao et al., 2019). “Self-determination refers to an employee’s ability to make choices in initiating and regulating action” (Miao et al., 2019:78). Construct C of MIMI deals with innovative behaviour of officials as underscored by self-determination. It is stressed that autonomy and self-determinism of employees should be encouraged by strategic and forward-looking leadership to foster innovation. This is part of creating an enabling environment for innovation within municipalities.

In addition, the sources of ideas for innovation is an important consideration to factor that reveals organisational culture. Sources of ideas for innovation looks into where or from whom does the innovation emerge (Arundel et al., 2019). Innovation that stems from front line staff, middle managers and even society is considered as ‘bottom-up’ innovation and associated with New Public Management and Networked style of Governance. Here management and staff utilises interactive engagement for innovation. ‘Top-down’ innovations are instigated by top managers and politicians for new policy or

concepts of service delivery. Borins (2002 cited in Hartley, 2005) also states that: “bottom-up innovations occur more frequently in the public sector than received wisdom would have us believe”. However, depending on what the organisation needs, both the top-down or bottom-up approach can be advantageous or disadvantageous for innovation. In addition, external sources of ideas for innovation and knowledge are also important factors to consider for PSI measurement particularly as this indicates whether the organisational model enables learning and the adoption of external ideas and innovation. .

Maio et al. (2019:78) stress: “Although public sector employees may feel that they may have a certain degree of autonomy in deciding work activities, this may not translate into innovative behaviour because of rules and regulations that mandate that minutely specified processes and procedures must be followed when implementing changes”. It should, therefore, be recognised that rules and regulations can be regarded as constraining factors to innovation at local municipality level and in other public sector organisations (Bernier et al., 2015).

An organisational culture of innovation is needed in the public sector to drive an agenda for innovation. An innovation culture is highly influenced by the organisation’s leaders and management. Where there is a lack of organisational support for innovation and learning, public sector innovation is limited or is limited to very minor changes and improvements. An organisation’s innovation culture speaks to the mechanisms for managing the risks of innovation failure. According to literature, highly innovative public agencies have well-established risk management frameworks based on a ‘risk-aware’ approach that enables managers to learn from mistakes and failures in a positive way (Torugsa and Arundel, 2017). This also includes organisational spaces that encourage continuous learning. In local government environments, risk-averse conditions can be created by political damage through scrutiny of failed policies and public pressure when municipalities fail to deliver. Since government agencies and especially local government are pushed and pulled in many directions simultaneously, through different projects/agendas, it is hard for them to be able to balance and reconcile the conflicting goals. Innovation and possible failure can be seen as being irresponsible. The public holds officials responsible for any changes occurring in their regions. The public also influences on officials’ willingness to take risks. However, Torugsa and Arundel (2017) argue that the notion of risk aversion as a stumbling block to PSI needs to be reconsidered.

The local government environment in South Africa often requires that strict prescribed procedures be followed where superiors or other branches/departments are to be informed before approval for action

can be undertaken. Indeed, the regulatory environment can impede PSI (Bernier et al., 2015). Flexibility accordingly is an antecedent of innovation which forms part of a culture for innovation. It is also underscored that skills and competences for innovation are important to support innovation and that this should align with hiring practices (Maio et al., 2019), as also identified in phase 1 of MIMI.

It is critical to recognise the importance of networks in public sector innovation (Arundel et al., 2019). Innovation comes from multiple organisations, institutions and other agents (Bernier et al., 2015). This corresponds to the notion of open innovation which underpins the MIMI theoretically. Networks are also of particular importance for public sector innovation, particularly in the case of local municipalities which typically have limited resources. Measurement of PSI should consider whether the source of ideas for innovation is internal or external to the organisation (Lagunes and Rubalcaba, 2015). Furthermore, co-creation or co-production (also related to user innovation) is an important concepts open innovation frameworks which is applicable in the context of public sector innovation (Howlett et al., 2015). Co-creation furthermore contributes to enhancing governance in relation to innovation in the public sector space (Howlett et al., 2015).

2.3 On Governance in Local Municipalities

MIMI Phase 1 focused on learning capabilities (individual employee and organisational) in aspirational development state. However, learning from phase 1 as informed by stakeholders and scientific community alike points to the need to incorporate indicators which speak to the broader environment within which municipalities operate.

Municipalities or local governments constitute the third sphere of government in South Africa and has been mandated by the Constitution to address and facilitate local economic development. This acknowledgment of the developmental role of local governance in the Constitution and other significant legislation, has given it a role to institute instruments of sustainable development and service delivery. However, in spite of the legislative structure to facilitate the smooth delivery of basic services to communities, enormous challenges remain (Chikulo, 2013). The recent 2019 published municipal audit indicates that only 18% of municipalities received clean audits in 2017/2018 fiscal year, recurrent violent service delivery protests, media reporting of rampant corruption and fraud are also indicative of the challenges afflicting local government. Governance, or rather good governance, remains a challenge in the public sector especially in municipalities.

2.3.1 Local Government Governance Framework

The Constitution of the Republic of South Africa, 1996 (Act No.108 of 1996) provides for local governance in section 152(1) and the role of municipalities is defined, with its objectives as follows:

- to promote social and economic development;
- to promote a safe and healthy environment; and
- to encourage the involvement of communities and community organizations in the matters of local government.
- to provide democratic and accountable government for local communities;
- to ensure the provision of services to communities in a sustainable manner.

‘Good governance’ should not only be at the heart of government but also central to any successful business or organisation. It is essential for a private company or organisation to achieve its objectives and drive improvement, as well as maintain legal and ethical standing in the eyes of shareholders, regulators and the wider community. Good Governance thus creates an environment that allows for well-maintained legal and ethical standing as well as the strengthening of relationships and networks which are essential both in the private and public sector. Good Governance is thus especially important in local government given their unique role in local communities (Taylor, 2016).

According to the United Nations, governance means the process of decision-making and the process by which decisions are implemented (or not implemented). From this one can infer that good governance refers to the efficient implementation of decisions taken. (United Nations, 2007). The Institute for Democratic Alternatives in South Africa (IDASA) proposes that good governance entails the existence of efficient and accountable institutions and systems, entrenched rules that promote development and ensure that people are free to participate and be heard regarding decisions and implementation thereof that directly affect their lives.

Various Municipal Acts aim to promote good governance outcomes as also stated by the IDASA. The Acts include; The Municipal Systems Act (2000); The Municipal Structures Act (Act No. 117 of 1998); The Municipal Finance Management Act (2003) and the Municipal Property Rates Act (2004) which are the result of the White Paper on Local Government which states that: “the central responsibility of municipalities is to work together with local communities to find sustainable ways to meet their needs and improve the quality of their lives”. This affirms that local government is the sphere of government that interacts closely with communities, ensuring the delivery of municipal services and infrastructure

as well as enabling economic growth and development. Public participation as a key function of local government is intended to provide platforms for members of the community to share their views and grievances around basic services (health, water, electricity and sanitation) as well as on other developmental processes through the Integrated Development Plan. As institutions that are responsible for the delivery of municipal services and infrastructure, local government is also tasked to ensure economic growth and development through community participation and accountability. They also have a duty and are obliged to discuss with communities the type of basic services (e.g. health, water, electricity and sanitation) they require through public participation in the development process of the Integrated Development Plan” (Masiya et al., 2018).

Professor Kanyane of the Democracy, Governance and Service Delivery at the HSRC states that there are three (3) pillars to municipal governance in South Africa.

- i. The first pillar is the legal framework and the major legal frameworks that govern SA local government are derived from 3 pieces of legislation; the Municipal Structures Act; Municipal Systems Act and; Municipal Finance Management Act.
- ii. The second pillar is composed of the Institutional Infrastructure – the committee structures, municipal council (i.e. Major, Speakers, and Municipal Managers).
- iii. The third pillar encapsulates public participation or community engagement in municipalities.

These pillars tied together give rise to “Municipal Governance”. Because governance touches many aspects of local government - bad governance or a lack of policy implementation or compliance to the Municipal Acts gives rise, however, to the many challenges faced within local government, which we will term “Governance Challenges.”

2.3.2 Governance Challenges facing Local Government

Ineffective local Committees

Municipal participatory committees do not function as efficiently as they have been set out to be. What is prescribed in policy is often not implemented in reality. Community participation is entrenched in the Constitution which requires local government to “encourage the involvement of communities and community organizations in matters of local government” (RSA, 1996:81) and the Municipal Systems Act 2000 compels local government to develop mechanisms that enable communities to participate.

Ward committees in local municipalities require more effective communication and networks channels between communities and municipalities which could result in less communities expressing their grievances through protests.

If ward committees, in general, would be effective functioning channels of communication and improve connectivity between communities and municipalities less communities in South Africa take their grievances to the streets.

Management Capacity Deficit

Management capacity deficit is a major deterrent to effective local governance. There is insufficient human resources and capacity to cope with the multiplicity of mandates. The shortage of qualified staff especially the scarcity of qualified technical and professional staff has been a major constraint for most municipalities (Chikulo, 2013). Furthermore, the lack of capacity skills has been exacerbated by appointments based on political patronage rather than skills and expertise. In addition, rural local authorities lack the organizational, technical and administrative capabilities to fulfil their mandate.

Financial Constraints

Another fundamental challenge faced by municipalities is the gap between municipal financial resources and expenditure needs, coupled with inadequate financial management systems. Although South Africa is characterised by a high degree of fiscal decentralisation, and local government is entitled to an equitable share of nation revenue, the majority of municipalities are highly dependent on central government National Planning Commission. An official report (COGTA, 2015:20) established that “most local government departments were found to be under-resourced, receiving only, on average, 3.5% of the provincial budget. Finally, poor financial management in local authorities, such as inadequate financial and budgetary management systems, and poor record-keeping, often results in the mismanagement of scarce financial resources.

Fiscal Challenges

According to Eskom, aggregate municipal consumer debt in Gauteng stands at R94 billion as of December 2018. Municipalities have failed to implement credit control measures especially in townships which have led to excessive service bills. The un-recouped revenue could assist municipalities in making use of alternative service delivery. Bad debts have proved to be a persistent fiscal problem for municipalities, despite increasing efforts to address billing systems and stricter enforcement of

payments. The Municipal Infrastructure Grant has been considered by local government to be insufficient in addressing the credit issues they face.

Autonomy of Local Government

Political interference in the functioning of municipalities has been a relentless problem and is a threat to the autonomy of local government. This includes instances where municipal officials use party political processes to undermine council procedures. Party political factionalism also impacts on the stability and effectiveness of local government. SALGA suggests that micro-management of municipal administration by political parties is a threat to good governance. It has been found that undue interference by councillors in the administration of municipalities is a very real hindrance to service delivery.

Alleged Fraud and Corruption

There have been numerous reports on forensic investigations into the fraudulent behaviour of municipal officials. Corruption website has a detailed section on municipal fraud ranging from abuse of funds, unscrupulous tender awards, procurement contracts to bribery and embezzlement cases. Corruption has a negative impact on development and service delivery. It undermined good governance and the rule of law to the detriment of economic development in the communities.

Urbanisation and Migration

Migration and urbanisation drive the mushrooming of informal settlements. Accordingly, municipalities who are already faced with limited resources have to deal with growing demands for housing and basic services (DCG, 2018). Urbanisation and migration, therefore, impact on municipal planning and governance, infrastructure development and service delivery including free basic services, local economic development, and social cohesion in many communities.

2.3.3 Review of Governance Indicators

Governance refers to the formal and informal arrangements that determine how public decisions are made and how public actions are carried out from the perspective of maintaining a country's constitutional values. Public administration is a constituent pillar of governance (United Nations, 2007). Governance indicators, accordingly, assess and compare the institutional quality of countries or municipalities and can assist in research and policymaking. Table 3 presents three popular international indexes that compare the quality of governance across different countries: the Worldwide Governance

Indicator (WGI) by the World Bank; the Ibrahim Index of African Governance (IIAG) by the Mo Ibrahim Foundation; and Corruption Perception Index (CPI) by Transparency International.

Table 3: List of selected international governance indicators

	Index	Institution	Description	Approach
1	Worldwide Governance Indicator (WGI)	World Bank	<ul style="list-style-type: none"> -summarises the views of citizens, enterprises and experts on the quality of governance in developing and developing countries; -it covers 200 countries and territories, and the data are gathered from a number of survey institutes, think tanks, non-governmental organizations, international organizations, and private sector firms; -constructs aggregate indicators of six broad dimensions of governance: (1) Voice and Accountability, (2) Political Stability and Absence of Violence/Terrorism, (3) Government Effectiveness, (4) Regulatory Quality, (5) Rule of Law, and (6) Control of Corruption 	<ul style="list-style-type: none"> -the unobserved components model (UCM) is used to construct the index; - data from diverse sources are standardised into comparable units; -the aggregate indicator of governance is constructed as a weighted average of the underlying source
2	The Ibrahim Index of African Governance (IIAG)	The Mo Ibrahim Foundation	<ul style="list-style-type: none"> -measures and monitors governance performance in 54 African countries using 102 indicators across 4 dimensions: Safety & Rule of Law, Participation & Human Rights, Sustainable Economic Opportunity and Human Development; -Each of these categories contain subcategories under which various indicators that provide quantifiable measures of the overarching dimensions of governance are organised; 	<ul style="list-style-type: none"> -min-max nominalisation/ rescaling of the source data (0-100) and then average the rescaled data; -The IIAG uses linear, additive aggregation and weights each sub-component equally within its dimension; -a country's score is calculated by calculating an unweighted average of its four underlying categories;
3	Corruption Perception Index (CPI)	Transparency International	<ul style="list-style-type: none"> -The CPI scores and ranks 180 countries/ territories based on how corrupt a country's public sector is perceived to be by experts and business executives; 	<ul style="list-style-type: none"> -CPI is calculated as the simple average of standardised scores across the available sources for each country;

The three governance indicators rely on perceptions of citizens and selected experts to determine the quality of governance of a particular country at the national level. Of particular interest are issues around empowering citizens to participate in decision making processes, upholding and entrenching the rule of law, as well as dealing with corruption. The overall country level indexes are constructed as

weighted (WGI) or unweighted (IAG/ CPI) averages of the various indicators across different governance dimensions.

Initially indicators such as the three outlined on Table 3 were used by academics to assess the role of good governance on economic growth and the overall performance of the public sector (Taylor, 2016). More recently, however, governance indicators are being developed and used to evaluate municipal performance in terms of service delivery, development performance and financial stability in South Africa. Measuring governance quality is thus of great significance in the country. Table 4 presents a selected list of governance indicators at the municipal level in South Africa.

Table 4: Selected governance indicators at the municipal level in South Africa

	Index	Institution	Description
1	The Government Performance index (GPI)	Good Governance Africa	-aim to assess the administrative, economic development and service delivery performance of municipalities -uses 15 indicators across the three themes: administration, economic development and service delivery
2	Municipal Barometer	SALGA	- provides information on local demographic trends, social development, economic growth and development, environment and municipal finances from 1996 to 2016 - Over 120 indicators are used across nine themes: 1. Demographic trends 2. Access to basic services 3. Access to social services 4. Economic growth and development 5. Environmental resilience 6. Municipal financial health 7. Good governance and accountability 8. Coherent municipal planning 9. Capacitated municipalities
3	Municipal IQ indices/ Ward IQ	Municipal IQ (South Africa)	- a web-based data and intelligence service specialising in the monitoring and assessment of all of South Africa's 257 municipalities since 2007; - 9 different performance indices assessing municipal productivity, poverty levels, free basic service delivery, compliance and governance as well as a developmental credit risk model; -no detail about the methodology is freely available – one needs to subscribe to access information/ data
4	Municipal Performance Index (MPI SA)	PwC	- The index is made up of three sub category namely; socioeconomic outcomes, service delivery, and municipal governance -While not much detail is provided on weighting, the overview given suggests that weighting is done based on expert opinion: strategic weighting for the 3 sub-index categories; policy weighting for the 23 performance categories; and data quality and functional impact weighting for the 1000 key indicators;
5	Corporate Governance Index (CGI SA)	The Institute of Internal Auditors	-provides views of interviewed chief audit executive of the state of corporate governance in South Africa, across industries and economic sectors;

		South Africa (IIA SA)	<ul style="list-style-type: none"> -aligned to the King IV code of Governance, the indicators covered seven dimensions of corporate governance: Ethics, Compliance, Leadership, Risk Management (i.e. Operational Risk and External Risk), Performance and Internal Audit - the overall index is produced by merging the 33 multiple choice Likert questions (items) across the 7 dimensions using simple arithmetic unweighted means
6	Municipal Audit Consistency Barometer	Community Law Centre, UWC	<ul style="list-style-type: none"> - measures trends in audit data over a five-year period using the patterns in data as a proxy to measure municipal compliance; -It also looks deeper at the resilience of key institutions; - further information on this indicator is not accessible

In summary, the indexes presented in Table 4 are strictly speaking not governance indicators, but are municipal performance indexes that also measure aspects of municipal governance. Most of these indicators are produced by private players (except for the Municipal Barometer produced by SALGA), requiring potential users to subscribe to get details on their approach or results. These local indexes are further reviewed below to determine their relevance for MIMI.

Government Performance Index

An index developed by Good Governance Africa is a research and advocacy non-profit organisation. GGA's ranking of South Africa's municipalities covers 205 local and eight metropolitan municipalities but excludes district municipalities, since local municipalities make up the latter. The index establishes the progression or regression of the municipalities in matters of administration, economic development and service delivery.

The indicators are divided into three clusters; they are weighted equally and are described below (Source: Government Performance Index 2019). The indicator definition follows.

1. **Administration:** This is a governance category that demonstrates whether there are sufficient numbers of personnel with the requisite qualifications; indicates proof of proper or improper financial management; and assesses whether municipalities comply with the guidelines for the annual reports as specified by relevant authorities.

Indicator	Definition
Municipal capacity	The indicator is drawn from the Auditor General's assessment of auditees' key controls at the time of the audit and particularly focuses on the human resources management performance of the local authority.

Financial soundness	The indicator is drawn from the Auditor General's opinion on the financial position of the local authority.
Compliance	This indicator measures how well the annual reporting by a local authority meets the standards set by the National Treasury.

- 2. *Economic development:*** The indicators under this category show the attractiveness of the municipality for economic opportunities, investments and habitation. The indicators identified to measure economic opportunity are the following:

Indicator	Definition
Poverty	The poverty rate indicates the percentage of households with an income below R2,300 per month.
Individual income	This indicator shows the percentage of the population that receives some form of monthly income, including social grants.
Work opportunities	Work opportunity is paid work created for an individual as indicated by South African municipalities in their employment statistics
Unemployment rate	A person is unemployed only if they have "taken active steps to look for work or to start some form of self-employment in the four weeks prior to the interview".

- 3. *Service delivery:*** The indicators under this category reflect the performance of the municipality. They assess whether the municipality is realising its potential to enhance public service delivery in relation to fulfilling its mandate as prescribed by the Constitution. The indicators measuring service delivery are the following:

Indicator	Definition
Water	The percentage of people in the municipality who have access to piped water.
Sanitation	The percentage of people with access to flush toilets with connection to sewerage

Education	The percentage of the population in the municipality with a matric qualification.
Electricity	The percentage of people within the municipality who have access to electricity.
Informal housing to formal housing	This is the percentage of formal dwellings to total dwellings in the municipality
Refuse removal	The percentage of people in the municipality who have their refuse collected on a weekly basis.
Health facilities	The total number of people per clinics and healthcare facilities in the municipality
Police coverage	The number of people per police station in the municipality.

Data is sourced from a number of publicly available sources, i.e.

- Statistics South Africa,
- The *Gaffney Local Government Year Book*
- The Auditor General's reports,
- Municipalities of South Africa and;
- National Treasury

Municipal Audit Consistency Barometer

The municipal Audit Consistency Barometer was developed by a team of researchers from The Multilevel Government Initiative at the University of the Western Cape's Community Law Centre. This barometer is an analytical tool that measures trends in audit data over a five-year period using the patterns in data as a proxy to measure municipal compliance. It also looks deeper at the resilience of key institutions. Note, however, that further information on this indicator is not accessible.

Municipal Barometer

In order to monitor and measure local government performance SALGA established the Municipal Barometer web-portal which tracks a pre-determined list of indicators. The indicators are grouped into 9 broad areas aligned with the constitutional mandate of local government and the NDP amongst others. The Municipal Barometer ensures that local governance and development data is readily

available and easily accessible for improved municipal governance and performance. The following broad outcome indicators make up the municipal barometer

- Demographic trends
- Access to basic services
- Access to social services
- Economic growth and development
- Environmental resilience
- Municipal financial health
- Good governance and accountability
- Coherent municipal planning
- Capacitated municipalities

A closer look at the Good governance and accountability (7) reveals that the below items are assessed.

- **Section 139 intervention**
 - Establishment of ward council committees
 - Establishment of oversight committee
- **Public Participation**
 - Total number of wards per municipality
 - Establishment of ward committees
 - Ward committees funding model in place
 - Total funding per ward
- **Functionality of ward committees**
 - Establishment of MPAC
 - MPAC training
 - MPAC meetings for oversight
 - Oversight reports submitted to the legislature
- **Corruption**
 - # of cases per type
 - # of investigation instituted
 - # of actions per type of investigation
 - # of pending investigations
 - # of completed investigation
 - Anti-corruption measures in place
- **Internal Audit function**
 - Establishment of internal audit unit

- Establishment of audit committee
 - Composition of audit committee (according to guidance)
 - Types of audit committee
 - Own audit function
 - Serviced by DM
 - Co-sourced
 - Outsourced
 - # of audit committee meetings
- **Management & operational systems**
 - Complains management systems (as per guidelines)
 - Fraud prevention plan (as per guidelines)
 - Communication strategy in place
 - Stakeholder mobilization strategy/public participation strategy

Municipal Performance Index (MPI)

The company PWC developed the municipal performance index. The index is made up of three sub category namely; socioeconomic outcomes, service delivery, and municipal governance. These are split down further into 23 categories, and over 1,000 individual indicators. A closer look at the municipal governance reveals the indicators shown in Table 5.

Table 5: Municipal Government Indicators

Sub-index category	Performance category	Example of data points/KPIs
Municipal Governance	Financial performance	Surplus, revenue per capita, gearing
	Financial management	Audit opinions
	Revenue management	Collection rates, margin per employee
	Working capital	Current ratio, debtor days
	Strategy	Predetermined objectives, budgeting
	GRC	Compliance with legislation, internal audit
	Operations	SCM, unfair procurement, IT
	People	HR, workforce diversity, key vacancies
	Ease of doing business	Construction permits, shareholder protection

To conclude, it is evident from the review that that existing local indexes on municipal governance cannot be used as a single indicator as a weight for MIMI 2. Instead, a list of indicators needs to be formulated and merged into construct A in relation to issues of governance as enablers/ inhibitors of municipal innovation. The following section considers how governance influences PSI.

2.3.4 How Governance Impacts on PSI

The public sector is increasingly under pressure to innovate. The rationale comes from the opportunities and benefits innovation has in improving the public sector's ability to provide quality public services. However, the way in which the public servants and organisations respond to this call is influenced by a number of factors including most importantly, the governance model of the organisation (Arundel et al, 2019).

When speaking about innovation and governance it is important however to firstly relate the changing ideological conceptions of governance and public management (Hartley, 2005). Three paradigms of public management and governance exist; traditional public administration, New Public Management as well as the Networked Governance Model. These paradigms or models of governance affect particular ways in which innovation is understood, generated and adopted in the public sector.

First is the traditional public administration or the Weberian governance model, commonly understood as a hierarchical system. A bureaucratic and centralised management exists which has been popular until the 1980's. In traditional public administration, there is a rule-based approach to public service provision undertaken by professionals who provide standardised services for the population. Power and authority lie with the government, therefore the introduction of new radical policy or innovation lies with the central government or politicians who build support from citizens to enact the innovations in legislation (Hartley, 2005).

The radical innovations are often implemented through national or local policy, innovation or change is large scale and universal therefore change is evident early through the deployment of financial and human resources. Hartley (2005) states that because of the top down implementation approach, the needed capacity for continuous improvements is often limited thus improvement does not often occur. Here policy makers act as commanders creating legislation and policy and assuming the detailed execution to be carried out by officials. In this governance model, public managers act as impassive officials implementing political will (Hartley, 2005). In addition, Hartley states that the population or users of services have very little contribution to innovation.

The second form of governance is through New Public Management developed from the 1980's as a new form of public governance that focuses on improving public sector efficiency and quality of public administration and service delivery through neoliberal management techniques (van der Meer, 2007). New Public Management focusses on organisational improvements; reduced bureaucracy,

incorporating private sector corporate governance, and giving autonomy and authority to senior and middle management to enhance service delivery. The public assumes the role of a customer thus effectively having a role to play.

Finally, the Networked Governance Model. In this model, the state “steers action within complex social systems rather than control solely through hierarchy or market mechanisms” (Hartley, 2005). The policy-maker’s leadership role is encouraged for translating new ideas into actions and public managers assume a role of support and nurturing of innovation. In addition, public managers act on behalf of society in establishing public value. Moore (1998 cited in Hartley, 2005) states: “managers are expected to use their initiative and imagination. But they are also expected to be responsive to more or less constant political guidance and feedback. Here the public has a larger role as co-producers of innovation”.

Therefore, in essence, the different public management paradigms or governance models suggest different roles of policy-makers, public managers and from the citizens. All paradigms have different rules and roles thus having different strengths and weaknesses for how innovation occurs. In addition, the different paradigms assume different approaches to innovation, from top down, bottom up or lateral however all have their advantages and disadvantages depending on the circumstance and context in which it occurs. Thus, governance in the public sector shapes innovation; in quality, impact and value.

A bureaucratic structure governs many of the South African local municipalities. Decision making and approval of plans follow a prescribed system. In effect, this model influences whether and how innovation is embraced, it also influences the perceived role of politicians, public officials and the organisation in relation to innovation. e.g. many Officials of small rural municipalities are of the opinion that innovation capabilities or capacity lie outside of them or with National Departments that have a funded innovation mandate.¹ Thus the key lies in helping municipalities learn and realise that they too are capable of being innovative and of embracing innovation regardless of the structures within which they work.

The literature on PSI confirms that broader ‘environmental issues’, including governance, support innovation in the public sector, especially at local municipalities (Arundel et al. 2019; Bernier et al. 2015; Korac et al. 2017; Walker et al., 2015). Walker et al. (2015:681) observe that “organizational

¹ Interviews with municipal official in the Karoo region by EPD researchers, 2019

environments play an important role in the innovative behaviour of public organizations”. However, Damanpour and Schneider (2016) suggest that certain environmental factors have a weaker influence on innovation than organisational characteristics which include leadership and top management attitudes. Strong institutions drive innovation. In the context of PSI, innovation capabilities depend on the quality of institutions hinging on the control of corruption, rule of law, government effectiveness and accountability, which is often constrained in the South (Rodríguez-Pose and Di Cataldo, 2015).

According to Arundel et al. (2019), governance influences the relationship between the elected and administrative arm of the public sector. Each having different motivations to innovate. We also observe that where there are different political parties influencing the administration of the local government space, this can impact on innovation because of the different motivations. While in the private sector an official may move up the rank through promotion, in the public sector this is not as gradual, thus the position and number of years in a position also influence motivation to innovate. Governance also influences fundamentally, the relationship officials have with society and vice versa. As such, innovation may include different ways in which the organisation engages with society.

In conclusion, the governance model, which could be strict bureaucracy, decentralised management or government collaborations where one could exist at a time or all existing simultaneously, has the ability to create effective or non-effective structures and systems that support or hinder innovation. In essence, an ideal governance model is one that enables active participation of all including the politicians, staff and citizens where necessary. Thus, the question is whether the organisation or individual staff are willing to learn and thus assimilate the new knowledge and/or technologies to move beyond innovation that may occur on an ad hoc basis. Is there a will to put in necessary systems and strategies to realise long-term innovation strategies?

2.4 Index Construction: Methodological considerations for MIMI

The construction and use of indexes to provide both simple and complex comparisons across units (e.g., countries, regions, etc.) has been popular for a number of decades (OECD, 2008). The advantage of these composite indicators is that they can illustrate complex and sometimes elusive or unobservable issues in a simple way that both experts and non-experts can understand. Several indexes have been developed across different fields, mainly comparing country performance concerning important issues such as the environment, economy, society and technological development (OECD, 2008).

Although MIMI is an attempt to measure innovation capabilities at the local government level, we review international indexes measuring different aspects of innovation, ICT and economic competitiveness to highlight the key dimensions captured, the structure of the indexes as well as the approaches adopted in constructing these indexes. Appendix A provides a summary of 14 indexes that were reviewed, which include the Global Innovation Index (GII), the Summary Innovation Index (SII), the Innovation Readiness Index (IRI), Knowledge Economy Index (KEI), etc. The discussion below focuses on the key trends from the indexes summarised in Appendix A, and their implications towards the construction of the MIMI. Readers are encouraged to read the appendix for summaries of the specific indexes.

The selected indexes are relevant for MIMI because, while some of the indexes reviewed report mainly on the state of innovation levels in a country, most of the indexes are about the readiness of the countries to benefit from different aspects of innovation. For example, the Knowledge Economy Index (KEI), produced by the World Bank, measures the overall level of preparedness of a country or region for the knowledge economy. The Government Artificial Intelligence Readiness Index (GAIRI), constructed by Oxford, estimates how prepared each country's national government is for implementing artificial intelligence (AI) in public service delivery. The limitation of these indexes, however, is that they focus at the national level, and fail to determine innovation levels or readiness at the sub-national levels.

In terms of index structure, all of indexes reviewed comprise of at least three key pillars or dimensions, showing that innovation is multi-dimensional, and cannot be adequately captured by one indicator. In summary, we observed that most indexes had four dimensions (range 2 – 12 dimensions). While captured in different ways, most of the indexes dealing with preparedness for innovation, such as the Innovation Readiness Index, report on key issues such as infrastructure, institutions, skills availability and the entrepreneurial culture of a country. That is, it is important for countries to have enabling conditions that facilitate the harnessing of innovation for economic growth, such as relevant infrastructure, enabling institutions as well as skilled workers. These aspects are in line with the MIMI, which deals with three dimensions of innovation maturity at municipalities in terms of organisational, managerial/ leadership and individual capabilities.

A further investigation into the innovation-readiness related indexes reveal that the number of indicators per index varied significantly, from a low of 11 indicators for the Government Artificial Intelligence Readiness Index (GAIRI), to a high of 103 indicators for the Global Competitiveness Index

(CGI). More than 50% of the indexes (9/14), however, had lower than 40 indicators, indicating the tendency for capturing the latent innovation levels or readiness with few indicators. The use of few indicators simplifies the interpretation of the index, especially when one is interested in diagnostic analysis, as it makes it simpler to dig deeper into the reasons for a particular index score. A complex index, with a huge number of indicators, is difficult to disaggregate to get the reasons behind the scores, which makes it less valuable to guide policy interventions. It is crucial for indicators to provide clear guides on which aspects of the issue under study should be dealt with to improve the score. It is not enough to know that the country has a low score, if the instrument does not provide further direction on what could be done to improve the score. The MIMI, with 25 indicators, approximates the norm among indicators capturing issues of readiness and innovation.

While some of the indicators are captured using objective indicators (e.g., number of people tertiary degrees or with PhD qualifications), a number of indicators are captured subjectively using perceptions. The quality of institutions, entrepreneurial culture, and the risk-taking behaviours of officials are often captured using subjective views of people interviewed, or the value judgements of experts. The norm among the reviewed indexes is to use both objective and subjective (perception-based) data. For example, ten of the fourteen indexes reviewed depended on a combination of objective and subjective indicators, three depended on only objective indicators, while one indicator was based on just subjective/ perception based indicators.

When aggregating indicators to generate an index, weighting of the indicators play a significant role, because weights affect the score of the index. With the exception of two indexes, all the reviewed indexes produced the overall index scores without any weighting. The focus is on calculating simple arithmetic averages using standardised values to generate index scores. Standardisation is important for most these indexes, as the data relied upon differs in scale, and needs to be converted to similar scale for successful simple additions. The issue of standardisation/ normalisation of data does not arise in MIMI, as all the indicators are captured in terms of the same scale (i.e., the 6 maturity levels).

The advantages of this sum score method is that it is relatively easy to calculate, straightforward to interpret and preserves the variation in the original data (DiStefano et al., 2009). However, using unweighted averages to calculate scores assumes that all indicators/ items are equally important in determining the final score. This is unlikely, as some items are more likely to be more important than others. The two indexes - Information and Communication Technologies Development Index (ICTDI) and the European Digital City Index (EDCI) – use principal components analysis (PCA) to generate weights.

Unlike the sum score method, PCA endogenously determines the appropriate weights when merging the indicators, avoiding the arbitrary selection of weights. The different items of the indexes are expected to have different influences, implying that assigning equal weights is incorrect (OECD, 2008). Weights can also be generated based on theory, if advanced theoretical concepts exist. However, for measuring innovation in the public sector, the theory is not yet adequately developed (Arundel et al., 2019; Gault, 2018). In some cases, weights are generated using the value judgements of experts, or a participatory approach where users of the index determine the weights based on what they think is important. However, this arbitrary weights selection affects the robustness of the index constructed.

Compensability is another issue that arises when indicators are aggregated. It is concerned with the notion that indicators, which are meant to measure different aspects, build up together so that they compensate one another (OECD, 2008). When compensability is allowed, which is the case with all the indexes reviewed, with the exception of one (the Global Innovation Index), it means that a higher score in one indicator compensates for a lower in another indicator. The question that should be asked when generating an index is: to what extent does another indicator compensate a deficiency in one indicator? For example, in the case of MIMI, should a very high score in an indicator such as incentives be allowed to compensate for an indicator such as lack of financial resources? This is something that the research team and other stakeholders should continue to debate and make a final determination.

2.5 Summary of Changes for the MIMI 2 Tool

The revision of the tool is informed by a revisit of the literature, in addition to research team session and a number of engagements. These are:

- The SALGA Expert Roundtable, 18 September 2019 at the SALGA Head Office in Pretoria
- The Tshwane Metro Benchmarking Meeting regarding their innovation measurement, 19 September 2019 at the Tshwane Metro Buildings
- The MIMI 2 Learning Forum 1, 23-24 October 2019 in Cape Town
- Two MIMI questionnaire workshops with the project team (HSRC, SALGA and UKZN) on 17 September 2019 in Pretoria 22 October 19 in Cape Town. In addition, details inputs received from both SALGA and UKZN were incorporated into the revision of the tool which need to be tested in early in 2020/

2.5.1 Recommended Changes to the MIMI Framework

Recommended changes from a revisit of the literature, research team meetings and stakeholder inputs include:

1. Change wording from 'organisation' to 'municipality'
2. Imbed definitions to which point to a broader understanding of innovation in municipalities beyond MIMI phase 1
 - The recommendation is to use a simple working definition capturing different types of innovation, without going into the types in detail. Include examples per type though.
3. Shorten the questions in the questionnaire. In other words, remove mention of innovation in the questions and use the definitions as a reference point.
 - See the Australian government online tool example
 - Insert the innovation definition/s upfront and refer questions to this
4. Consider who are the 'ideal' respondents at municipalities
 - The recommendation is to include a broad-suite of employees both horizontally and vertically. That is, across departments, and also top, middle and low level staff.
 - Potentially include persons in political positions, like mayors, ward councillors, etc. (see Korac et al. 2017; Walker et al., 2015). This is important to present as balanced a view of possible of innovation maturity at municipal level.
5. Expand the maturity levels to 6 levels – see Table 4
6. Consolidated items/indicators and remove Construct D
7. Revisit institutional governance indicators in the existing constructs

Table 6 outlines some recommendations for refining the tool as informed by the literature and stakeholder engagements

Table 6: Recommendations (Conceptual) for Refining the MIMI Framework - update

Conceptual issues	In Phase 1	For Phase 2
Strategic management	<p>Items A1, A2, D1 and D4 deals with strategic orientation</p> <p>Flexibility however was not addressed in Phase 1</p> <p>Issues on top-down or bottom-up management were also not include in Phase 1</p>	<p>A question about the regulatory environment in Construct A to include flexibility to navigate bureaucracy has been reworded</p> <p>Questions with related to management styles in Construct B have been refined</p>
Leadership	<p>Both Construct A and B are designed around strategic leadership and management support issues</p> <p>Questions about experience of top managers are included in the demographic section</p>	<p>The questions around leadership is sufficient and items have been consolidated</p>
Resources	<p>Items of physical, financial and human resources for innovation are included in Construct A (A4-A8)</p> <p>However, whether innovation capabilities are internal or external to the organisation were not considered</p>	<p>The questions about finances are sufficient – they have been reworded somewhat</p>
Skills for innovation	<p>This was covered phase 1. Items of human resources, whether staff are hired for innovation, and overall skills are included in both Constructs A and D</p>	<p>The questions on skills have been consolidated and the wording has been changed</p>
Public service motivation	<p>This was not included in phase 1</p>	<p>Questions and responses about the strategic orientation towards innovation has been refined</p>
Networked innovation	<p>Items on collaboration and networking are included in Construct A (see A9 and A10, and C5-C7)</p>	<p>The question on networking is sufficient, items on this has been consolidated</p>
Co-creation/user innovation	<p>Issues on co-creation was not covered by MIMI 1 explicitly</p> <p>However, items on the assessment of community (user) needs have been included (see B9)</p>	<p>A deliberate question about community participation in innovation have been included in Construct A</p>

Risk	Items B7 and B8 deals with risk taking behaviour	There is now one items which deals with risk-taking attitude in Construct B, the wording has been refined
Regulations	An item on whether the regulatory environment are considered to be constraining are includes (see A3)	A question about the regulatory environment in Construct A to include flexibility to navigate bureaucracy has been reworded
Individual innovation behaviour	Included in Construct C	Questions about individual behaviour have been refined and includes the notion of teamwork in innovation
Institutional governance	Some items which relate to institutional governance were included in MIMI 1	Questions on institutional governance have been revisited and reworded
Innovation outputs	Items on innovation outputs have not been included in phase 1	In first section of the questionnaire (Section M), now includes questions about outputs
Inclusive innovation	-	Questions have been added to asked if officials participate in decision-making, and if community members participate in innovation

2.5.2 The Revised MIMI 2 Tool

Based on the recommendations made, the following key changes were made to the MIMI 2 tool

1. The general information section has been shortened
2. Section M was included to ask questions about arrangements for innovation at the municipal management level to provide information about evidence of innovation planning and implementation, questions are asked about:
 - Whether innovation is included in any of the municipalities' strategies, and if so which ones?
 - Whether the municipality has an innovation division / unit / department?
 - Which innovation projects or initiatives have been implemented in recent years?
 - The municipality's innovation successes or achievements
 - Whether the municipality measures innovation performance and how?

- How the municipality funds innovation?
- Partnerships for innovation
- Innovation constraints

3. The maturity levels have been expanded to six (see Table 5)

Table 7: Innovation Maturity Levels for MIMI 2

Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
<i>Limited, if any</i>	<i>Defined</i>	<i>Applied</i>	<i>Managed</i>	<i>Entrenched</i>	<i>Share learnings</i>
Limited, if any, awareness or evidence of innovation on the part of individual officials or the organisation.	Innovation is defined. Officials understand innovation principles and innovation strategies are in place, but there is little, if any, evidence of innovation implementation.	Innovation is applied. There is evidence of implementation in certain departments of the municipality. Innovation is repeatable, but irregular.	Innovation is managed. Innovation occurs on an on-going basis and processes in relation to this are managed well in the municipality.	Innovation principles and practices are entrenched throughout the municipality. Innovation. Officials seek to optimise and evaluate solutions, and improve on these continuously for internal benefit.	Innovation is open and outward looking. New knowledge is applied creatively, based on evidence, in different contexts and shared with others outside of the organisation.

4. The framework still has two broad dimensions (reworded somewhat), i.e.:
- Dimension 1: Organisational Innovation Culture and Governance
 - Dimension 2: Individual Innovation Capability
5. The MIMI framework now has three constructs instead of four with 25 items (Table 5):
- Construct A: Municipal Enablers of Innovation
 - Construct B: Management Support for Innovation
 - Construct C: Individual Innovation Behaviour

Table 8: MIMI 2 Framework: Revised Constructs and Items

Construct	Item
I. ORGANISATIONAL INNOVATION CULTURE & GOVERNANCE	
A. Municipal enablers of innovation	A1. Innovation linked to strategy A2. Innovation linked to performance A3. Processes for innovation A4. Financial resources for innovation A5. Physical resources for innovation A6. Human resources for innovation A7. Staff incentives for innovation A8. Inter-departmental collaboration for innovation A9. External collaboration and partnerships for innovation A10. Tools for managing knowledge A11. Idea take-up processes A12. Accountability and transparency to support innovation A13. Inclusive decision-making for innovation A14. Political support for innovation A15. Community participation in innovation
B. Management support for innovation	B1. Openness to new ideas B2. Encouragement of learning B3. Understanding of innovation processes B4. Support for testing innovations B5. Communication by management for innovation
II. INDIVIDUAL INNOVATION CAPABILITY	
C. Individual innovation behaviour	C1. Idea screening C2. Knowledge management C3. Knowledge use C4. Networking behaviour C5. Innovation collaboration

6. The items have been consolidated to 25 instead of 33 and carefully reworded. There was some overlap between items in phase 1 and the expansion to six maturity levels allowed for the deepening of notions captured by items
7. Items for institutional governance are embedded in the framework and the notions have been refined.
8. Definitions of innovation have been provided in the questionnaire. Note that MIMI does not measure innovation per se, but the definitions of innovation are helpful to guide respondents regarding what is meant by innovation by municipalities. The definitions

have been informed by the public sector innovation literature (see Arundel et al., 2019; Walker, 2006; Table 7)

9. Examples and guidelines have also been embedded in the questionnaire. Examples should be inserted as drop-down boxes in the online version of the questionnaire.

Table 9: Definitions of Municipal Innovation

Innovation	Definition
<i>Service innovation</i>	<p><u>New or significantly improved</u> municipal services.</p> <p>This will include the design and delivery of <u>new or significantly improved</u> service products. For instance, water, sanitation, energy; and also public, social or community services such as clinics, schools, libraries, school nurses, counselling services etc.</p> <p>Service innovation also includes <u>new or significantly improved</u> ways of delivering services. For instance, in relation to repairing or upgrading road; fixing water leakages and interacting with the public/communities (often using technology interfaces).</p>
<i>Process innovation</i>	<p><u>New or significantly improved</u> processes to raise the performance of operations.</p> <p>This will include new systems and often the adoption of Information and Communications Technologies to enhance efficiency, productivity and flow of operations at the municipality.</p>
<i>Organisational innovation</i>	<p><u>New or significantly improved:</u></p> <ul style="list-style-type: none"> • ways of organising or administering activities; • management methods or organisational models; • forms of internal and external collaboration such as new strategic alliances, improved relationships (formalised) with other agencies or organisation; • health and safety measures; • training procedures; and • ways of managing risk.
<i>Policy innovation</i>	New or significantly improved policies and/or policy instruments

2.5.3. Initial Considerations on Governance Indicators for MIMI 2

The MIMI team considered the following issues to capture governance issues for MIMI 2 and considered to include an additional construct for governance (see Table 8).

Community Participation

The levels and quality of communication participation differ from municipality to municipality. The nature of issues under consideration has an impact on how communities participate. The degree of

participation depends on the availability of time, resources, and literacy levels. A majority of municipalities have established ward committees although the extent to which they are functional varies. Through the ward committee systems, it is hoped that the majority of stakeholders can give input into governance issues in the respective municipality. This is a platform where municipalities would get an inclination of the needs of the community and develop new methods/approaches in attaining them. Community participation can encapsulate community consultation

Transparency

The availability of the agendas of council meetings and the manner in which decisions are taken by the council are publicized are critical to promoting transparency. The publication of the annual report of the council and the financial report as required by the office of the Auditor general are other ways in which municipalities can promote transparency through these reports. These can curb all sorts of fraudulent activities that reduce municipality funds, which can be invested in new or improved projects.

Disclosure

In order to ensure that there is no conflict of interest, public institutions require officials and politicians to declare their financial interest. Public representatives and employed government are required to sign the register (declarations interest form) of disclosure on an annual basis and to indicate any changes during the course of the year.

Corruption

Corruption is seen as a serious crime to be dealt with using legal instruments in place. Legislation prescribes that the code of ethics and the disciplinary committees should be established within municipal institutions as part of anti-corruption practices.

Political Interference

Political interference or the independence of the civil service from political pressure. In the functioning of municipalities, this has been a relentless problem and is a threat to the autonomy of local government. This includes instances where municipal officials use party political processes to undermine council procedures. Party political factionalism also affects the stability and effectiveness of local government. Interference of municipal administration by political parties is a threat to good governance in the municipalities. Undue interference by councillors and the inability of the council to reach consensus in decision making is a real hindrance to service delivery and innovation.

Table 10: Recommended Governance Indicator Matrix

Indicator	Suggested means of measurement	Suggested Source of Information
Community Participation	Functioning Ward Committee	Total number of wards
Transparency	Report, publicly available	Public release of the annual report and the Auditor General's report
Corruption	Existence of anti-corruption committee	Corruption Watch and other websites. Municipalities of South Africa
Disclosure	Declaration Interest Form	Public release of the annual report and the Auditor General's report
Political Interference	Minutes and resolutions	Council minutes and resolutions available from municipalities

2.5.4 Recommendations Regarding Governance Indicators for MIMI 2

An important learning from looking into the governance indicators, looking for secondary data sources and also consulting with experts include:

1. Existing data source with potential indicators on governance are typically not publicly available
2. It is important to link governance indicators to innovation and maturity, not all indicators on governance are relevant to innovation maturity at municipal level
3. The unit of observation is an important consideration. In other words, on what level of observation are governance indicators available for? How can this be used in the index seeing that the MIMI indicators are on the individual official (micro) level?

Accordingly, it is recommended that the notion of 'Institutional Governance' be incorporated in order to improve the index, this can be done at two levels. In the first instance, the team has decided to refine the items in the MIMI framework to provide an indication of governance in cases where this is possible and can be linked to innovation. In other words, we included that what we thought was reasonable to ask from municipal officials. In addition, we opted to include issues which can be directly linked to innovation. If we were not sure whether there is a possible link between innovation and some governance issue, it was not included. Speculation about the impact of governance on innovation is not particularly useful, i.e. if we can't provide a clear indication of how corruption for instance impacts

innovation maturity a question regarding this should not be asked. Construct A was refined to capture indicators of organisational culture and institutional governance to enable innovation at the municipality.

In the second instance, we recommend a framework which needs to be developed as part of the back-end of the tool with secondary indicators for the following:

- i. The demographic/ socio-economic profile of the municipality
- ii. A framework to assess STI-content of municipal strategic documents to determine the municipal innovation orientation levels (see Appendix B for methods and an approach which can to be adapted for MIMI 2); and
- iii. Results of the analysis of these key documents with some indicators for governance

The suggested framework will need to be populated with data while the front end of the questionnaire is being tested and further refined. The recommendation is to collect the secondary data for up to 40 municipalities for the testing phase of the revised MIMI tool.

The recommended approach for governance indicators will allow us to move towards the following outcomes from the digital MIMI platform will be:

- a. **Municipality in a glance:** provides the profile of the municipality (*completed using existing secondary data sources, as in 1 above*), highlighting the current municipal socio-economic status quo and factors that affect innovation maturity);
- b. **Perception-based (subjective) MIMI score:** Our key maturity score, based on the interviews of the municipal officials using the MIMI instrument we are currently finalizing and;
- c. **Adjusted MIMI score:** produced after making adjustments on some MIMI indicators in (b) above based on some form of objective assessment (e.g. *based on content analysis of municipal documents as in 2 above, or any other relevant validation approach?*)

The recommended approach is in response to advise from stakeholder engagements we need to:

- Consider weighing responses from different employees at municipalities, should the responses from managers, for instance, carry the same weight as responses from other employees?
- Think about triangulating data using mixed methods i.e. perceptions, data from documents to provide some evidence, and other external indicators

3. Alignment with Existing Instruments and Policies (Work Package 2)

In this section, international public sector innovation tools are considered, this is followed South African innovation indices and other local government tools. Section 4 outlines government policies, frameworks and tools vis-à-vis local government and local economic development, and Section 4 considers innovation practices and tools at Metro councils. Conclusions are furnished in Section 6.

3.1 International Public Sector Innovation Tools

International experience concerning the measurement of public sector innovation was reviewed (see Mhula-Links et al., 2017). It was found that, while evidence exists on innovation in the public sector, this is largely based on minor modifications of frameworks, guidelines and approaches that rely heavily on the conceptualisation and measurement of innovation in the private sector (Arundel et al., 2019; Gault, 2018). Most of the recent public sector innovation surveys have been conducted in Europe, and were inspired by the Oslo Manual (Arundel et al., 2015; 2019), which is the international standard for defining and measuring innovation (Table 11). The Community Innovation Survey is used widely as a measuring instrument to collect standardised and comparable innovation data. As highlighted in Arundel et al (2019), the existing frameworks come short when dealing with public sector innovation, and there is a huge need for fit-for-purpose instruments that will collect additional types of data that sufficiently inform policy. Extant public sector innovation tools are set out in concept paper no. 2 in MIMI phase 1 (see Mhula-Links et al., 2017). Table 11 presents a summary of four attempts to measure innovation in the public sector in recent years.

Table 11: Extant Public Sector Innovation Tools

Public Sector Innovation Tool	Purpose/Aim/ Approach
Korean Government Innovation Index (GII)	To establish the level of innovation of public enterprises, identify their innovation strengths and weaknesses, and develop action plans, where necessary, to foster innovation capacity.
Measuring Public Innovation in Nordic Countries (MEPIN)	To develop a framework that collects internationally comparable data which can contribute towards understanding the nature and process of public sector innovation and to develop metrics for use in promoting public sector innovation. Relied heavily on the Oslo manual

Australian Public Sector Innovation Indicators (APSII)	To develop a conceptual framework for measuring public sector innovation in Australia. The APSII framework mainly builds on the MEPIN project, with a few modifications to meet the Australian needs.
European Public Sector Innovation Scoreboard (EPSIS)	The Innovation Union Scoreboard did not adequately capture innovation in the public sector. Therefore, two special 'Innobarometer Surveys' were launched between 2010 and 2012 to obtain more information on public sector innovation and its impact on innovation activity in the business sector.
UK Public Sector Innovation Index (the NESTA study)	The public sector innovation index that was being developed by NESTA in the UK is quite similar to EPSIS. NESTA, based on a revision of EPSIS, rolled out a survey of innovation activities to measure public sector innovation.

However, none of these tools measuring the maturity of learning and innovation capabilities *per se* in either developed or developing country contexts. In other words, innovation maturity in public sector organisations, and local government in particular, has received limited, if any, research attention in development and developmental contexts alike. Walker et al. (2015) observe that while innovativeness in organizations and governments has been studied across a broad variety of contexts which include state policy, international governments, and local governments; the appropriate levels of capacity, especially with an emphasis on the environmental factors, have been under-explored. The Walker et al. (2015) does not into capacity at local governments in England, yet innovation maturity is not interrogated in the fashion adopted for MIMI. Moreover, Arundel and Huber (2013) note that the focus of public sector innovation measurement has been on examining the concepts from an empirical point of view, mainly relying on case studies. While this enhances the understanding of public sector innovation, it does not allow for the development of benchmark indicators or analysis of innovation in the public sector over time.

3.2 South African Innovation Indices

3.2.1 Innovation Measurement Tools and Frameworks

Table 12 outlines extant innovation indices and organisations measuring innovation in South African and the alignment of these with MIMI.

Table 12: South African Innovation Tools and Frameworks

Organisation and tool	Description of measurement tool/framework	Typical indicators	Alignment with MIMI
Centre for Science, Technology and Innovation indicators (CeSTII), HSRC Tools: 1. National Research and Development (R&D) Survey 2. South African Business Innovation Survey	1. The National R&D Survey captures R&D expenditure and resources for research and experimental development, i.e. the statistics measure the size, growth and composition of R&D expenditure and the human resources devoted to R&D 2. The South African Business Innovation Survey measures the state of business innovation in South Africa; and looks into innovation support mechanisms The Innovation Survey follows the Oslo Manual of the OECD and the European Community Innovation Survey methodology to measure to following innovations: <ul style="list-style-type: none"> • product, • process, • organisational, and • marketing 	R&D indicators: <ul style="list-style-type: none"> • Gross domestic expenditure on R&D (GERD) (R million) • GERD as a percentage of GDP (%) • Government-funded* R&D (R million) • Business-funded R&D (R million) • Foreign funding of R&D (R million) • Total R&D personnel Innovation Survey indicators: <ul style="list-style-type: none"> • Innovation rate of South Africa businesses • Innovation by Oslo Manual types • Innovation activities and expenditures • Financial support for innovation • Cooperation for innovation • Effects of innovation • Factors hampering innovation • Intellectual property rights 	Although the R&D survey considers R&D at government agencies and universities, it does not measure innovation directly. No direct alignment with MIMI is evident The Innovation Survey is private sector focussed and does not consider public sector innovation. While no direct alignment with MIMI is evident, Oslo Manual definitions will be incorporated into MIMI phase 2 No alignment with MIMI - The CeSTII tools look into investment, money spent on Research & Development
Centre for Public Sector Innovation (CPSI) Frameworks:	1. The South African framework for public sector innovation:	1. Framework for public sector innovation considers <ul style="list-style-type: none"> • Effective leadership 	There is potential alignment with MIMI as the framework also looks into public sector innovation,

<ol style="list-style-type: none"> 1. The South African framework for public sector innovation 2. Public Sector Innovation Awards 	<ul style="list-style-type: none"> • Measures the level of innovation in the public service* • Aims to improve the coordination of activities in the public service, • To integrate new and simplified technology for service delivery • To foster, faster and simpler processes. <ol style="list-style-type: none"> 2. Public Sector Innovation Awards <ul style="list-style-type: none"> • Recognises and honours best innovation initiatives in the country. 	<ul style="list-style-type: none"> • Capacity building of public sector officials • Organisational culture • Promotion of team-work and partnership • Well-planned and well-managed systems • Knowledge and idea exchange <ol style="list-style-type: none"> 2. The Public Sector Innovation Awards Categories: <ul style="list-style-type: none"> • Innovative solutions saving government money • Innovative use of ICTs for effective service delivery • Innovative service delivery institutions • Innovative enhancements of internal systems of government 	<p>and the indicators can be aligned to the MIMI items which address similar issues. This said, CPSI does not measure public sector innovation maturity and learning capabilities as such.</p> <p>MIMI WP 5 Innovation awards suggestion: MIMI awards to be based on <u>significant improvement</u> in the local municipality in a 3 - 5 year period</p>
<p>National Advisory Council on Innovation (NACI)</p> <p>Tool:</p> <p>South African Innovation Scorecard</p>	<p>The NACI Innovation Scorecard collates science, technology and innovation (STI) indicators from secondary sources. It incorporates the Global Innovation Index, Global Competitive Index, the Global Entrepreneurship Monitor and the Human Development Index</p> <p>STI activities are categorised into three components:</p> <ol style="list-style-type: none"> 1. The public sector's enabling activities, 2. firm-level innovation activities, 	<p>Indicators for the public sector's enabling activities include</p> <ul style="list-style-type: none"> • University graduates in science and technology fields • Employment of researchers in the private sector, government, higher education, science councils and NGOs • Scientific publications • STI funding 	<p>There is no direct alignment between the NACI indicators and MIMI</p> <p>Their reports include a section on public sector innovation by it does not correspond with the MIMI approach and framework</p>

Stellenbosch University Business School; NACI Tool: State of Innovation Capabilities Survey	3. and the economic and social outputs of innovation. The Survey is done to inform the State of Innovation Report on Capabilities.	The tools consists of 30 questions, uses a Likert scale (6-levels). Questions are very broad, asked at a high level Indicators include organisational enabling factors which is not dissimilar from MIMI Random sampling is used	The tool has a broad organisational focus and is not tailored for municipalities, it also does not capture individual innovation behaviour like MIMI The tool uses a heat-map in real time and responses from a group of respondents is obtained at the same time via a facilitator. This should be considered for MIMI
Economic Performance and Development, HSRC Tools: Local Innovation Advancement Tools (LIAT)	The LIAT toolbox promotes innovation orientation, networking and interactive learning among local actors	LIAT typically looks at: <ul style="list-style-type: none"> • The actors involved and linkages/networks within, • The main types of innovation activities or processes, • The role of economic sectors, • The use of local resources in innovation activities. • The innovation orientation of municipalities 	In looking into the innovation orientation of local municipalities, LIAT draws on the MIMI framework. There is close alignment between LIAT and MIMI regarding the understanding of what innovation entails in relation to the social dynamics of innovation

*Information on how this is done is not forthcoming

3.2.2 Smart Cities Framework

The Smart Cities Framework (SCF) by SALGA includes a focus on maturity (SALGA 2019). The Smart Cities notion can be seen as an innovative approach to addressing urbanisation in the 21st century during the time of the Fourth Industrial Revolution. This is evident in the rationale for the Smart Cities model in

relation to leveraging and integrating new models into new and existing information architectures; easing change management processing; and ensuring a cost-effective smooth implementation of the smart cities vision and strategy across municipalities (SALGA, 2019:6). An emphasis on e-governance is an integral component of the framework.

The purpose of the Smart Cities Framework is to (SALGA, 2019:7):

- Offer a Smart City strategy aimed at developing smart and digital technologies intended to transform and modernise municipal functions and operations;
- develop of assessment toolkits to assist municipalities in evaluating their capabilities (human and IT);
- develop the necessary roadmaps towards smart and digital communities; and
- design performance metrics for municipalities to utilise for planning and implementing projects and determine milestones to be achieved in ensuring digitisation of municipal functions and operations.

The SCF underscores the need for ‘smart people’ and human capabilities to implement technological solutions in the municipal environment. Similar to MIMI, the SCF also draws on Capability Maturity Models. MIMI, however, has four maturity levels compared to the five levels in the Smart Cities Framework. The initial MIMI instrument piloted in phase 1 had three maturity levels. Statistical analysis, however, showed conflation between maturity levels two and three. This suggests that the wording of the questions was not sufficiently clear or strong to differentiate between the two maturity scores. The Standard Deviations which indicate the standard variance between the maturity levels, were large and there was an overlap at the end of the distributions, particularly between levels two and three. The questionnaire was thus revised. Substantial work was done to the framework in order to split up level three by adding a level four. The four MIMI maturity levels are thus scientifically grounded.

Alignment with MIMI

The MIMI framework aligns closely with the ‘Strategic Intent and Mandate’ dimension of the SCF especially in relation to:

- Vision,
- Investment strategy,
- Governance, and

- Innovation culture

as set out under the above-mentioned dimension in the SCF. This said, the other dimensions dealing with data, information, technology, application, infrastructure and engagement do not correspond with the MIMI focus. Therefore, while there is alignment in the approach and certain dimension in the two frameworks these tools serve different purposes the SCF is specifically concerned with the use of smart technology for city development and how mature municipalities are to implement this, whereas MIMI considers whether municipalities broadly have an innovation orientation across innovation types and how mature they are in this regard.

3.3 Other Local Government Tools

Other tools for local government which are not developed by government departments or municipalities are presented here.

3.3.1 Greenbook, Council for Scientific and Industrial Research²

The Greenbook is developed by the Council for Scientific and Industrial Research (CSIR). The online tool maps environment risk areas at local municipality levels. The dashboard which includes infographics can be used to inform policy change and action.

Alignment with MIMI

While this is a much needed open access decision tool which should benefit municipalities, there is no direct alignment with MIMI.

3.3.2 South African Cities Open Data Almanac (SCODA)³

The South African Cities Network (SACN) has developed the South African Cities Open Data Almanac (SCODA). It is in response to the recognition that there is a heavy burden on cities to report on over 2,500 indicators for different government departments. This online portal aims to consolidate different data reporting requirements. Cities can use and customise their data platforms using SCODA.

² SALGA Expert Roundtable, 18 September 2019

³ MIMI Learning Forum 1, Cape Town, 23-24 October 2019.

Alignment with MIMI

There is no direct alignment between MIMI and this initiative. MIMI needs to cover all municipalities and not just those in cities.

3.4 Government Policies, Frameworks and/or Tools

This section presents how MIMI aligns with the policies, strategies, framework and/or tools of government departments concerned with local government and local economic development.

3.4.1 SALGA Strategies and Tools***SALGA Innovation Strategy***

SALGA's Innovation Strategy (2017-2022) is informed by the global and national agenda on innovation and transformation. This strategy acknowledges the growing challenges faced by organisations worldwide and more especially institutions in local government. Local government institutions face legislative and resource constraints and are under pressure to do more with less while still meeting the demands of society. Doing more with less, rethinking existing approaches and coming up with new relevant solutions requires the recognition of innovation as a significant function in local government. As an advocate for a transformative local government, SALGA places innovation in the forefront for municipalities to create and implement new or improved processes, services and methods of service delivery.

SALGA recognises however that in the innovation process, municipalities in particular face a number of obstacles including a culture of risk aversion, a lack of critical skills for innovation and a lack of dedicated support for innovation. The SALGA's innovation strategy thus commits to providing a 'strategic direction, coordination and management of innovation in local government'. The strategy also aims to support innovation capabilities, promote an awareness and appreciation for innovation for socio-economic development, and facilitate the dissemination, sharing and replication of innovation and good practice across local government.

Municipal Barometer⁴

SALGA has a Municipal Barometer which draws on data from SALGA, COGTA, Stats SA, and DPME. The barometer emphasises Municipal Capabilities and Governance, and includes data on the socio-economic profiles of municipalities and risks such as service delivery protests.

The barometer is being reviewed and reengineered with a stronger focus on business intelligence and a SALGA Business Intelligence Strategy is being developed.

Alignment with MIMI

There is potential to incorporate the MIMI online tool into the Municipal Barometer portal which is being redeveloped. That is part of the **Integrated Municipal Collection Database** which is being developed. This needs to be considered as part of the institutionalisation of the tool.

3.4.2 Department of Science and Innovation

The new White Paper on Science, Technology and Innovation sets out proposed policy action to ensure a growing role for Science, Technology and Innovation (STI) in South Africa. The White Paper recognises the fundamental role played by STI in supporting economic growth and social development. At the core of the White Paper is an emphasis on improving the inclusivity of innovation by supporting regional and local systems of innovation, placing a stronger role on innovation for development in the local and rural areas, which will in large, bring together different actors such as local government, development agencies and the community etc.

In addition, the White Paper recognises the capacity needed to realise the tasks of the innovation policy. As such, the White paper endorses the development of an innovation culture in society, the development and expansion of the appropriate skills and capabilities as well as the development of institutional arrangements that will support and coordinate STI in South Africa. While capacity is needed to realise the STI objectives, the financing of STI is also of utmost importance. As such, the White paper speaks of the need to encourage government (provincial and local) to invest more in STI and set targets for investment as part of their growth and development strategies.

The Innovation for Local Economic Development (ILED) by DSI furthermore supports innovation in local areas which includes a role for municipalities and the DSI has been instrumental in driving the inclusion

⁴ SALGA Expert Roundtable, 18 September 2019

of an innovation focus or outlook in the Integrated Development Plans (IDPs) of municipalities with the support of SALGA and COGTA.

Alignment with MIMI

MIMI aligns with the strategic focus of the DSI strategies and initiatives.

3.4.3 Department of Cooperative Governance and Traditional Affairs

COGTA National Framework for LED: Creating Innovation Driven Local Economies⁵

Core pillars include:

1. Strengthening local innovation systems by:
 - Strengthening relationships between municipalities and universities and science councils
 - Strengthening capacities of municipalities to support science and technology entrepreneurship
 - Providing support for science and technology infrastructure
 - Strengthening capacities of municipalities to undertake science, technology and innovation activities especially those that originate from local system of innovation and solve local problems
2. Building a diverse and innovation-driven local economies
3. Developing learning and skilful economies:
 - Improving economic and management capacity
 - Leadership and management skills
 - Addressing skills gaps
 - Enhancing innovation, skills and productive capacities
 - Workplace skills
 - 21 Century skills
 - Innovation capacities

Alignment with MIMI

MIMI aligns with the strategic focus of the COGTA in relation to ILED.

⁵ Presented at the National LED conference 2017

3.4.4 The Department of Planning, Monitoring and Evaluation

The Local Government Management Improvement Model

The LGMIM assesses the compliance and quality of an organisations management practices as a means to support and improve on the productivity, performance and service delivery. The LGMIM is a model or technique that measures or benchmarks the institutional performance of municipalities across a number of Key Performance Areas. Each KPA performance is assessed against the standards established by different Departments e.g. National treasury for financial management.

The LGMIM focusses on the management practices in six Key Performance Areas, namely:

- Integrated Planning and Implementation;
- Service delivery;
- Human Resource Management;
- Financial Management;
- Community Engagement/Participation; and
- Governance.

Under the Governance KPA, the LGMIM looks into the performance standard i.e. Assessment of Audit Committee. This is followed by the definition of an audit committee and its relevance for the assessment tool. The tool then lists the relevant legislation in relation to municipal audits e.g. Municipal Finance Management Act (Act 56 Of 2003), the MFMA Circular 65: Internal Audit and Audit Committee (2012) etc.

For the score or level of maturity to be given, the tool looks at standard criteria e.g. (Table 13).

Table 13: LGMIM Maturity Score Criteria

Standard criteria	Evidence documents	Moderation criteria	Level
The municipality had a Council appointed Audit Committee or shared Audit Committee in place during the 2018/19 FY	Resolution Register OR Appointment letters for Audit Committee or shared Audit Committee members applicable to the 2018/19 FY	A moderator is to verify whether this information is true	2

Table 14: LGMIM Maturity Levels

Level	Description
Level 1	The municipality lacks basic adherence to management practices in line with legal, regulatory and prescribed best practice requirements. Affected management standard require serious attention from the management team.
Level 2	The municipality has some management practices in place that partially adhere to legal, regulatory and prescribed best practice requirements. A platform exists to become fully effective, but will require some attention from the management team.
Level 3	Municipality employs management practices in line with legal, regulatory and prescribed best practice requirements. The municipality is fully effective and the management team should endeavour to sustain the good performance.
Level 4	Municipality employs management practices in line with legal, regulatory and prescribed best practice requirements and shows innovation.

Alignment with MIMI

There is a potential alignment between MIMI and LGMIM. A KPA for innovation can be added. Maturity levels should then be adapted. It should be discussed between partners as part of the negotiations about the institutionalisation of the tool.

3.4.5. The Presidency

Presidential Advisory Committee on the 4th Industrial Revolution⁶

The Presidential Advisory Commission was established in 2018 to consider the impact of the 4th Industrial Revolution on the South African economy. The strategy is to revive and restructure the economy to benefit from rapid technological change. A focus on innovation will open up opportunities to address challenges and respond to advance presented by this phenomenon.

The Commission aims to undertake research, embark on a benchmarking exercise and stimulate collaboration between the government, the private sector and other role players. The Commission's working groups will focus on:

- Digital society and ICT policy
- Innovation, research and development

⁶ Source: SALGA, in.KNOW.vation Magazine, March 2019

- Economic policy
- Labour market restructuring
- Inclusive growth
- Skills development
- Transforming government and governance

Alignment with MIMI

MIMI with its focus on innovation aligns with the work of the Presidential Advisory Committee on the 4th Industrial Revolution.

An area of alignment to consider in the future is the **District Coordination Model** which is being developed by the Presidency.

3.4.6 The National Treasury

The National Treasury manages the Local Government Database. The focus is on compliance and governance and innovation does not emerge as a key focus.

In addition, there is no direct reference to any funding for innovation in local government in the National Treasury Annual Report (2018/19). This said, there is mention of the Knowledge Management unit that has implemented learning and innovation sharing events. The National Treasury also participated in the conceptualisation of a small business and innovation fund. There is also mention of support for innovative initiatives that generate employment.

Alignment with MIMI

There is no direct alignment between MIMI and the work of the National Treasury.

3.5 Innovation by Municipal Councils: Strategic Focus and Tools

Certain Metro councils are active and leading when it comes to municipal innovation. This section outlines what selected dynamic Metros are doing in relation to promoting and measuring innovation.

3.5.1 Tshwane Metro Council⁷

Strategic Focus

The Tshwane Metro Council actively pursues innovation and also measures innovation performance and maturity. The City has been key in driving the innovation agenda through its Innovation and Knowledge Management unit. Currently the Metropolitan Municipality focuses its attention on igniting the Tshwane innovation ecosystem by looking not only internally but also externally for enhancing an innovation ecosystem in the City. An example shared included the City utilising Universities in the City through an innovation challenge giving the universities problems faced by the City and allowing the universities to respond. In addition to this, the city believes in being an open lab as well as responsive to ideas (the City has a portal for ideas which includes mechanisms to take up innovations). Where resources are limited, the City ensures a direct link between the innovators and support or platforms to pilot their ideas where necessary. Often, this results in large funders availing themselves once an idea or project has gained momentum. This stressed the importance of responsive governance structures as being essential for innovation.

Their focus on innovation is supported by the Tshwane Metro's Innovation Strategy which has four pillars, i.e.:

1. Igniting an Innovation Ecosystems
2. Establishing responsive government structures for sustainable innovation and transversal participation
3. Providing platforms for piloting innovative solutions to emerging entrepreneurs and/or innovators
4. Building a balanced innovation project that will impact on service delivery

⁷ Learning/benchmarking session with the City of Tshwane on 19 September 2019; MIMI Learning Forum 1, Cape Town, 23-24 October 2019.

Innovation Capability Assessment

The Innovation Capability Assessment does not measure whether there is innovation projects in the City but rather the level of enablement that exists. The City observed that it is easy for innovative ideas internally or externally to get lost in a “black hole” due to inadequate capacity, so innovation capabilities are meant to prevent this from occurring. The Capability Index is the extent to which the City supports systemic innovation – thus a function of how quickly the City turns intellectual assets, and ideas into value. Generally, if the index score is high, this should mean everyone in the municipality can find it easy to make a difference and if low, it indicates that there could be frustrations in trying to do so.

They do a regular Innovation Capability Assessment (every 2-3 years) and currently use the InnoSurvey™ tool.⁸ They have done two assessments using this tool in recent years. This tool considers

- Strategic focus
- Innovation types, i.e. process, service, business model, organisational structures and management systems
- Leadership styles
- Personalities – 10 faces of innovation
- Process steps – ideation, selection, development, commercialisation
- Innovation maturity, a separate framework

The tool is a 99 question tool and they need evidence which includes financial figures for innovation performance indicators. They are perception questions, but this is often linked to evidence. The perception questions are rating/scale questions. The tool is a comprehensive tool which brings various aspects together: performance indicators, strategy, types of innovation, leadership styles/personalities, process, and maturity. Maturity is embedded in the broader tool.

The tool has a dashboard of graphs. Some are infographics which include icons for action. They also have Knowledge Management Systems which include a portal for submitting ideas. The tool is rolled out across employees. If responses are low this is followed up by focus groups and individual interviews. They use both paper-based and online versions. They have translated questionnaires.

⁸ InnoSurvey is from a company in Sweden that has measured over 6000 companies globally both in the public and private sector. InnoSurvey has artificial intelligence with ample learning capacity.

3.5.2 City of Cape Town Metro⁹

The City of Cape Town has adopted a focus on innovation and implemented strategies, structures and partnerships to affect a culture of innovation in the city-region.

Their focus on innovation and partnerships with universities and other stakeholders in the innovation ecosystem started with the World Design Capital (2014) initiatives, i.e. the year-long programme of events which included a number of innovative projects – social and technological innovation.

They have organisational and strategic changes to embrace innovation i.e.:

1. incorporated an innovative outlook in their IDP (2017-2020),
2. developed and adopted an Organisational Development and Transformation Plan (2016) with the aim of creating a dynamic, progressive and customer-centric organisation
3. established an Organisational Effectiveness and Innovation Department, and
4. established an Innovation Unit concerned with the implementation of innovative strategies and projects; drive operational efficiency and drive the City's government modernisation initiatives

Key focus areas for innovation are:

- Operational excellence
- Digital innovation/ technology
- Urban innovation
- Social and economic innovation

Enablers for innovation include:

- Leadership commitment
- Organisational culture alignment
- Navigate the legislative/ policy framework
- Technology platform, including an open data platform

They have an iForum that illicit ideas from employees and the broader public. The iForum also brings different departments together.

⁹ Source: SALGA, in.KNOW.vation Magazine, June 2018; MIMI Learning Forum 1, Cape Town, 23-24 October 2019.

Innovation Tools

The Metro measures innovation maturity performance against its innovation principles. That is measuring maturity in relation to how they perform in terms of what they want to achieve in relation to innovation. They do not focus on the maturity of the municipality in terms of providing an enabling environment for innovation or on individual innovation capabilities which are the emphases of MIMI. They also have a community satisfaction survey.

3.5.3 eThekweni Metro Municipality^{10,11}

The eThekweni Municipality promote Durban as an innovation hub in South Africa. The Metro has incorporated innovation into its Integrated Development Plan (IDP), 2019-25. They have established *Innovate Durban* and also *the Municipal Institute of Learning (MILE)*. The institute (for local government learning) brings universities, researchers, government official, and other stakeholders together on a regular basis to share knowledge through conferences which are expected to stimulate further interaction.

Innovate Durban was set up by the eThekweni Municipality in 2013 and operates as a non-profit organisation (NGO) to stimulate innovation for economic development in Durban. The Metro council is the core funder of *Innovate Durban*. The agency aims to support innovation and innovators in the city-region. The focus is on support the local innovation ecosystem, which is a network of innovative role-players. The main activities of *Innovate Durban* centre on programmes to support grassroots innovation and innovation incubator and living lab initiatives. They are not focussed on innovation for industrial development or improving public sector processes or services per se.

Innovation Tools

They have developed an online tool for mapping actors in the innovation ecosystem in Durban and surrounds.

¹⁰ Source: <https://www.innovate.durban/>

¹¹ Source: SALGA, in.KNOW.vation Magazine, March 2019

3.5.4 City of Joburg Metro

The City of Johannesburg has an Innovation and Knowledge Exchange Department which focusses on¹²:

- Innovation and knowledge enhance the COJ as a “learning organisation” and ensure replication and promotion of “best practice”
- Provide leadership, standards and oversight to the Group on Knowledge Management practice.
- Provide leadership, standards and oversight to the Group on Innovation practice. (Promote the uptake of External and Internal Innovation).
- Concept incubation - new ideas / projects to support GDS 2040 strategy
- Driver of Smart City strategy and initiative & partnerships towards municipal university.
- Custodian of relations with Higher Education institutions (MoU and all related institutional mechanisms)
- Coordinate City spend on research and development and develop an organisational repository

3.6 Conclusions

International Public Sector Innovation Tools

An updated online search did not uncover any new developments on in relation to innovation maturity measure of innovation maturity index development in the public sector space. The rationale for MIMI, therefore, clear: there is a need to develop a customised innovation measurement framework to measure public sector innovation maturity in South Africa remains a pressing research and policy gap.

South African Innovation Indices

This section considers other innovation measurement tools in South Africa. Most of the extant tools are not aimed at measuring innovation maturity and/or municipal innovation specifically. MIMI aligns best with the SALGA tools, it is accordingly suggested that:

- The MIMI aligns closely with the Smart Cities Framework and there is potential for integration
- There is potential to incorporate the MIMI online tool into the Municipal Barometer portal

¹² City of Joburg website: www.joburg.org.za

Government Policies, Strategies and Tools

MIMI aligns strategically with the following departments concerned with governance in the local municipality environment and promoting local economic development.

- SALGA
- DSI
- COGTA
- DPME
- The Presidency
- The National Treasury

This said, MIMI provides an unique approach and value addition to existing tools.

Innovation Measurement at Municipal Councils

The City of Cape Town and the Tshwane Metro Councils measure innovation maturity. The City of Cape Town measures innovation maturity performance against their innovation principles. That is measuring maturity in relation to how they perform in terms of what they want to achieve in relation to innovation. They do not focus on the maturity of the municipality in terms of providing an enabling environment for innovation or on individual innovation capabilities which are the emphases of MIMI.

The Tshwane Metro measures both innovation performance and innovation maturity using the InnoSurvey™ tool. The InnoSurvey™ tool has a broader focus on municipal innovation than the MIMI, but the MIMI provides a much deeper assessment of innovation maturity in relation to learning and enabling environment. They cannot share the tool with us since it is trademarked. They also make use of perception questions, but evidence is also required (comprehensive figures are needed). Including more comprehensive evidence and performance indicators are issues than can be considered for a third phase of MIMI.

It is important to realise that there is a difference between measuring maturity and performance – as maturity improves, results should also improve, initiatives to improve innovation capability. As such, the maturity assessment evidence is linked or looked at against customer and employee satisfaction surveys. This is the evidence the City uses to gauge whether the maturity level is consistent with customer and employee satisfaction. In addition, the Innovation Assessment is integrated into the City's performance scorecard.

There is an undeniable importance of governance and governance structures in innovation. In the City, Exco appoints the innovation steering committee – this allows a stream of communication from committee to Exco and above. The committee hosts and welcomes external and/or internal innovative ideas that can potentially be turned into projects. Innovation ideas follow a set process where it cannot be accepted or declined by one individual. Having innovation champions as representatives of all regions who advocate for innovation and ideas is also very important for the Innovation unit.

References

- Al-rawahna, A. S. M., Hung, C. W., & Chen, S. C. (2018). Readiness of Government Organizations for Cloud-Computing Age: An Empirical Evidence from Jordan. *Journal of Business and Management Sciences* 6(4), 152-162.
- Andersen, K. N., Medaglia, R., Vatrupu, R., Henriksen, H. Z., & Gauld, R. (2011). The forgotten promise of e-government maturity: Assessing responsiveness in the digital public sector. *Government Information Quarterly*, 28(4), 439-445.
- Arundel, A., Bloch, C., & Ferguson, B. (2019). Advancing innovation in the public sector: Aligning innovation measurement with policy goals. *Research Policy* 48(3), 789-798.
- Arundel, A., Casali, L. & Hollanders, H. (2015). How European public sector agencies innovate: the use of bottom-up, policy-dependent and knowledge-scanning innovation methods. *Research Policy* 44, 1271-1282.
- Arundel, A. & Huber, D. (2013). From too little to too much innovation? Issues in measuring innovation in the public sector. *Structural Change and Economic Dynamics*, 27, 146-159.
- Bernier, L., Hafsi, T., & Deschamps, C. (2015). Environmental Determinants of Public Sector Innovation: A study of innovation awards in Canada. *Public Management Review* 17(6), 834-856.
- Bland, T., Bruk, B., Kim, D. & Lee, K.T. (2010). Enhancing Public Sector Innovation: Examining the Network-Innovation Relationship. *The Innovation Journal: the Public Sector Innovation Journal*, 15(3), article 3.
- Boyne G.A., Gould-Williams J.S., Law J. & Walker R.M. (2005). Explaining the adoption of innovation: An empirical analysis of public management reform. *Environment and Planning C: Government and Policy* 23, 419-435.
- Damanpour, F. & Wischnevsky, J.D. (2006). Research on innovation in organizations: Distinguishing innovation-generating from innovation-adopting organizations. *Journal of Engineering and Technology Management* 23(4), 269-291.
- Chikulo, B. C. (2013). Developmental local governance and service delivery in South Africa: Progress, achievements and challenges. *Journal of Social Development in Africa* 28(1), pp. 35–64.
- DCG (2018). Integrated Urban Development “Framework” (IUDF) and Spatial Planning into smart cities. Smart City Region Summit, Johannesburg, 3 October 2018.

- Enkel, E., Bell, J. & Hogenkamp, H. (2011). Open Innovation Maturity Framework. *International Journal of Innovation Management* 15 (6), 1161-1189.
- Eom, S. J., & Kim, J. H. (2014). The adoption of public smartphone applications in Korea: Empirical analysis on maturity level and influential factors. *Government Information Quarterly*, 31, S26-S36.
- EPD, HSRC (2017). *Innovation Dynamics Report No. 2*. Cape Town: HSRC.
- Essmann, H.E. (2009). *Toward Innovation Capability Maturity*. Unpublished PhD thesis, University of Stellenbosch, Stellenbosch.
- Faisal, N., & Talib, F. (2016). E-government to m-government: a study in a developing economy. *International Journal of Mobile Communications*, 14(6), 568-592.
- Gallouj, F. & Weinstein, O. (1997). Innovation in services. *Research Policy* 16, 537-556.
- Gault, F. (2015). *Measuring innovation in all sectors of the economy*. UNU-MERIT Working Paper Series, No. 2015-038. Maastricht: UNU-MERIT & MGSoG.
- Gault, F. (2012). User innovation and the market. *Science and Public Policy* 39, 118-128.
- Gault, F. 2018. Defining and measuring innovation in all sectors of the economy. *Research Policy*, 47 (3), 617-622.
- Haini, S. I., Rahim, N. Z. A., & Mohd, N. M. (2017). Citizen Centric Impact on Success Factors of Digital Government Maturity in Malaysian Public Sector. In PACIS (p. 194).
- Hartley, J. (2005). Innovation in Governance and Public Services: Past and Present. *Public Money & Management* 25 (1), 27-34
- Ham, J., Lee, J. N., Kim, D., & Choi, B. (2015). Open innovation maturity model for the government: an open system perspective. Available <https://aisel.aisnet.org/icis2015/proceedings/eBizeGov/15/>. Accessed 29 July 2019.
- He, R. & Li, S. (2019). *What Affects the Innovative Behavior of Civil Servants? Survey Evidence from China*. In International Conference on Management Science and Engineering Management (pp. 616-627). Cham: Springer.
- Howlett, M., Koštro, A.K. & Poocharoen, O-O. (2015). *Merging policy and management thinking to advance policy theory & practice: understanding co-production as a new public management*

tool. Paper presented at the International Conference on Public Policy II, Milan, Italy, Friday July 3, 2015.

Jacobs, P. & Hart, T. (2012). *Skills development in rural areas: a brief review of evidence*. RIAT Concept Paper #1. Cape Town: HSRC.

Jäkel, T. (2019). Innovative self-efficacy of municipal employees: empirical evidence from Russia's Leningrad region. *International Review of Public Administration* 24(1), 36-59.

Korac, S., Saliterer, I., & Walker, R. M. (2017). Analysing the environmental antecedents of innovation adoption among politicians and public managers. *Public Management Review* 19(4), 566-587.

Lagunes, H.J. & Rubalcaba L. (2015). External sources for innovation in public organizations. *The Service Industries Journal* 35, 710-727.

Lewis, M.J. & Ricard, L.M. (2014). *Innovation capacity in the public sector: structures, networks and leadership. Learning from Innovation in Public Sector Environments (LIPSE) Project*. Working Paper No 3. Rotterdam: Erasmus University Rotterdam.

Liang, Y., Qi, G., Wei, K., & Chen, J. (2017). Exploring the determinant and influence mechanism of e-Government cloud adoption in government agencies in China. *Government Information Quarterly* 34(3), 481-495.

Lundvall, B-A. (2009). Innovation as an interactive process: user-producer interaction to the National System of Innovation. *African Journal of Science, Technology, Innovation and Development* 1(2&3), 10-34.

Masiya, T. & Davids, Y. D. (2019). Assessing service delivery: Public perception of municipal service delivery in South Africa. *Theoretical and Empirical Researches in Urban Management* 14(2), 20–40.

Mhula-Links, A., Booyens, I & Jacobs, P. (2017). *Measuring Public Sector Innovation in South Africa – towards a customised Innovation Maturity Index to enhance learning capabilities in priority municipalities*. IPRDP Concept Paper #2. Cape Town, HSRC.

Miao, Q., Newman, A., Schwarz, G., & Cooper, B. (2018). How leadership and public service motivation enhance innovative behavior. *Public Administration Review* 78(1), 71-81.

OECD (Organisation for Economic Cooperation and Development) (2018). *Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation, 4th Edition*. Paris: OECD.

- OECD (Organisation for Economic Cooperation and Development). (2008). *Handbook on Constructing Composite Indicators: Methodology and User Guide*. Paris, OECD.
- Ramoroka, K.H., Booyens, I. & Jacobs, P.T. (2017). *Innovation by local government for improved basic service delivery in South Africa*. IPRDP Concept Paper #1. Cape Town: HSRC.
- Rodríguez-Pose, A. & Di Cataldo, M. (2015). Quality of government and innovative performance in the regions of Europe. *Journal of Economic Geography*, 15(4), 673-706.
- SALGA (2019). *SALGA Smart City Development Maturity Framework*. Pretoria: SALGA
- Skuras, D., Tseggenidi, K. & Tsekouras, K. (2008). Product innovation and the decision to invest in fixed capital assets: evidence from an SME survey in six European Union member states. *Research Policy* 37, 1778-1789.
- Taylor, Z. (2016). *Good Governance at the Local Level: Meaning and Measurement*. IMFG papers on Municipal Finance and Governance No 26
- Torugsa, N. A., & Arundel, A. (2017). Rethinking the effect of risk aversion on the benefits of service innovations in public administration agencies. *Research Policy* 46(5), 900-910.
- Van der Meer, F. B. (2007). New public management and evaluation. In *New Public Management in Europe* (pp. 165-180). Palgrave Macmillan, London.
- Visser, J.D. (2011). *Assessing the innovation capability of a research organisation*. Unpublished PhD thesis. University of Stellenbosch, Stellenbosch.
- United Nations (2007). *Public Governance Indicators: A Literature Review*. Department of Economic and Social Affairs (ST/ESA/PAD/SER.E/100).
- Von Hippel, E. (2005). *Democratising Innovation*. Cambridge, MA: MIT Press.
- Walker, R. M. (2006). Innovation type and diffusion: An empirical analysis of local government. *Public Administration* 84(2), 311-335.
- Walker, R.M., Berry, F.S. & Avellaneda, C.N. (2015). The limits on innovativeness in local government: Examining capacity, complexity and dynamism in organisational task environments. *Public Administration* 93(3), 663–683
- Willis, G.B. (2005). *Cognitive interviewing: A tool for improving questionnaire design*. Thousand Oaks, California: Sage Publications.



Appendices

Appendix A. Summary of selected global innovation indexes

	Index	Publisher	Outline	Number of indicators/Data Structure	Objective or Subjective indicators	Sample	Data sources	Analysis technique
1	Global Innovation Index(GII)	Cornell University, INSEAD and associates	-aims to find and determine metrics and methods that could better capture the richness of innovation in society, going beyond the traditional measures of innovation such as the number of research articles and the level of research and development (R&D) expenditures;	-80 indicators -GII relies on two sub-indexes: --the Innovation Input Sub-Index: <i>Five input pillars capture elements of the national economy that enable innovative activities</i> --the Innovation Output Sub-Index: <i>Innovation outputs are the result of innovative activities within the economy</i>	-Objective	-129 countries/economies	-Various: World Bank; OECD;	-The overall GII score is the unweighted average of the Input and Output Sub-Indexes -arithmetic averages
2	Knowledge Economy Index (KEI)	World Bank	-broad measure of the overall level of preparedness of a country or region for the knowledge economy. -Four pillars of a knowledge economy: (a) Economic and institutional regime; (b) Education and skills; (c) Information and communication infrastructure; and (d) Innovation system	-83 structural and qualitative variables to proxy the four knowledge-economy pillars	-Objective	-140 countries	-Various	-The KEI is constructed as the simple average of the normalized values of those indicators, from 0 to 10; -All 83 variables are normalized on a scale from 0 (weakest) to 10 (strongest), and all 140 countries are ranked on an ordinal scale; -
3	Social Innovation Index	Economist Intelligence Unit	- assesses the policy and business environment that enables social innovation	-17 indicators - Index scores countries across four categories –	-Objective & subjective (quantitative and	-45 countries	-EIU analysis -World Bank	- The EIU research team assigned category and indicator weights after consultations with

				(1) Policy and Institutional Framework, (2) Financing, (3) Entrepreneurship and (4) Society.	subjective indicators)		-Global Entrepreneurship Monitor -ILO -WEF -etc	internal analysts and external social innovation experts; - Indicator scores are normalised and then aggregated across categories to enable an overall comparison; -normalised using the min-max approach
4	Networked Readiness Index (NRI),	World Economic Forum	-assess countries' preparedness to reap the benefits of emerging technologies and capitalize on the opportunities - presented by the digital transformation and beyond	- 53 indicators - four categories of indicators: (1) the overall environment for technology use and creation (political, regulatory, business, and innovation); (2) networked readiness in terms of ICT infrastructure, affordability, and skills; (3) technology adoption/usage by the three groups of stakeholders (government, the private sector, and private individuals); and (4) the economic and social impact of the new technologies.	-objective and subjective data	- 139 economies in 2016	-UN agencies -ITU -WEF executive opinion survey	
5	Summary Innovation Index	-European Innovation Scorecard	- provides a comparative assessment of the research and innovation performance of the EU Member States and the relative strengths and weaknesses of their research and innovation systems.	-27 indicators across 10 innovation dimensions -distinguishes between three main types of indicators: enablers, firm activities and outputs	-Objective indicators	-27 EU countries and 10 reference countries	-Eurostat -Scopus -Global Entrepreneurship Index -OECD -etc.	-re-scaled using min-max technique - a composite Summary Innovation Index is calculated as the unweighted average of the rescaled scores for all indicators where all indicators receive the same weight (1/27 if data are available for all 27 indicators).
6	The state of innovation report	Creative Leadership Collective and			Subjective		Primary Source - Survey	-both datasets weighted based on criteria defined by experts and

	(SIR)	Stellenbosch University						the existing entrepreneurship literature; -The weighting carried out first at the variable level, and then subsequently at the theme level to ensure the most differentiated possible outcome; -Variables aggregated using a weighted arithmetic mean to create theme scores (linear aggregation); -Theme scores then aggregated using a weighted geometric mean to produce the overall index score;
7	The Innovation Readiness Index (IRI)	PYMNTS.COM	-The 2019 Innovation Readiness Index gauges FI (Financial Institutes)' innovation strategies based on survey responses from more than 200 financial institutions; -Financial decision-makers are asked detailed questions about their FIs' innovation processes, how they measured their recent innovations' successes and their priorities going forward to provide a comprehensive look at the state of innovation in the financial sector.	No details provided	Subjective +objective	More than 200 decision-makers from U.S. commercial banks, local banks and credit unions	Primary Source – Survey	No details provided
8	The Government AI Readiness Index (GAIRI)	Oxford Insights and the International Development Research Centre	-Index provides an overall estimate for how prepared each country's national government is for implementing AI in public service delivery; -It comprises nine input metrics, ranging from in-country digital skills and	-11 indicators across four themes: governance, infrastructure and data, skills and education, government and public service;	Objective + Subjective	194 countries, all UN countries, plus Taiwan.	The data is derived from a variety of resources, ranging from their own desk research into AI strategies, to databases such as the number of registered AI startups on Crunchbase, to indexes such as the UN	-Worked with existing indexes that have been cleaned data. In those cases they took the data sets for each indicator and normalised the scores for each country between zero and one to make them comparable; -To mitigate against the impact of skewness they applied a logarithmic scale (base 10) to the

			government innovation to existing data capabilities; -The Index highlights which countries have some way to go before they are ready for the AI revolution, and identifies possible areas of improvement for every OECD government, regardless of ranking;				eGovernment Development Index.	scores before normalising to provide a fairer sense; -Then they add the numbers for each indicator together to get a final score for government AI readiness; -they <i>weight each indicator equally based on the feedback received when consulting on methodology, as it was felt that each was of equal importance.</i>
9	Information and Communication Technologies Development Index (ICTDI)	International Telecommunication Union	- It is used to monitor and compare developments in information and communication technology (ICT) between countries and over time	-14 indicators	-Objective access and use indicators		-various: UNESCO, World Bank,	- distance to a reference measure was used as the normalization method; - The indicators and sub-indexes included in the IDI were weighted on the basis of the PCA results obtained when the Index was first computed
10	Technology Barometer	Tekniikan akateemiset TEK, Finland	-It measures Finland's technological competence and its performance capacity based on the level of its economic and societal development (compared to 8 countries) -Target countries are compared in terms of four dimensions, (1) information society; (2) knowledge society; (3) knowledge-value society; (4) society based on sustainable development	-77 indicators across the 4 domains,	-Objective/ Subjective	-9 countries	-Eurostat -Survey	- Before calculating the combined indicators, the annual scores of each partial indicator are standardised within the reference group; - The value of a combined index consists of the arithmetic average value of the standardised scores of these partial indicators
11	Composite Science and Technology Innovation Index (COSTII)	KISTEP, Korea	-diagnostic tool of science and technology innovation with its wide coverage of all related areas	-31 indicators, across 5 domains, & 13 sub-domain				
12	Change Readiness Index (CRI)	KPMG	The index measures how effectively a country's private and public enterprises, government, people and civil society anticipate, prepare for,	-25 Indicators -The 2019 CRI is structured around three pillars (enterprise capability, government	-Subjective and Objective	-The CRI now covers 140 countries	-More than 125 secondary data variables were used to calculate the 2019 CRI	-The composite/overall change readiness score is comprised of equally weighted pillar scores, which are derived from equally

			manage and respond to change and cultivate opportunity. Examples of change include: — shocks such as natural disasters and financial or social instability — economic and political opportunities and risks such as changes in demographics, technology and government.	capability and people & civil society capability), with sub-indexes for each pillar			and CRI survey questions	weighted standardized sub-index scores; -Sub-index scores are derived from standardized primary survey question responses and secondary data, with equal weighting given per variable, whether it is a primary survey question or secondary data indicator.
13	European Digital City Index (EDCI)	European Digital Forum and Nesta	-The purpose of this composite Index is to measure the readiness or receptiveness of city-level ecosystems for both digital start-ups, as well as scale-ups; -ten themes are chosen: Access to capital, Business Environment, Digital infrastructure, Entrepreneurial Culture, Knowledge spill overs, Lifestyle, Market, Mentoring, Non-digital infrastructure and Skills; - Each of these themes contain between two and eight variables and a set of indicators to operationalise them.	-40 indicators grouped into the 10 buckets/ themes	-Subjective and Objective	60 European cities in 28 European countries, including all capital cities in the EU.	-The indicators were selected using a combination of interviews with digital experts and a review of existing, recent indexes.	-Standardize the indicators to make them comparable they therefore normalize the data - Principal Component Analysis (PCA) – the increase in number of cities means they can conduct PCA to explore the underlying data structure -Variables are aggregated using a weighted arithmetic mean to create theme scores (linear aggregation); -Theme scores are then aggregated using a weighted geometric mean to produce the overall index score; -Using geometric aggregation meant that compensability is lower for theme scores with low value, so a city with a low score for one theme will need a much higher score on the others to improve its score.
14	Global Competitiveness Index 4.0 (GCI)	World Economic Forum	-Global Competitiveness Index 4.0 measures national competitiveness—defined as the set of institutions, policies and factors that determine the level of productivity;	-103 indicators distributed across the 12 pillars	-Objective and subjective indicators	-141 economies	-international organizations; -academic institutions; -NGOs -WEF's executive opinion survey (15000	-successive aggregations of scores, from the indicator level (the most disaggregated level) to the overall GCI 4.0 score (the highest level) -At every aggregation level, each aggregated measure is computed

			-12 pillars: Institutions; Infrastructure; ICT adoption; Macroeconomic stability; Health; Skills; Product market; Labour market; Financial system; Market size; Business dynamism; and Innovation capability				business executives interviewed);	by taking the average (i.e. arithmetic mean) of the scores of its components, with a few exceptions; -The overall GCI 4.0 score is the average of the scores of the 12 pillars.
--	--	--	---	--	--	--	-----------------------------------	--