PD ISO/TS 37107:2019

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Sustainable cities and communities — Maturity model for smart sustainable communities

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National foreword

This Published Document is the UK implementation of ISO/TS 37107:2019.

The UK participation in its preparation was entrusted to Technical Committee SDS/2, Smart and sustainable cities and communitiesSustainable Communities.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Published by BSI Standards Limited 2019

ISBN 978 0 539 00904 0

ICS 13.020.20

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This Published Document was published under the authority of the Standards Policy and Strategy Committee on 31 December 2019.

Amendments/corrigenda issued since publication

Date	Text affected

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TECHNICAL SPECIFICATION

ISO/TS 37107

First edition
2019-12

Sustainable cities and communities — Maturity model for smart sustainable communities

Reference number
ISO/TS 37107:2019(E)

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 268, *Sustainable cities and communities*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

The United Nations (UN) sustainable development agenda, "Transforming Our World: The 2030 Agenda for Sustainable Development", was adopted by world leaders in New York in September 2015. Through 17 Sustainable Development Goals (SDGs) and 169 targets, this agenda aims to end poverty and promote prosperity and well-being by 2030, while reducing the adverse impact of human activities on the environment. The UN SDGs address cities directly through Goal 11, which aims to "Make cities inclusive, safe, resilient and sustainable".

This document was developed in response to an increasing demand from city and community leaders for a simple-to-use, high-level diagnostic tool that will give them an overview of the extent to which they are implementing good practices. The maturity model described in this document has been developed in close collaboration with several pilot cities, including: Birmingham, UK; Cambridge, UK; Glasgow, UK; London, UK; Peterborough, UK; Dubai, UAE; Tianjin, China; Singapore; Moscow, Russia; Sydney, Australia.

This document is structured in five parts:

— Clause 1 describes the scope of the Maturity Model for Smart Sustainable Communities (MMSSC);

— Clause 2 lists normative references;

— Clause 3 sets out the terms and definitions used in this document;

— Clause 4 describes the methodology and principles used in development of the MMSSC;

— Clause 5 presents the structure of the MMSSC that has resulted from this development process, and gives guidance on how to use the MMSSC, looking at

  — how to use the MMSSC to baseline current maturity of a community,

  — how to use the MMSSC to drive improved performance in future, and

  — how to use the MMSSC in conjunction with other maturity models that address specific elements of smart-enabled sustainable development in more detail (such as CEN's smart mature resilience model, and the quality assurance matrix for the key functions of local government described in ISO 18091).

Supporting tools are provided in three annexes:

— Annex A provides the detailed diagnostic tool to be used when applying the MMSSC;

— Annex B maps the wider set of ISO standards and guidance which communities can use in order to build on strengths and address weaknesses that they may identify through use of the MMSSC;

— Annex C provides more detailed mapping of this model against the key functions of local government described in ISO 18091, to facilitate joint use of the two tools.

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Sustainable cities and communities — Maturity model for smart sustainable communities

1 Scope

This document provides a top-level maturity model for smart sustainable communities (MMSSC), which can be used for self-assessment by individual cities and communities and as the basis for cross-city benchmarking. The MMSSC is a simple way for community leaders to assess how mature their community is in its journey towards adoption of good practices as set out in ISO standards for sustainable and smart-enabled development; to identify strengths and weaknesses; and then to quickly find their way to the international standards and guidance that are most relevant to their needs.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 37100, *Sustainable cities and communities — Vocabulary*

ISO 37153, *Smart community infrastructures — Maturity model for assessment and improvement*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 37100 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Methodology and structure

4.1 Context

The MMSSC shall use the methodology for developing maturity models in ISO 37153. This is a highly relevant methodology which draws on other widely used standards for maturity models (such as the capability maturity model presented in the ISO/IEC 15504 series, which addresses maturity in the field of software development). This methodology and the resulting structure of the MMSSC is described below:

— 4.3 presents an overview of the MMSSC;

— 4.4 provides more detail on the dimensions and key characteristics of a sustainable and smart-enabled community that are assessed in the model;

— 4.5 describes the five levels of maturity which are used in the MMSSC to describe each of the key characteristics.

First, though, 4.2 sets out the principles that have been followed when applying the ISO 37153 methodology to develop the MMSSC.

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4.2 MMSSC design principles

ISO 37153 is a methodology to develop maturity models for use in assessing the maturity of smart community infrastructure. In this document, it has been deployed in order to assess the maturity of a community as a whole. This broad scope for the MMSSC inevitably requires a number of choices to be made when applying the ISO 37153 methodology. These choices are informed by eight principles of what the MMSSC should be, as shown in Table 1.

Inevitably, there could be tensions between some of these principles, for example, the more comprehensive the model becomes, the more detailed it gets and hence less simple to use. In balancing these trade-offs, Principle 1 (user-focus) has been used as the key determining question – what approach is of most value to users?

Table 1 — MMSSC design principles

MMSSC principle	Description
User-focused	The MMSSC should be developed in close conjunction with city and community leaders to ensure it meets their needs in a user-friendly way.
Comprehensive	The MMSSC should cover, at least at a high level, the key city-wide challenges involved in the journey to become a sustainable and smart-enabled community.
Applicable to all communities	The MMSSC should be useful for communities of any scale, both urban and rural, even if some elements are particularly relevant when managing change at city-scale.
Simple to use	The MMSSC should not be complex and should be intuitively easy to use. Its use should not require extensive and costly data collection.
Flexible	The MMSSC should be applicable to very different sizes and types of community, regardless of their social, economic and cultural context.
Technology-neutral	The MMSSC should avoid defining levels of maturity in terms of adoption of specific technologies or solutions, which risk rapidly become outdated.
Action-oriented	The MMSC should be designed so that any gaps or weaknesses it identifies can easily be matched against practical advice within international standards on how a community can address these.
Extensible and interoperable	The MMSSC should use a modular, extensible and interoperable structure, deploying the standardised approach recommended in ISO 37153, in order to easily extend it in future, for example: — by developing sector-specific versions of the model; — through interoperability with other more detailed maturity models that look at individual MMSSC characteristics in greater levels of detail than is possible in an overview model such as MMSSC.

4.3 Overview of the MMSSC structure

A high-level summary of the MMSSC structure is shown in Figure 1. As it illustrates, the model is a matrix, in which a set of 32 characteristics (clustered together in four dimensions: purposes; strategy management; citizen-centric service management; and digital and physical resource management) are each defined against five levels of maturity (on a 1 to 5 scale in which each level represents an improvement in performance from the previous level).

4.4 describes the characteristics and dimensions, and 4.5 describes the definitions for the maturity levels. The achievement criteria table that results is set out in Annex A; it provides detailed descriptions of the criteria that a particular characteristic must meet in order to reach a particular level of maturity.

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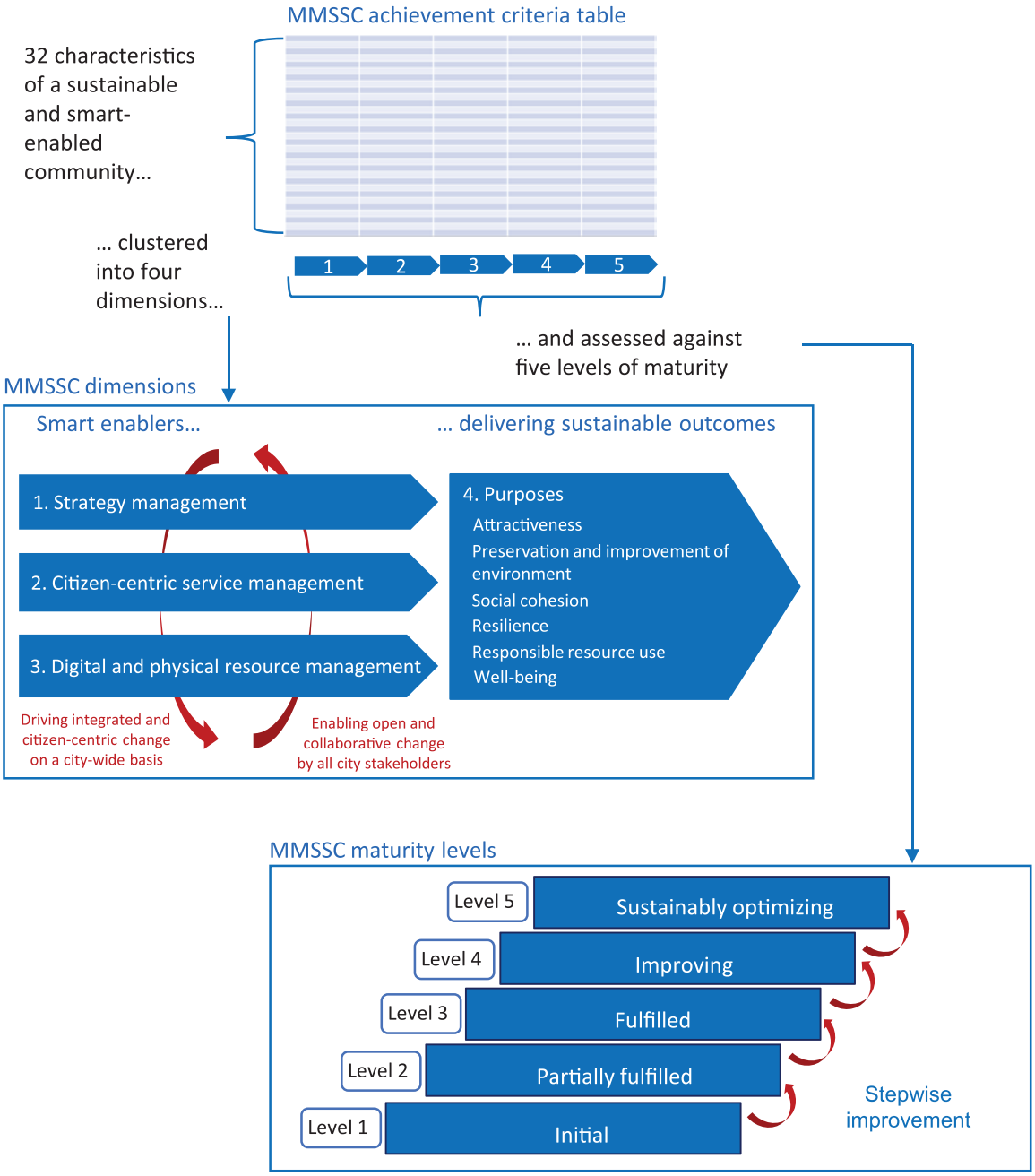

Figure 1 — Overview of the MMSSC structure

4.4 Dimensions and characteristics of a sustainable and smart-enabled community

The MMSSC assesses a community across four dimensions.

Dimensions 1 to 3 of the model assess the city's maturity in establishing smart enablers. The dimensions being assessed are derived from best practices described within ISO standards for smart cities and smart community infrastructures[1)].

1) Specifically, the maturity model gives an overview of city maturity against the best practices described in ISO 37104, ISO 37106, ISO/TS 37151 and ISO/TR 37152.

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They cover 26 'smart enablers', grouped in three dimensions[2]:

— Strategy management: the key aspects of governance, planning and decision-making that need to be managed at a whole-of-city level rather than within individual city departments, organizations or sectors.

— Citizen-centric service management: 'smart enablement' of the way in which services for citizens and businesses in the city are planned and delivered, including through co-creation of services that respond to local conditions and needs.

— Physical and digital resource management**:** changes to the way in which physical, technological and information resources are managed in a city that help to accelerate, de-risk and lower the cost of delivering change within the city.

Dimension 4 of the model assesses the city's maturity in achieving the six purposes of a sustainable community described in ISO 37101:

— attractiveness;

— preservation and improvement of the environment;

— resilience;

— responsible resource use;

— social cohesion;

— well-being.

A detailed illustration of the structure of these four dimensions and their sub-dimensions is shown in Figure 2. Users should note that the purpose of the dimensions and sub-dimensions is only to enable communities to report the results of their MMSSC assessment at different levels of summary information and that the actual assessment is made at the level of the 31 detailed characteristics within these dimensions.

2) These dimensions follow the structure used in ISO 37106. However, at the sub-dimensional level (as illustrated in Figure 2), the structure of the MMSSC is similar to ISO 37106 but not identical. This is because ISO 37106 focuses on the business processes that are needed within a smart city while the MMSSC is focused on measuring the performance and outputs of those processes. When a single process contributes to delivery of more than one key characteristic of a smart city, the MMSSC looks separately at the maturity of each characteristic whereas ISO 37106 provides integrated advice on how to manage that process.

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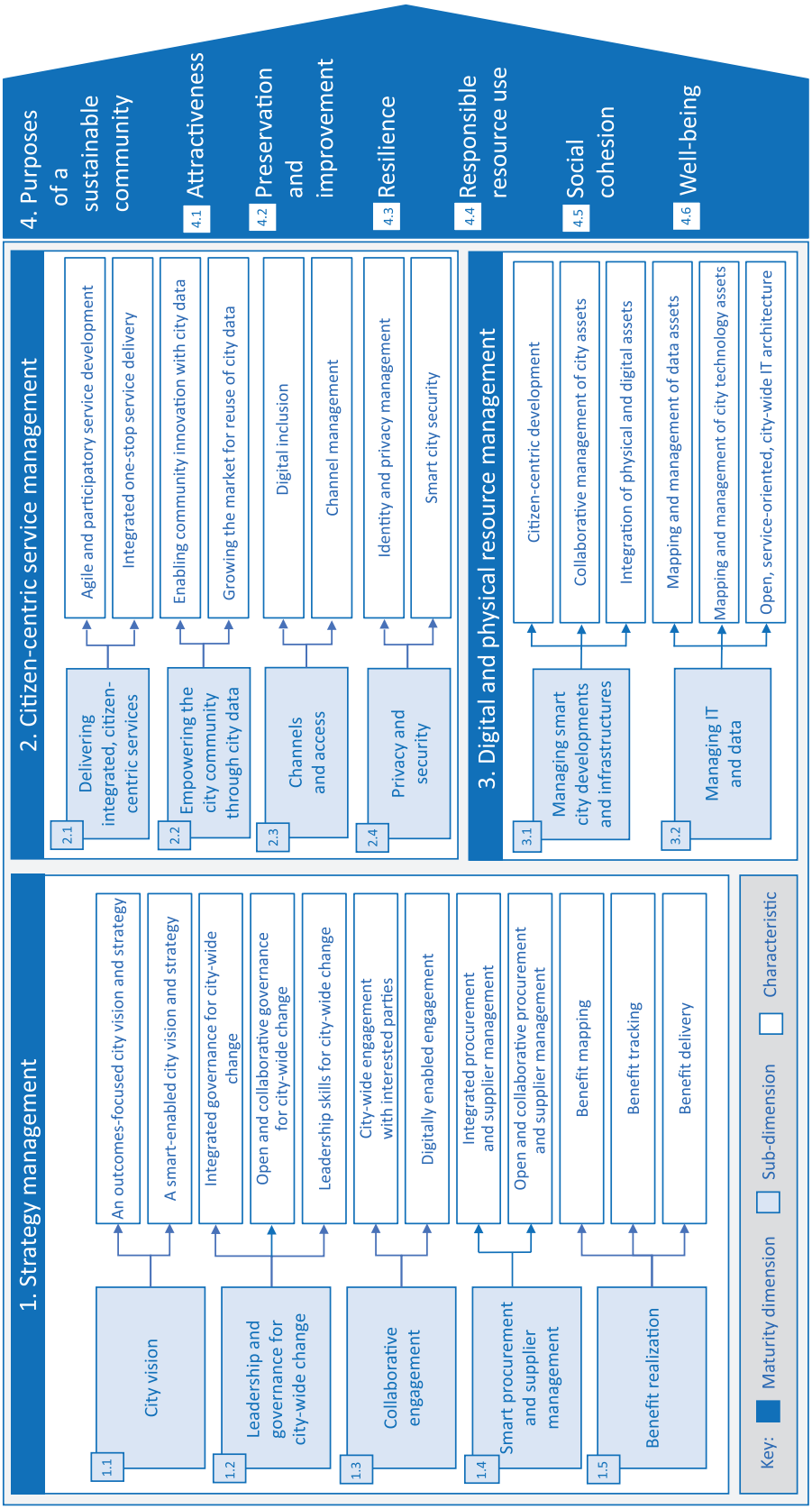

Figure 2 — MMSSC dimensions, sub-dimensions and characteristics

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4.5 Levels of maturity

The levels of maturity used in the MMSSC shall be those recommended in ISO 37153. The detailed definition of each level varies slightly according to the nature of the characteristic being assessed. Table 2 shows the level definitions used in the MMSSC.

Table 2 — Definitions for the five levels of maturity

	Dimensions 1–3: smart enablers		Dimension 4: purposes
Level	**For characteristics focused on how integrated and citizen-centric the community is[a]**	**For characteristics focused on how open and collaborative the community is[b]**	**For components focused on progress towards the six purposes of a sustainable community[c]**
1. Initial	Processes to manage this smart enabler either do not exist or are managed on a fragmented basis by different community organizations.	Processes to manage this either do not exist or are managed entirely within the local government with no engagement with or transparency to the community.	The community has no strategy to address this purpose; action is ad hoc and fragmented.
2. Partially fulfilled	Some progress is being made towards a community-wide plan, but not within a consistently applied community-wide management framework.	Some processes have been established to consult interested parties, but these are ad hoc.	Community leaders have identified priorities in pursuit of this sustainability purpose and have developed a community-wide plan to deliver these.
3. Fulfilled	The community has established community-wide management processes to deliver best practices in this area.	The community has established community-wide management communication and engagement processes to ensure effective input from interested parties.	Community leaders have baselined current performance against this sustainability purpose, and established success criteria and trajectories for the changes that the community aims to deliver over time. The local government has established community-wide accountability and governance structures to manage these improvements.
4. Improving	The community can demonstrate that it is measuring the performance of these processes and that positive impacts are being achieved.	The community can demonstrate that interested parties (not just the local government) are engaged in the governance of these processes.	Community leaders are actively tracking performance against key indicators for this sustainability purpose and have established clear processes for interested parties to give feedback. There is substantial community and authority buy-in, and there is demonstrable evidence that performance is improving.

[a] These refer to characteristics 1.1.2, 1.2.1, 1.2.3, 1.4.1, 1.5.1, 1.5.2, 1.5.3, 2.1.2, 2.4.2, 3.1.3.

[b] These refer to characteristics 1.2.2, 1.3.1, 1.3.2, 1.4.2, 2.1.1, 2.2.1, 2.2.2, 2.3.1, 2.3.2, 2.4.1, 3.1.1, 3.1.2, 3.2.1, 3.2.2.

[c] These refer to characteristics 1.1.1, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6.

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Table 2 *(continued)*

	Dimensions 1–3: smart enablers		Dimension 4: purposes
Level	**For characteristics focused on how integrated and citizen-centric the community is[a]**	**For characteristics focused on how open and collaborative the community is[b]**	**For components focused on progress towards the six purposes of a sustainable community[c]**
5. Sustainably optimising	The community can demonstrate clear evidence of systemic continual improvement, where relevant in real time or near real time.	The community can demonstrate that it is using effective, collaborative and digitally enabled engagement with interested parties to drive systemic continual performance.	Digital dashboards give all interested parties near real-time insight into community performance on key priorities for this sustainability purpose. There is clear evidence that the community is evaluating the effectiveness of its policies to deliver this sustainability purpose and using the learning from this to drive continuous improvement – both within the community and across wider regional, national and international networks.

[a] These refer to characteristics 1.1.2, 1.2.1, 1.2.3, 1.4.1, 1.5.1, 1.5.2, 1.5.3, 2.1.2, 2.4.2, 3.1.3.

[b] These refer to characteristics 1.2.2, 1.3.1, 1.3.2, 1.4.2, 2.1.1, 2.2.1, 2.2.2, 2.3.1, 2.3.2, 2.4.1, 3.1.1, 3.1.2, 3.2.1, 3.2.2.

[c] These refer to characteristics 1.1.1, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6.

5 Structure and use of the MMSSC

5.1 How to baseline current maturity

The diagnostic tool for use when assessing the maturity of a city or community against the MMSSC is given in Annex A. This provides detailed assessment criteria for each of the 31 key characteristics of a sustainable and smart-enabled community to determine which maturity level the community has reached.

Users are recommended to assess their community's maturity both:

— now; which of the achievement criteria given in Table A.1 best describes the community's current performance for each characteristic?

— in two years; based on current plans that community leaders have already put in place, would the community be expected to meet a high level of achievement criteria in two years' time?

This dual assessment will give an overview of both current strengths and weaknesses, and of where there are key gaps in existing plans for improvement.

Different approaches may be used to gather evidence for the maturity assessment. As summarized in Figure 3, these differ in both the degree of confidence they deliver in the accuracy of the resulting assessment, and in their cost and complexity.

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