

A Capability Maturity Framework for Sustainable Information and Communication Technology

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A consortium of leading organizations from industry, the nonprofit sector, and academia has developed and tested a framework for systematically assessing and improving sustainable information and communication technology (ICT) capabilities.

Researchers estimate that information and communication technology (ICT) is responsible for at least 2 percent of global greenhouse gas (GHG) emissions.¹ Furthermore, in any individual business, ICT is responsible for a much higher percentage of that business's GHG footprint. Yet researchers also estimate that ICT can provide business solutions to reduce its GHG footprint fivefold.² It thus seems imperative that IT departments and professionals get their house in order to deliver on this potential.

Sustainable ICT (SICT) can develop solutions that offer benefits both internally and across the enterprise by

- aligning all ICT processes and practices with the core principles of sustainability, which are to reduce, reuse, and recycle; and
- finding innovative ways to use ICT in business processes to deliver sustainability benefits across the enterprise and beyond.

However, because the field is new and evolving, few guidelines and best practices are available.

To address this issue, a consortium of leading organizations from industry, the nonprofit sector, and academia has developed and tested a framework for systematically assessing and improving SICT capabilities. The Innovation Value Institute (IVI; <http://ivi.nuim.ie>) consortium used an open-innovation model of collaboration,

The IT-Capability Maturity Framework

The IT-Capability Maturity Framework (IT-CMF) is a high-level process capability maturity framework for managing the IT function within an organization to deliver greater value from IT by assessing and improving a broad range of management practices. The framework identifies 33 critical IT processes and describes an approach to designing maturity frameworks for each process.

A core function of the IT-CMF is to act as an assessment tool and a management system with associated improvement roadmaps that guide senior IT and business management in selecting strategies to continuously improve, develop, and manage the IT capability in support of optimized business value delivery.

engaging academia and industry in scholarly work to create the SICT-Capability Maturity Framework (SICT-CMF).

Challenges for SICT Management

Sustainability is an important business issue, affecting new products and services, compliance, cost reduction opportunities, the organization's reputation, and revenue generation. Many organizations think it requires a significant transformational change program, yet the ultimate goal is to embed sustainability into business-as-usual activities.

Organizations face many challenges in developing and driving their overall sustainability strategies and programs:

- the complexity of the subject and its rapid evolution,
- the lack of agreed-upon and consistent standards,
- changing stakeholder expectations,
- the lack of subject-matter expertise,
- the need for new metrics and measures, and
- evolving and increasing regulations and legislation around the world.

Unfortunately, organizations often don't exploit ICT's full potential in their efforts to achieve sustainability. Business and IT leaders frequently can't find satisfactory answers to questions such as

- Does the organization recognize ICT as a significant contributor to its overall sustainability strategy?
- How is ICT contributing to the organization's sustainability goals?
- What more could ICT do to contribute to those goals?
- Are there clear measurable goals and objectives for SICT?

IT departments face additional challenges specific to new ICT methods and tools, industry metrics, and standards bodies. They also face a general lack of relevant information, such as power consumption quantifications.

The challenge for IT departments is further complicated by the fact that sustainability is an enterprise-wide issue that spans the full value chain. The business is facing its own challenges in developing clear strategies and priorities to address a burning problem in such a dynamic and uncertain environment and might lack the maturity to fully include SICT in its efforts. This puts the onus on the ICT organization to deliver SICT benefits across the organization.

A Capability Maturity Framework for SICT

The IVI has developed a capability maturity framework for managing SICT. The SICT-CMF complements existing approaches for measuring SICT maturity, such as the G-readiness framework (which provides a benchmark score against SICT best practices^{3,4}) or the Gartner Green IT Score Card (which measures corporate social responsibility compliance). It offers a comprehensive value-based model for organizing, evaluating, planning, and managing SICT capabilities, and it fits within the IVI's IT-Capability Maturity Framework (IT-CMF).^{5,6} (See the "IT-Capability Maturity Framework" sidebar for more information.)

The SICT-CMF assessment methodology determines how SICT capabilities are contributing to the business organization's overall sustainability goals and objectives. This gap analysis between what the business wants and what SICT is actually achieving positions the SICT-CMF as a management tool for aligning SICT capabilities with business sustainability objectives.

The framework focuses on the execution of four key actions for increasing SICT's business value:

- define the scope and goal of SICT,
- understand the current SICT capability maturity level,
- systematically develop and manage the SICT capability building blocks, and
- assess and manage SICT progress over time.

Here we outline these actions in more detail and discuss their implementation.

Defining the Scope and Goal

First, the organization must define the scope of its SICT effort. As a prerequisite, the organization should identify how it views sustainability and its own aspirations. Typically, organizational goals involve one or more of the following:

- develop significant capabilities and a reputation for environmental leadership,
- keep pace with industry or stakeholder expectations, or
- meet minimum compliance requirements and reap readily available benefits.

Agreeing on the desired business posture on sustainability will have a significant impact on business and thus on SICT goals and priorities. After deciding to improve SICT, organizations are often keen to aim for a consistent and widespread approach across the organization. However, getting it right is an iterative process and requires investment from both business and IT to learn from the implementation and gain longer-term benefits.

Second, the organization must define the goals of its SICT effort. It's important to be clear on the organization's business objectives and the role of SICT in enabling those objectives. Having a transparent agreement between business and IT stakeholders can tangibly help achieve those objectives. Significant benefits can be gained even by simply understanding the relationship between business and SICT goals.

Understanding the Capability Maturity Level

Once the scope and goals of SICT are clear, the organization must identify its current capability

maturity level by examining, across business functions, its broader attitude toward SICT and its view of SICT's contribution to sustainability.

The framework defines a five-level maturity curve for identifying and developing SICT capabilities:

1. *Initial:* SICT is ad hoc; there's little understanding of the subject and few or no related policies. Accountabilities for SICT aren't defined, and SICT isn't considered in the systems life cycle.

It's important to be clear on the organization's business objectives and the role of SICT in enabling those objectives.

2. *Basic:* There's a limited SICT strategy with associated execution plans. It's largely reactive and lacks consistency. There's an increasing awareness of the subject, but accountability isn't clearly established. Some policies might exist but are adopted inconsistently.
3. *Intermediate:* A SICT strategy exists with associated plans and priorities. The organization has developed capabilities and skills and encourages individuals to contribute to sustainability programs. The organization includes SICT across the full systems life cycle, and it tracks targets and metrics on an individual project basis.
4. *Advanced:* Sustainability is a core component of the IT and business planning life cycles. IT and business jointly drive programs and progress. The organization recognizes SICT as a significant contributor to its sustainability strategy. It aligns business and SICT metrics to achieve success across the enterprise. It also designs policies to enable the achievement of best practices.
5. *Optimizing:* The organization employs SICT practices across the extended enterprise to include customers, suppliers, and partners. The industry recognizes the organization as a sustainability leader and uses its SICT practices to drive industry standards. The organization recognizes SICT as a key

Measuring SICT's Business Value

It's important to define metrics that will provide evidence of success instead of simply measuring what's readily available. Metrics, while often necessary, might not provide sufficient data for determining success; the organization might also need to review, analyze, and invest in the underlying processes and outcomes that the metrics measure.

The SICT maturity curve helps organizations understand and measure SICT's business value. For each SICT maturity level, the framework identifies key practices and outcomes across the categories along with key performance metrics to track progress along the SICT maturity curve.

At the lower maturity levels, metrics include, for example, the number of SICT objectives and the number of projects identified that include sustainability benefits. At the intermediate levels, metrics will start to include the number of

- business initiatives SICT enables,
- job roles with defined SICT requirements, and
- SICT performance metrics that can be aligned with corporate and ICT sustainability objectives.

The higher maturity levels require business and IT leaders to develop metrics jointly. These might include

- sustainability awards and educational programs,
- SICT objectives supporting the extended value chain, or
- technology and research projects supported.

In some cases, achieving the overall business objective might actually increase IT's carbon footprint—which is why business alignment and a holistic approach are critical. SICT metrics can't be set or measured in isolation.

Example metrics include the following:

- *overall*: company CO₂ emissions and CO₂ emissions per employee;
- *office*: kilowatt hours consumed per year (per device), energy use per cubicle, and the percentage of paper recycled and of printing reduced;
- *data center*: server load, cooling load, power usage effectiveness (total facility power/IT equipment power), data center infrastructure efficiency, FLOPS (floating point operations per second) per watt, and SWaP (space, wattage, and performance);
- *travel*: CO₂ emissions reduction and avoidance through online collaboration tools; and
- *dematerialization*: the percentage of material replaced by ICT (for example, 85% of paper reduced by e-business solutions).

The specific metrics used will undoubtedly vary for different organizations and industries, but as maturity increases, so does the confidence to identify and use metrics that confirm the value delivered by the investment in improving SICT maturity. The ultimate metric is likely to reflect the achievement of the organization's overall sustainability objectives and IT's recognized contribution.

factor in driving sustainability as a competitive differentiator.

This maturity curve serves two important purposes. First, it's the basis of an assessment process that helps to determine the current maturity level. Second, it provides a view of the growth path by identifying the next set of capabilities an organization should develop to drive greater business value from SICT. (For more information, see the "Measuring SICT's Business Value" sidebar.)

Based on SICT-CMF experiences to date, the typical timeline for a maturity assessment is four weeks. However, its main component is a survey that takes no more than 30 minutes to complete, and it can remain open for as long as the participating organizations chooses. Typically, a range of business and IT individuals who are involved

in or accountable for SICT complete the survey. Targeted interviews that last between 30 and 90 minutes can support the survey data, and metrics can validate and augment the results.

Developing SICT Capability Building Blocks

Although it's useful to understand the broad path to increasing maturity, it's more important to assess an organization's specific capabilities related to SICT. The SICT framework consists of nine capability building blocks (see Table 1) across the following four categories:

- *strategy and planning*, which includes the specific objectives of SICT and its alignment with the organization's overall sustainability strategy, objectives, and goals;

Table 1. Capability building blocks of sustainable information and communication technology (SICT).

Category	Capability Building Block	Description
Strategy and planning	Alignment	Define and execute the ICT sustainability strategy to influence and align to business sustainability objectives.
	Objectives	Define and agree on sustainability objectives for ICT.
Process management	Operations and life cycle	Source (purchase), operate, and dispose of ICT systems to deliver sustainability objectives.
	ICT-enabled business processes	Create provisions for ICT systems that enable improved sustainability outcomes across the extended enterprise.
	Performance and reporting	Report and demonstrate progress against ICT-specific and ICT-enabled sustainability objectives, within the ICT business and across the extended enterprise.
People and culture	Adoption	Embed sustainability principles across ICT and the extended enterprise.
	Language	Define, communicate, and use common sustainability language and vocabulary across ICT and other business units, including the extended enterprise, to leverage a common understanding.
Governance	External compliance	Evangelize sustainability successes and contribute to industry best practices.
	Corporate policies	Enable and demonstrate compliance with ICT and business sustainability legislation and regulation. Require accountability for sustainability roles and decision making across ICT and the enterprise.

- *process management*, which includes the sourcing, operation, and disposal of ICT systems, as well as the provision of systems based on sustainability objectives and the reporting of performance;
- *people and culture*, which defines a common language to improve communication throughout the enterprise and establishes activities to help embed sustainability principles across IT and the wider enterprise; and
- *governance*, which develops common and consistent policies and requires accountability and compliance with relevant regulation and legislation.

The first step to systematically develop and manage the nine capabilities within this framework is to assess the organizations status in relation to each one.

The assessment begins with the survey of IT and business leaders to understand their individual assessments of the maturity and importance of these capabilities. A series of interviews with key stakeholders augments the survey to understand key business priorities and SICT drivers, successes achieved, and initiatives taken or planned. In addition to helping organizations understand their current maturity level,

the initial assessment provides insight into the value placed on each capability, which will undoubtedly vary according to each organization's strategy and objectives. The assessment also provides valuable insight into the similarities and differences in how key stakeholders view both the importance and maturity of individual capabilities, as well as the overall vision for success.

Plotting current levels of maturity and strategic importance lets an organization quickly identify gaps in capabilities. This is the foundation for developing a meaningful action plan. Figure 1 shows the results of an organization's assessment of importance of capabilities versus its own assessment of its current maturity in those capabilities.

This organization is close to level-three maturity overall but is less mature in some individual capabilities. It views alignment and objectives under the strategy and planning category as the most important capability building blocks, but it hasn't achieved level-three maturity in these areas. It also views operations and life cycle as an important capability, but its maturity level for that building block is even lower (level 2.4).

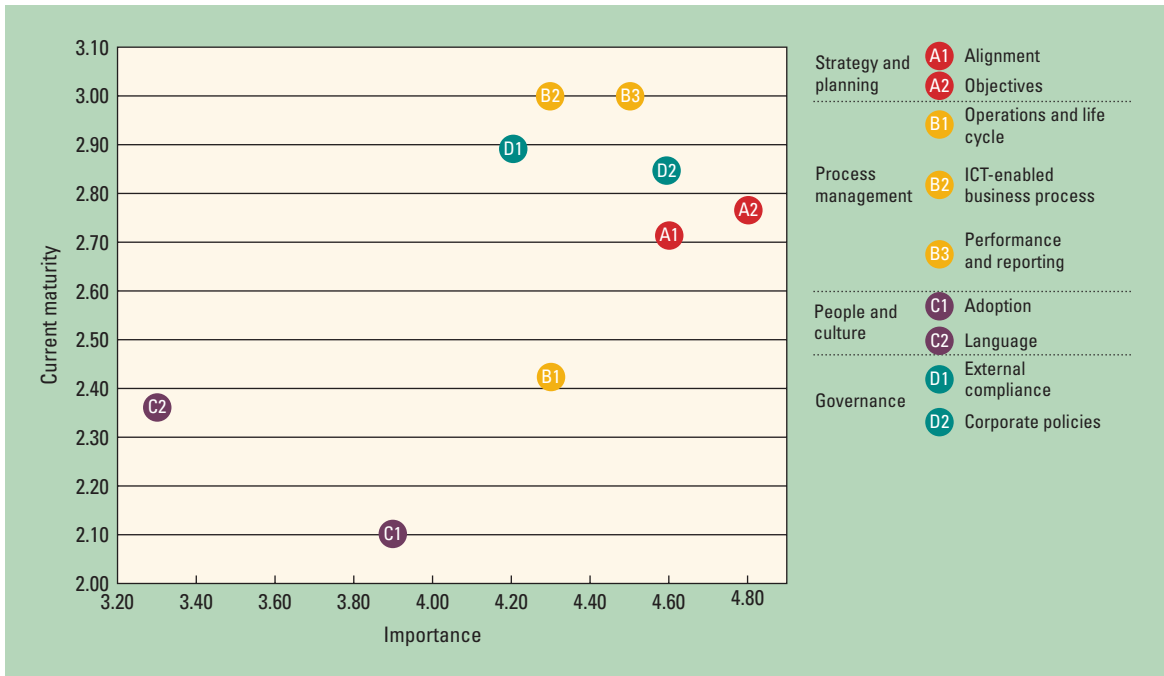


Figure 1. Maturity level versus importance plotted for each capability building block. This organization views strategy alignment and objectives as the most important capability building blocks, but it has yet to achieve level-three maturity in these areas.

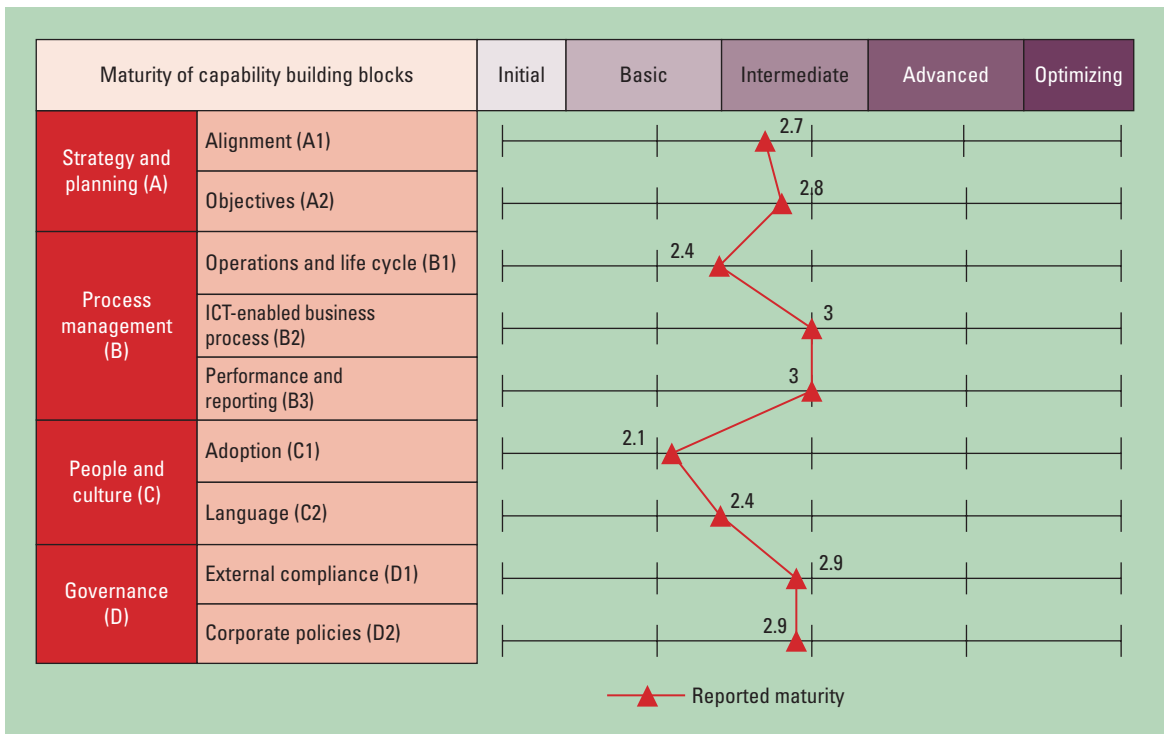


Figure 2. The aggregated result for the current maturity level from the assessment. The organization is close to level-three maturity overall.

Figure 2 shows the consolidated survey results, resulting in an overall maturity level for each capability building block.

Assessing and Managing SICT Progress

With the initial assessment complete, organizations will have a clear view of current capability

and key areas for action and improvement. However, to further develop SICT capability, the organization should assess and manage SICT progress over time by using the assessment results to

- develop a roadmap and action plan, and
- add a yearly follow-up assessment to the overall IT management process to measure over time both progress and the value delivered from adopting SICT.

Agreeing on stakeholder ownership for each priority area is critical to developing both short-term and long-term action plans for improvement. The assessment results can be used to prioritize the opportunities for quick wins—that is, those capabilities that have smaller gaps between current and desired maturity and those that are recognized as more important but might have a bigger gap to bridge.

Insights from Pilot Assessments

As a relatively new and rapidly evolving field, businesses face many challenges in achieving their sustainability objectives. Initial application of the framework has revealed some common requirements.

Obtain Senior Management’s Vision

The pilot assessments confirmed that a key requirement is a clearly articulated business vision for sustainability with associated goals and milestones. Senior-level drive, visibility, and communication regarding sustainability are critical for successfully developing SICT, as is accountability. Otherwise, successes remain isolated, and the organization doesn’t leverage the full benefits.

Engage IT and Business Organizations

Performing an assessment provides both the IT department and business organizations with a new view of the true nature of their SICT efforts. In many cases, it’s a wake-up call for both parties.

Although some organizations recognize technology’s increasingly valuable role in achieving sustainability objectives, other business executives see SICT’s contribution as limited to data-center and power-saving activities. Other CIOs are tempted to move forward on their own while the organization is still working on its strategy

and objectives. However, broad actions are needed across both IT and the business—not just in IT.

Accept Cultural Change

Driving SICT adoption within the wider organization is a significant challenge. Engaging the general workforce requires a shift in culture that embeds SICT into the everyday work routine.

Developing and agreeing on the right metrics remains a common challenge, as does recognizing the need for new approaches to assess the return on investment. Although SICT incorporates all the activities associated with a major change program, success requires the organization to view SICT as “business as usual.”

The misconception remains that sustainability typically represents a cost to the organization. Executives don’t always realize the potential benefits.


Incentives are another area that requires specific consideration for cultural changes. Incentives will vary across the various organizational layers, ranging from awards and recognition for new ideas and innovation, to a direct relationship between sustainable performance and rewards for senior executives.

Understand the Potential and Expand Expertise

Executives at senior levels in organizations have a good understanding of SICT issues and recognize there’s much more to learn and do. However, the misconception remains that sustainability typically represents a cost to the organization. Executives don’t always realize the potential benefits, including cost savings and revenue generation based on new business opportunities. Undoubtedly, investments are needed, but they deliver benefits in both the short and long term. Specific benefits will vary according to business maturity, industry sector, and desired sustainability posture but typically include reduced energy and travel costs.

As a relatively new and rapidly evolving field, SICT skills and experience are still in short supply.

While pockets of expertise exist, with strong individual technical experts, SICT across the wider organization is limited. Education will be critical to changing this skills shortage. It's also the key to changing the culture and embedding SICT into the organization's core values.

The SICT Capability Maturity Framework gives organizations a vital tool to manage their sustainability capability. The framework provides a comprehensive value-based model for organizing, evaluating, planning, and managing SICT capabilities. Using the framework, organizations can assess the maturity of their SICT capability and systematically improve capabilities in a measurable way to meet the sustainability objectives. 

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