Towards a Maturity Model for the Assessment of Ideation in Crowdsourcing Projects

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Abstract

Social media technology has enabled virtual collaborative environments such that people can actively interact, share knowledge, coordinate activities, solve problems and co-create value. Organizations have begun to leverage approaches and technologies to involve numerous people from outside their boundaries to perform organizational tasks. Crowdsourcing is a collaboration model enabled by people-centric web technologies to solve individual, organizational, and societal problems using a dynamically formed crowd of people who respond to an open call for participation. Despite the success and popularity of this phenomenon, there appears to be a lack of guidance on how to organize the ideation processes in crowdsourcing. To address this need, we propose a Crowdsourcing Ideation Maturity Assessment Model (CIMAM). The CIMAM is intended to be sufficiently generic to be applied to different types of crowdsourcing initiatives/projects. It can be used by external assessors or by crowdsourcing organizers themselves for self-assessments. CIMAM was developed through a literature review and built on the constructs of Pedersen et al. [22] model. This paper contributes to research by examining the various factors influencing crowd engagement and productivity.

1. Introduction

The advent of new collaboration technologies, such as social media and Web 2.0, have made it feasible for businesses, non-profits, and governments, to engage large numbers of individuals, both within and outside their organizational boundaries, to perform various organizational tasks. This phenomenon is well-known in the public media as "crowdsourcing" [18], "mass collaboration" [8], "open collaboration" [24], or "collective intelligence" [23, 40]. Crowdsourcing applications cover both private and public sectors. In the private sector, crowdsourcing initiatives range from design competitions, to product development and evaluation, to distributing large scale tasks, to enabling open discussions to solve complex problems [18]. In the public sector, crowdsourcing typically focuses on making use of online citizens as a new resource for government agencies' innovation and problem-solving [2].

While crowdsourcing has been praised for tapping into the wisdom of crowds at a reasonable cost [18], for many organizations it poses considerable implementation challenges, as they move from traditional small-group, focused and time-boxed collaboration to an environment in which unstructured, longitudinal, mass collaboration is the norm. For example, Guido [16], upon his recall of Cisco I-Prize crowdsourcing initiative, admitted that most of the ideas submitted by the crowd were immature and required lots of filtering and improvement. Also situations like "crowdslapping" (p. 79) occur, where the crowd's responses go against the prior intention of the crowdsourcing organizers [5]. In addition, Bonabeau [10] raised a number of interesting issues regarding crowdsourcing practices such as loss of control of final outcomes, crowd engagement, relevance of crowd members' profiles to the crowdsourcing task, or management of the crowd's misconducts.

Challenges of crowdsourcing implementation offer a fertile ground for research, especially those aiming at improving crowdsourcing performance. Among the many issues that require further scientific understanding, the question what constitutes a good crowdsourcing project appears to be both fundamental and highly relevant. Inspite of the increasing number of crowdsourcing projects and services that are emerging, there exists little guidance and standards on how to organize these projects effectively. In this paper, we particularly focus on the ideation processes in crowdsourcing project, i.e. the idea generation and selection processes, as these are at the core of most crowdsourcing projects. Therefore, the objective of our research is to develop a way to assess the maturity of ideation in crowdsourcing projects along a number of relevant dimensions. It addresses the following research questions: What steps need to be taken to

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assess ideation maturity in crowdsourcing projects? What are relevant analysis criteria for crowdsourcing projects that need to be part of such a maturity model?

This paper proposes the first version of the Crowdsourcing Ideation Maturity Assessment Model (CIMAM), a maturity model for the assessment of ideation processes in crowdsourcing projects. CIMAM is intended to be sufficiently generic to be applied to different types of crowdsourcing initiatives or projects and be useable by practitioners i.e. problem or platform owners (crowdsourcing organizers) for conducting self-assessments. The model was developed based on a comprehensive literature review and the conceptual model proposed by Pedersen et al. [22]. The value of CIMAM is that it may assist organizations to (a) select among crowdsourcing (platform) providers on the basis of the idea selection and evaluation techniques that are supported, and (b) determine and manage the most suitable idea selection and evaluation practice for specific crowdsourcing projects. In this sense, our research objective addresses an immediate need as organizations currently do not have access to such methodical assessment tools available for their crowdsourcing projects.

The remainder of this paper is structured as follows. First, we provide background information on crowdsourcing and summarize research on maturity models. Next, we introduce the method through which the CIMAM was built. Then, we report on the CIMAM elements and application guidance. Finally, we present the implications for research and practice followed by our conclusions where we summarize the limitations of this study and present future research directions.

2. Crowdsourcing

Despite its increasing popularity, crowdsourcing is not understood consistently across the literature. Estelles, Arolas, and Gonzalez Ladron de Guevara [11] found that there were 40 different definitions of crowdsourcing in the literature. Arguably, the most popular definition of crowdsourcing comes from Jeff Howe, who coined the term. Howe [19 p. 1] considers crowdsourcing as a special form of outsourcing and defined it as "…the act of taking a job traditionally performed by a designated agent (usually an employee) and outsourcing it to an undefined, generally large group of people in the form of an open call." In contrast, [4] perceives crowdsourcing as a collaborative problem solving and production model. From the perspective of online workers, Heer & Bostok [17 p. 1]) understand crowdsourcing as a relatively new phenomenon in which web workers complete one or more small tasks, often for micro-payments on the order of $0.01 to $0.10 per task. Pedersen et al. [22 p.3] define crowdsourcing as "a collaboration model enabled by people-centric web technologies to solve individual, organizational, and societal problems using a dynamically formed crowd of interested people who respond to an open call for participation". We adopt this latter definition in this research.

Typically the collaborative process in crowdsourcing initiatives goes through two major stages: idea generation and idea selection, each of which may have many variations. For example, several idea generation approaches exist in the crowdsourcing initiatives. An organization may organize an open collaboration process [6, 31], where the members of crowd can see each other's contributions and build/comment/expand on them. Organizations may also use a closed model [26, 31], where crowd members are made to compete against each other to submit the best idea and thus may not be allowed to see each other's contributions. To stimulate idea generation, crowdsourcing organizers employ diverse creativity and elaboration techniques like presenting a selection of previous ideas to participants or asking participants to propose new ideas by combining two or more previous ideas [27].

A variety of idea selection approaches exist in crowdsourcing literature [42]: An organization may ask the crowd itself to vote for the best ideas. A crowd may self-organize and identify their key contributions [27]. Alternately, an organization may evaluate the ideas themselves using one or more criteria or they may institutionalize a panel of judges to perform the idea selection task.

Idea generation and selection processes may face various challenges. In Internet-enabled mass collaboration, the anonymity of participants, weak governance structure to manage online participants and the lack of responsibility for the outcomes leave abundant room for frivolous ideas, playful comments, or bias to grow. For example, in a case study of idea competitions, Bojin et al. [30] noted that contenders might ask their friends to join the community or create multiple accounts to vote for them (the barnstorming phenomenon) or community members may come to an agreement to select a winner for each competition so that each of them could get a prize after multiple competitions (the collusion phenomenon). Even in the best of situations where all submitted ideas are excellent, limited resources of the organization may make it very difficult to consider or execute them all [16].

These hindrances drive the need for a systematic and generic way to probe areas for improvement in different crowdsourcing projects. This may be provided through a model that exposes the relevant

dimensions of crowdsourcing projects. To this end, we adopt the model by Pedersen et al. [22]. Based on a structured literature review, they propose a conceptual model to explain the dimensions of crowdsourcing projects and provide a starting point for further study of the crowdsourcing phenomenon. Shown in Figure 1, their conceptual model includes different elements: Problem, Process, Governance, People, Technology, and Outcome. It resembles the traditional Input-Process-Output (IPO) model. Their conceptual model is an example of a Theory for Analyzing, and is "used to classify specific dimensions or characteristics… by summarizing the commonalities found in discrete observations… when nothing or very little is known about the phenomenon in question" [39 p. 623].

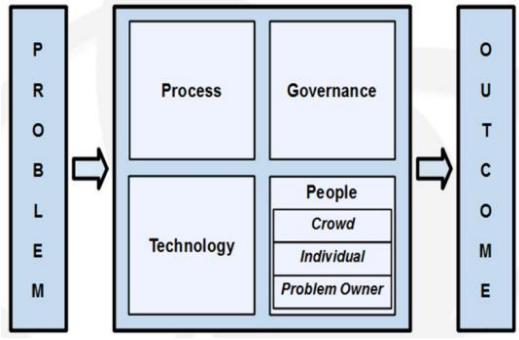

Figure 1. Conceptual Model for Crowdsourcing

Problem: A crowdsourcing problem involves a statement of an initial condition and a desired ending condition [18]. The problem is at the heart of the crowdsourcing approach, and its characteristics determine requirements placed on all other elements of the conceptual model [3, 18].

Process: A process is a set of actions undertaken by all actors in a crowdsourcing project to achieve a particular outcome or to solve a particular problem. In this context, process refers to the design of the step-by-step plan of action for solving a crowdsourcing problem.

Governance: Governance refers to the actions and policies employed to effectively manage the crowd and steer them toward the desired solution. Crowdsourcing governance can be a significant challenge as an uncontrolled crowd may never reach the ultimate goal. Simple projects may be self-governed by the crowd. However, experience shows that complex projects require a more dedicated governance strategy.

People: This includes the different stakeholders are involved in a crowdsourcing project. There are three subtypes:

- **Problem Owner:** This is typically an organization of some sort, i.e. the entity which has a problem that needs to be solved.
- **Individuals:** These are the individual members of the crowd, i.e. the problems solvers or workers. They generally interact with the problem owner to provide the solution to the problem. These individuals are always involved as separate entities, but in some problems the individuals will have to work collectively and collaboratively. Optimizing their attraction and retention process requires an understanding of what motivates them to contribute, both initially and on a continuing basis, and also how trust develops among the group of individuals.
- **Crowd:** The "crowd" is the dynamically formed group of individuals who participate in the crowdsourcing problem over a certain period of time. The exact composition of the crowd changes over time as individuals join and leave the crowd.

Technology: This concerns the technical capabilities that enable the crowd to form, and also facilitate and optimize their continued interaction to arrive at the solution or deliverable to the crowdsourcing problem.

Outcome: This refers to the outputs of the crowdsourcing process. Both factual outcomes (e.g. the solutions the problem owner wanted to obtain) and perceptual outcomes (e.g. how the problem owners and participants feel about the process and its results) are important considerations.

The conceptual model by Pedersen and colleagues [22] provides a foundation to develop a crowdsourcing maturity model. The value of such a maturity model is that it may provide a systematic and generic way to identify strengths and weaknesses in crowdsourcing projects and point to areas of improvement. The concept of maturity models and their advantages are further introduced in the next section.

3. Maturity models

Maturity literally means 'ripeness'. It describes the transition from an initial to a more advanced state, possibly through a number of intermediate states. According to Fraser et al. [33 p. 247] maturity can be seen as "a combination of the presence of a process and the organization's attitude to it". Maturity models reflect the degree to which key processes or activities are defined, managed, and executed effectively. They typically describe the characteristics of an activity at a number of different levels of performance [32].

Approaches to determine process or capability maturity are increasingly applied to various aspects of product development, both as an assessment instrument and as part of an improvement framework [25]. Most maturity models define an organization's typical behavior for several key processes or activities at various levels of 'maturity' [32]. Even though maturity

models are declarative, i.e. based on self-reports, they provide an instantaneous snapshot of a situation and a framework for defining and prioritizing improvement measures. The key strengths of maturity models include:

- They are typically easy to use and often require simple quantitative analysis;
- They can be applied from both functional and cross-functional perspectives;
- They provide opportunities for consensus and team building around a common language and a shared understanding and perception;
- They can be performed by external auditors or through self-assessment.

One of the earliest maturity models is Crosby's Quality Management Maturity Grid (QMMG) [36], which was developed to evaluate the status and evolution of a firm's approach to quality management. Subsequently, other maturity models have been proposed for a range of activities including quality assurance [36], software development [29], supplier relationships [7], innovation [41], product design [34], R&D effectiveness [28], product reliability [37], strategic alignment [21], knowledge management [38], community evolution [35, 20, 15] and collaboration [13, 14].

The best known models are the CMM for software engineering (based on the Process Maturity Framework of Watts Humphrey, quoted in Paulk et al., [29], developed at the Software Engineering Institute (SEI), and the ISO 9001 standard developed by the International Standards Organization. Both share a common concern with quality and process management. Unlike the other maturity models cited above, CMM is a more extensive framework in which each maturity level contains a number of key process areas (KPAs) containing common features and key practices to achieve stated goals. A number of studies of the software CMM have shown links between maturity and software quality (e.g. [12, 9]).

To the best of our knowledge, no model has been proposed to assess the maturity of crowdsourcing projects and investigated the correlation between the quality of the collaborative ideation processes and the quality of a crowdsourcing project's outcomes. As stated, the key constructs of our maturity model for crowdsourcing ideation processes are developed from the crowdsourcing conceptual model by Pedersen et al. [22]. In the context of this research, we expand Pedersen et al.'s (2013)[x] crowdsourcing conceptual model to define **Crowdsourcing Maturity** as a crowd's current maximum capability to collaboratively solve problem where crowd members, through a web technology and a good governance, actively interact, participate and share knowledge, effectively co-create value, and adjust their tasks and behaviors to generate and select ideas in order to produce high quality outcomes that satisfy the problem owner.

4. Method

The present research is based on Design Science. Design Science research tries to meet identified business needs through the building and evaluation of artifacts [1]. These artifacts are built to address unsolved problems and are evaluated with respect to the utility they provided in solving these problems. This approach is suitable for the development and evaluation of the CIMAM by demonstrating its practical feasibility and utility through case studies according to Hevner et al.'s [1 p.86] design evaluation framework. In our research, the CIMAM artifacts would be represented as follows:

- **Constructs:** The CIMAM structure that describes the crowdsourcing project characteristics (constructs or themes) and their related criteria.
- **Model:** The CIMAM questionnaire that includes questions, levels of rating, and mathematical equations for analysis.
- **Method:** The CIMAM method that a) defines the steps and provides guidance on how to run the CIMAM questionnaire in the field, and b) supports the development of recommendations.
- **Instantiation:** The CIMAM tool which is a customized MS Excel application that represents the implementation of the above artifacts, and enables the execution of a concrete assessment by enabling the collection and analysis of quantitative and qualitative questionnaire data. It provides different presentations of results (e.g. individual and team spider diagrams, comparison curves, and cloud matrices) and the results' report generation.

The development of the CIMAM follows the following steps. First, based on the literature on maturity models and crowdsourcing, we identified a gap in the literature related to the assessment of crowdsourcing projects. Second, we developed a first version of CIMAM based on the crowdsourcing literature and the constructs of the Pedersen et al. [22] conceptual model. This part is reported in this paper. Third, the CIMAM will be pilot-tested in three case studies. These studies will involve three crowdsourcing projects powered by MindMixer.com, where city authorities seek suggestions from the online citizens to improve the quality of life in the city. We will use observational and interview data to understand and evaluate the ideation processes that take place in the crowdsourcing platforms (e.g. user profiles, engagement of crowds, number of contributions, and

number of selected ideas) and to assess the quality of outcomes (e.g. appropriateness of ideas with respect to the problem and satisfaction of problem owners). This step will also assist in a further refinement of the model. Fourth, experts will assess the refined version of the CIMAM to validate the proposed maturity model's relevance and practical applicability to crowdsourcing ideation assessment. Finally, the model will be field-tested with a selection of other crowdsourcing projects to enhance the quality of the CIMAM artifacts.

5. Description of the CIMAM

The CIMAM aims to assess the maturity of a given crowdsourcing project holistically from different perspectives: people, process, governance, technology and outcomes. It supports the development of recommendations in form of an action plan to reach improved quality and performance. Its applicability is not limited to a particular type of crowdsourcing project whatever the type of collaboration and domain of application.

Inspired by the maturity model literature, CIMAM consists of four maturity levels: Ad-hoc, Exploring, Managing and Optimizing. At the **Ad-hoc level**, the crowdsourcing project is immature. Crowd members may have to overcome the barriers to effective communication, shared understanding on the problem to solve, and synchronization of tasks and behaviors before they can produce high quality outcomes together. This could be related to their competences, the governance of the project or the technology they use. At the **Exploring level**, crowd members and organizers are well aware of their weaknesses related to the ideation processes. They try to find an optimal way to produce valuable outcomes, but are faced with many challenges related to their competences, the governance of the project, or the technology they use. Some initiatives to address these are attempted but do not help significantly. At the **Managing level**, the maturity of the crowdsourcing project is quite good but there is still room for improvement. In general, crowd members are able to produce outcomes of good quality. At the **Optimizing level**, the crowdsourcing project is mature. Crowd members collaborate optimally and are able to accomplish high quality outcomes.

As mentioned above, the CIMAM explores the maturity of a given crowdsourcing project from various different perspectives. These perspectives, also called the CIMAM themes, correspond to the constructs of the crowdsourcing conceptual model proposed by Pedersen et al. (2013). Table 1 presents the themes and criteria of the CIMAM.

Theme	**Criterion**
Problem	• Goal clarity • Business need • Task nature (problem type) • Constraints
Process	• Work mode • Rules statement • Collaboration patterns • Contribution mode • Task complexity • Duration • Contribution level • Idea selection mode
Governance	• Task decomposition (break-down) • Task assignment and integration • Feedback system • Quality assurance • Control mechanism • Facilitation • Conflict management • Contribution assessment • Incentives/rewards
People	
Crowd	• Profile and type • Member admission • Structure and size • Dynamic (participants vs. contributors) • Shared understanding • Trust climate • Interactivity/interdependency • Complementarity of skills
Individual	• Background • Motivation type and level • Expertise level • Creativity aptitude • Engagement and participation • Willingness to collaborate
Problem owner	• Profile and type • Rational and intention • Responsibility • Process involvement
Technology	• Type • Usefulness • Ergonomics • Ease of use • Interactivity & socialization • Knowledge sharing enabling • Traceability • Interoperability
Outcome	• Productivity • Consensus • Quality • Usefulness • Creativity • Satisfaction • Commitment

Table 1. The CIMAM

The criteria represent the topics for the CIMAM questionnaire. Each criterion is represented by an item that is evaluated on a 4-point scale. To guide the respondents, the levels of each criterion are described

briefly, with examples wherever possible. An example of a criterion item is provided in Figure 2. Respondents are allowed to provide scores such as "0.5", "1.5", "2.5", and "3.5". When a respondent cannot answer, no score will be recorded. The calculation of points provides the level of maturity based on the percentage of the maximum number of points possible (Ad hoc (<20%), Exploring (20%-50%), Managing (50%-80%) and Optimizing (80%-100%)).

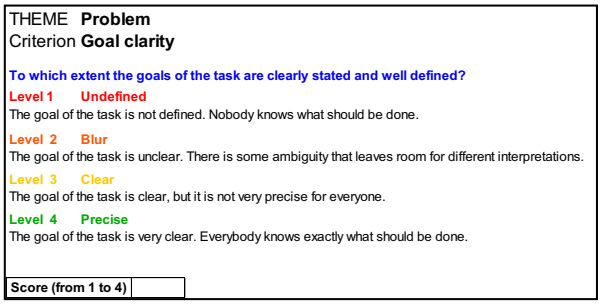

Figure 2. Example of criterion in CIMAM

In essence, the CIMAM is structured as a library of criteria. It is important to remember that not all criteria are always relevant. So, a crowdsourcing project can decide which criteria fit better to a particular context. It can also decide to expand the set of criteria. Also, for some cases, certain criteria may be more important than others. In such situations, it is possible to assign different weights to the criteria.

5.1. The CIMAM application process

The CIMAM method defines the five main steps to perform the analysis: scoping, data collection, data analysis, presentation of results, and recommendations. During **scoping**, the purpose of the CIMAM analysis is defined according to the context, business needs, and strategy. The boundaries of the analysis are precisely defined before the project begins. The reasons for performing the assessment are communicated to all the crowd stakeholders (crowd members, problem owners, platform owners, crowdsourcing providers or organizers). At this step, the organization can decide which criteria fit better with the context. It is recommended that the CIMAM version being used not contain any more than 25 criteria. Otherwise, it increases the complexity of its application to the crowdsourcing situation.

During the **data collection** phase, individual and/or collective interviews are performed based on the CIMAM questionnaire (quantitative data). The selection of crowd stakeholders needs to be representative of the target crowdsourcing project according to their roles (member, coordinator, and owner). During interviews, qualitative observations are collected to enrich the analysis and to gain a deeper understanding of any perceptual differences that may exist.

After the data collection, a first quantitative **data analysis** is performed using the CIMAM tool. This analysis presents individual perceptions about the maturity of the crowdsourcing project. It also helps to identify critical perception differences concerning the different criteria. The qualitative data analysis (performed using a content/thematic analysis approach based on the oral statements collected during interviews) helps to gain a more in-depth understanding of these perceptual differences for each criterion or group of criteria (theme). In addition, follow-up discussions and consensus building efforts may be carried out for relevant scores in order to settle on an acceptable assessment. This cross analysis may yield additional interpretations by combining criteria for specific measurements of capabilities according the aim of the assessment. Pattern recognition may also be performed to analyze the collaboration processes executed by the crowd in terms of dominant collaboration patterns.

The **presentation of results** can be done through the CIMAM tool as:

- Individual spider diagrams of all criteria scores individually or grouped by topic.
- Superimposition of individual spider diagrams showing the rating gaps on individual criteria or topics.
- Comparison curves which allow visualizing perception differences between different respondents regarding the same criterion. This helps to identify criteria for which it is necessary to collect additional information.
- Collective spider diagrams of all criteria scores individually or grouped by topic. These represent the collective perception of the maturity of the community.
- Cloud matrices showing the combination of criteria.

The last step of the CIMAM method concerns the creation of a list of recommendations. It helps in the framing of concrete actions to improve crowdsourcing project performance and the quality of outcomes. Such actions may involve a variety of initiatives, for example, the clarification of task goals, better motivation and incentives, or providing different technologies.

5.2. The CIMAM validation

To validate the CIMAM, the seven guidelines for design science as proposed by Hevner et al. (2004) will

be performed. In order to produce new artifacts [**CIMAM structure, questionnaire, method, and tool**] to be added as applicable knowledge to the knowledge base [see IS research framework in Hevner et al. (2004, p.80)], we developed a purposeful method (**guideline 1: design as an artifact**) showing step by step how to solve a specific problem related to the holistic assessment of the maturity of a crowdsourcing project. This problem meets a clear business need as expressed by practitioners as a means to reach better productivity and performance of crowdsourcing projects (**guideline 2: problem relevance**). A total of three pilot cases studies in three different cities from MindMixer.com using observational methods will be executed to evaluate the appropriateness and usefulness of the CIMAM (**guideline 3: design evaluation**). The literature review showed that a CIMAM does not appear to be addressed in the field in spite of the practitioners expressing a clear business need (**guideline 4: research contributions**). The development will be rigorously defined (**guideline 5: research rigor**) using a combination of research methods including a literature review, empirical studies and an expert focus group to be programmed in the future (**guideline 6: design as a search process**). Finally, the results of our study will be communicated in two steps (**guideline 7: communication of research**): First, the method and initial experiences will be presented through publications and seminars to other researchers who will have the opportunity to consolidate and extend the CIMAM method and application and to practitioners who can apply this method and provide feedback and recommendations for its future enhancement. Second, after further examination of this method and its application in various contexts (other field studies), crowdsourcing providers can decide to use it as a strategic instrument to improve their crowdsourcing projects' performance.

6. Conclusion

In this paper, we propose a first version of CIMAM, to assist in the assessment of crowdsourcing projects. Our contribution is both theoretical as it provides a new model to extend the knowledge base as well as practical as it answers a business need expressed by practitioners. It was developed from an inductive perspective to meet a real business need. Therefore the results have the potential to be interesting to academic researchers and information systems practitioners interested in the governance and performance of crowdsourcing projects.

Nevertheless, there are certain limitations to this study. First, this paper describes the design of CIMAM. The next step in our research is to collect empirical evidence from three pilot studies. Additional field studies will have to be executed in order to expand the evaluation of the CIMAM artifacts and to further enhance the model. Particular care needs to be taken to ensure that CIMAM can take into account all relevant characteristics of a given crowdsourcing project whatever the type of collaboration and the profile of crowd. Second, at this stage, the CIMAM cannot yet be used to investigate a correlation between crowdsourcing maturity levels and performance. However, it is a first step in this direction. Using the CIMAM in a number of projects that have different levels of performance, we may start to investigate the relationship between maturity levels and performance.

Several perspectives need to be taken into account in the future in order to enhance the CIMAM artifacts. First, an Excel application for CIMAM (CIMAM tool) has to be customized to allow data collection and quantitative analysis, and generation of reports. Second, guidelines for the selection of criteria according to the context should be developed. Finally, the weighting of criteria should also be further explored and aligned with the four levels of maturity.

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