



## Evaluation of the usability of a new ITG instrument to measure hard and soft governance maturity

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### **Abstract:**

IT governance (ITG) has stayed a challenging matter for years. Research suggests the existence of a gap between theoretical frameworks and practice. Although current ITG research is largely focused on hard governance (structure, processes), soft governance (behavior, collaboration) is equally important and might be crucial to close the gap. The goal of this study is to evaluate the usability of a new ITG maturity instrument that covers hard and soft ITG in detail. We conducted ten case studies and evaluated the instrument positively on usability; but feedback also revealed that the assessment questions needed improvements. We demonstrate that combining the instrument with structured interviews results in an enhanced and usable instrument to determine an organization's current level of hard and soft ITG. We conclude that this new instrument demonstrates a way to reduce the mismatch between ITG maturity theory and practice.

### **Keywords:**

IT governance; IT governance maturity; soft governance; hard governance; design science.

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## 1. Introduction

When IT governance (ITG) or corporate governance go awry, “the results can be devastating” [1]. The bankruptcy of Enron in 2001 and other scandals at Tyco, Global Crossing, WorldCom and Xerox resulting in the enactment in the United States of the Sarbanes-Oxley Act are just a few examples. Employees, customers, suppliers and local societies suffered severe losses owing to managers driven by the possibilities of creating personal wealth through dramatic increases in the market prices of their shares [2].

The impact of ITG on firm performance have been well-established in previous studies, yet there remains a gap explaining exactly how ITG influences firm performance [1]. ITG is positively related to business performance through IT and business process relatedness [3], [4]. Weill and Ross [5] present another excellent example of the linkage between ITG and corporate governance with corporate and IT decision-making. A third example comprises the relationship between corporate governance and ITG of Borth and Bradley [6], in which ITG is presented as one of the key assets to govern.

Improving ITG is difficult because it is a challenging, complex topic. ITG is complex because it is not only about organizational processes and structures but about human behavior too. We look at ITG from two perspectives: an organizational perspective referred to as “hard governance” and a social perspective referred to as “soft governance”. In traditional ITG research and frameworks the main focus was hard governance, sometimes defined as “structures and processes”. Social elements were not completely out of focus but many researchers favored generalizations like “social integration” [7] or “relational mechanisms” [8]. The social or human interactions in organizations are much more complex than organizational structures and processes and need at least the same amount of consideration in models or frameworks. This rarely happens in ITG research. This however is the focus of our research and the distinction between hard and soft governance is becoming more common in ITG research [9]-[14].

The purpose of this study is to demonstrate and evaluate the usability of a new ITG instrument to measure ITG maturity in an organization. This is an assessment instrument that can be used to measure hard and soft ITG maturity in detail. Our approach is grounded in the assumption that improving “ITG maturity” results in improving ITG and thus firm performance.

This paper is organized as follows. This section introduces the purpose of this study. The next section introduces the topics of hard and soft ITG and ITG maturity. Section 3 presents the research methodology. The results of the case studies are described in Section 4. Section 5 covers the discussion. The conclusion, limitations and implications for future research are included in Section 6.

## 2. IT governance

In this section we introduce hard and soft ITG and ITG maturity.

### 2.1 *Hard and soft IT governance*

ITG is a relatively new topic [8], with the first publications appearing in the late 1990s. Although a considerable body of literature on ITG exists, definitions of ITG in the literature vary considerably [15], [16]. There simply does not seem to be a common body of ITG knowledge or a widely used ITG framework. An analysis of the ITG literature reveals that six streams of thought can be distinguished [17]. Four ITG streams differ in scope: “IT Audit”, “Decision making”, “Part of corporate governance, conformance perspective”, and “Part of corporate governance, performance perspective”. The last two streams differ in the direction in which ITG works: “Top down” and “Bottom up”.

In practice, organizations use all kinds of frameworks or methods for ITG. Frameworks are the most important enablers for effective ITG [18]. A variety of frameworks devised for improving ITG exists [19]. The list of frameworks frequently used for ITG vary considerably, as can be seen in several global surveys from the ITGI addressed to 749 CEO-/CIO-level executives in 23 countries [18], [20]. Best practice frameworks are the most important enablers for

effective ITG. Other enablers include toolkits, benchmarking, certifications, networking, white papers and ITG-related research. Some of the frequently cited frameworks comprise COBIT, ITIL, ISO/IEC 17799, ISO/IEC 27001, ISO/IEC 38500 and BS 7799 [21].

Except for COBIT and ISO/IEC 38500, these frameworks are not ITG-specific. The ISO/IEC 38500 standard comprises a set of six principles for directors and top management: responsibility, strategy, acquisition, performance, conformance and human behavior [22]. However, there is “no specific and well defined exemplar framework and standard for IT” [23]. That makes it insufficient for implementation in practice. Although COBIT’s scope has increased over the years, accounting and information systems are the predominant domains related to COBIT [24].

A well-known classification comprises the three layers of Peterson et al. [7]:

- Structural integration;
- Functional integration;
- Social integration.

In 2004 this became better known (and somewhat simplified) as the trichotomy of structure, processes and relational mechanisms [8]. This classification may be concise and practical, but as among others Willson and Pollard [25] have shown, ITG is not limited to structure, processes and mechanisms; it also relies on complex relationships, between history and present operations. Furthermore, cultural and human aspects are some of the factors that had the greatest influence on the implementation of ITG by 50% of the participants of a large global survey conducted by ITGI [18]. Thus, in this study, we look at ITG from two perspectives: a “hard governance” perspective and a “soft governance” perspective.

### ***Hard governance***

Hard governance is related to structural integration and functional integration:

- *Structural integration*: formal structural mechanisms with increasing complexity and capability, ranging from direct supervision, liaison roles, task forces and temporary teams to full-time integrating roles and cross-functional units and committees for IT [7], [26], [27]. Informal structural integration comprises unplanned cooperative activities. Under complex and dynamic conditions, informal structural mechanisms support formal structural integration [27].
- *Functional integration*: the system of IT decision-making and communication processes [28]. The decision-making processes and decision-making arrangements [29] are redefined in a later stage as “decision rights and accountability framework” [5]. The communication processes describe the formal communication and mutual adjustments among stakeholders [26], [27].

We define hard governance as the organizational aspects of governance, linking it to functional aspects like structure, process and the formal side of decision-making. These aspects are also defined as elements of organizational design. Structural integration mechanisms for ITG describe formal integration structures and staff-skill professionalization.

### ***Soft governance***

The third element *Social integration* is highly related to soft governance and related to people. People represent the most important assets of an organization. People do not work or think in terms of process and structure only; human behavior and organizational culture are equally important aspects of governance. Improvements are needed less in terms of structure and process and more in terms of the human or social aspects of governance [30]. Mettler and Rohner argue that an organization can be seen as a consciously coordinated social entity in which contextual factors describe the situativity in organizational design [31]. An understanding of the organizational culture is critical in a maturity model for ITG [32].

A survey by the IT Governance Institute showed that the culture of an organization was deemed by 50% of the participants as one of the factors that most influenced the implementation of ITG, surpassed only by “*business*

*objectives or strategy*”, which scored 57% [18]. Thus, governance is about people too, which intimates that human behavior and social aspects are just as important. Soft governance requires greater attention.

## 2.2 ITG maturity

Most maturity models used for ITG are related to the existing frameworks previously mentioned, which are largely focused on processes and structure [32]. Thus in practice, processes and organizational structures are needed, but ITG has social elements, too. To be able to grow in maturity, organizations should pay attention to the hard and soft aspects of governance. Relational mechanisms can be seen as the social dimension [17] but are too limited to cover the broad range of topics from the social sciences which are relevant for ITG.

A systematic literature review searching ITG literature for maturity models that include the soft side resulted in five (relatively) new ITG maturity models [33]. Only two frameworks were found covering hard and soft ITG: COBIT 5.0 in a holistic way and the MIG model in a more practical way. The MIG model was developed using design science to measure hard and soft ITG [34] because an ITG maturity model covering both parts of governance did not exist [14], [18], [35]. In this study, we applied the MIG model and the corresponding MIG assessment instrument [14], [36].

The MIG model is a focus area maturity model (FAMM) designed to measure the hard and soft ITG of an organization. The MIG assessment instrument is an instrument designed to be used in practice to measure ITG maturity using the MIG model. The goal of this study is to evaluate the usability of the MIG assessment instrument, and in the process, to answer the following research question:

*How usable is the MIG assessment instrument for measuring hard and soft ITG maturity in an organization?*

FAMMs differ from previous approaches by defining a specific number of maturity levels for a set of *focus areas*, which embrace concrete capabilities to be developed, to achieve maturity in a targeted domain [37]. Table 1 summarizes the MIG model.

Table 1. The MIG model

Governance	Domain	Focus area	Maturity model used
Soft governance	Behavior	Continuous improvement	Bessant et al. [38]
	Behavior	Leadership	Collins [39]
	Collaboration	Participation	Magdaleno et al. [40]
	Collaboration	Understanding and trust	Reich and Benbasat [41]
Hard governance	Structure	Functions and roles	CMM [42]
	Structure	Formal networks	CMM [42]
	Process	IT decision-making	CMM [42]
	Process	Planning	CMM [42]
	Process	Monitoring	CMM [42]
Context	Internal	Culture	Quinn and Rohrbaugh [43]
	Internal	Informal organization	Using the nine focus areas of soft and hard governance.
	External	Sector	Sections of NACE Rev. 2 [44]

The MIG model follows the theoretical proposition that improving ITG focus areas will result in more mature ITG, which will result in improved firm performance. The context is important because research has shown that IT governance is situational and essential for delivering information about the situational part of ITG [18], [31], [32], [45].

We introduced two perspectives in the third version of the MIG assessment instrument: a departmental and a corporate perspective. To complement the instrument with a corporate perspective, we have been careful not to make significant alterations to the validated instrument [46].

Corporate governance is IT- and business-related. In practice there are almost no IT-specific projects: with the exception of some very particular technical projects, all projects are business-related. In the assessment, the participants were asked to fill out the questionnaire from both a departmental and corporate perspective. We explained that for “the entire organization”, the focus area “IT decision-making” may be seen as “Decision-making”. The statements were kept the same as in the previous version. The only change to the instrument was to double the questionnaires by adding a second column to the instrument for the corporate governance perspective.

The adjusted instrument consisted of three questionnaires:

- *Questionnaire 1:* containing 70 statements using a six-point Likert scale for the department and for the corporate perspective (the entire organization).
- *Questionnaire 2:* containing nine groups of two statements for the Informal organization. Respondents had to divide 100 points between each pair. Twice, again for the department and for the entire organization.
- *Questionnaire 3:* the third questionnaire on culture was based on an existing questionnaire, the Organizational Cultural Assessment Instrument (OCAI). The respondents filled out the questionnaire twice, once for each perspective.

During the interviews, we evaluated the results sheet for both perspectives. When processing the results, we created two results sheets rather than one. Each sheet displayed the maturity level reached for each of the nine focus areas, a table and a graph with percentages for “informal organization”, and the positioning within the Competing Values Framework for one of the perspectives (see Figure 1).

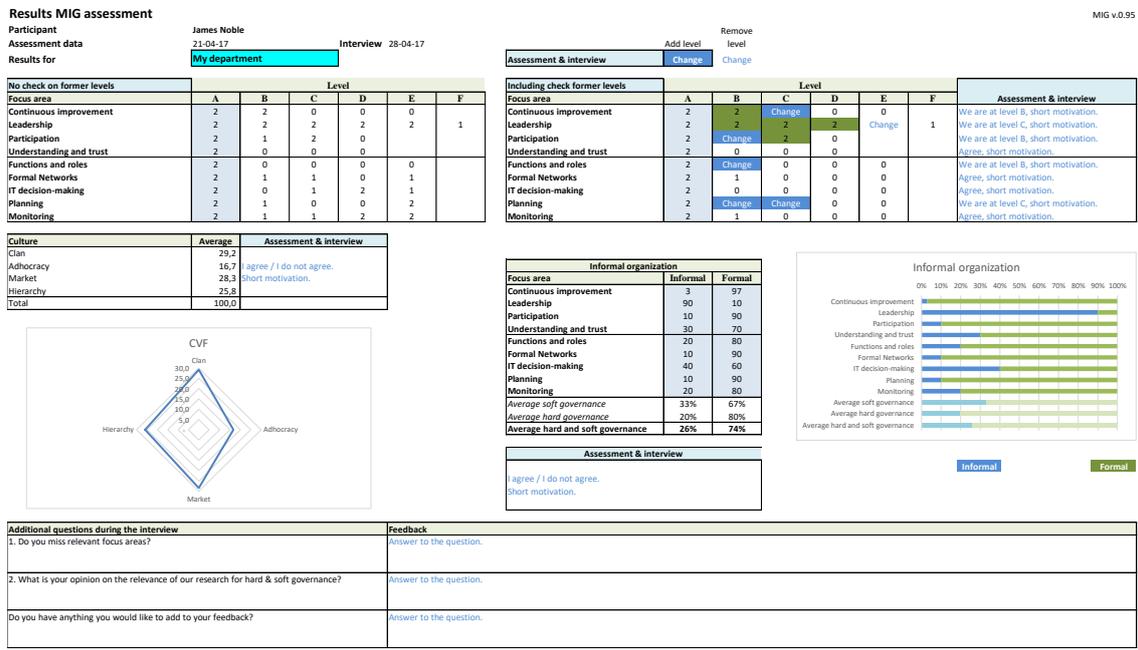


Figure 1. Example result sheet IG assessment instrument (department view)

The results sheet might appear more complex than the reality:

- The two upper tables show the results of the maturity part of the MIG model following the survey (left) and the interview (right). The tables show the maturity level reached for each focus area of the MIG model (questionnaire 1). Column A is the starting point. A colored box means that a level has been reached. The text “Change” means that the level was changed at the request of the interviewee.
- The graph and table on the lower right show the results of the points assigned to the “informal organization” for each focus area in the form of a graph and the associated data (questionnaire 2).
- The graph and table on the lower left show the results of the OCAI (questionnaire 3), consisting of the Competing Values Framework in the form of a graph and the associated data.

A description of the changes applied to the instrument during the third cycle are included in the results section. A full description of the MIG assessment instrument version 3 is included in Appendix C of the PhD dissertation “Hard and soft IT governance maturity” [47].

### 3. Research method

The research presented in this paper is based on design science. The MIG model and the MIG assessment instrument are also artefacts resulting from design-science.

Our research process was as follows:

- a. Design the third version of the MIG assessment instrument based on an analysis of the evaluations of the previous version;
- b. Conduct case studies using the third version of the MIG assessment instrument to test the usability for different types of users;
- c. Evaluate the results of the study.

#### 3.1 Design science

The scientific view of design originates from the concepts found in Simon’s [48] seminal book *The Sciences of the Artificial*. Charles and Ray Eames [49] define design as “a plan for arranging elements in such a way as to best accomplish a particular purpose”. Design science is “a body of intellectually tough, analytic, partly formalizable, partly empirical, teachable doctrine about the design process” [50]. At its root it is a problem-solving paradigm. Design science is a science of the artificial that involves searching for the means by which artefacts help achieve goals in an environment [51]. The environment in this research is the organization. The goal of this study is to evaluate a designed artefact that can help the ITG of an organization to grow in maturity to become more effective.

There is no widely accepted definition of design-science research [52]. The design-science paradigm embraces seemingly contradictory principles [53]. Design and science share the same subject – in this study people and organizations – and produce artefacts, but their aims, methods and criteria are quite different [54]. Indeed, design is concerned with synthesis, whereas science is concerned with analysis [48]. This has resulted in a rich discussion around the process of design-science research, its artefacts and the role of theory.

In order to create a *useful* artefact to solve a practical problem, the design of the MIG model and instrument followed the guidelines of Hevner et al. [55] and Peffers et al.’s [56] design-science research methodology process model. In addition, we applied the guidelines and three cycles of Hevner: the Relevance cycle, the Design cycle and the Rigor cycle [57]. In the research, each cycle was covered:

1. The use of Delphi panels with practitioners to design the artefacts relevant for practice [58]. To be relevant in practice, the artefacts must be easy to use and understood in practice.
2. The design of the first version of the MIG assessment instrument was already published [34]. This paper describes the evaluation of the second and third version of the instrument. Evaluation is a key activity in design-

science research [59]. We collect information from the participants in the case studies to validate and evaluate the artefacts. “The actual success of a maturity model is proved if it brings about a discussion on improvement among the targeted audience” [60].

3. The studies are based on previous research and scientific methods when adding, combining or improving components of the artefacts.

Hevner et al. [55] note that the design-science paradigm seeks to extend the boundaries of human and organizational capabilities by creating new and innovative artefacts. Design science is a commonly used approach in IS research as well in the social sciences [61]. Our goal is to design an ITG maturity model that can be used to help organizations to grow in maturity and thereby become more effective. This affects organizational processes, structures and the collaboration between people (the employees). Thus, we need to combine IS research and the social sciences.

Tarhan et al. [62] propose a distinction between the maturity model and assessment instrument because:

1. The model describes an improvement path while the instrument determines the status quo;
2. The instrument is not necessarily unique: there could be more assessment instruments based on the same maturity model e.g. an instrument for self-assessment and an instrument for use by (specialized) assessors;
3. The absence of a clear distinction may lead to flawed designs [63] and confusion [64].

In addition to the model, an assessment instrument was developed to determine the current status of an organization’s ITG. The model was named the MIG model (Maturity IT Governance) and the instrument was named the MIG assessment instrument. The research approach combines knowledge from literature and experts from practice to achieve both “problem relevance” and “research rigor” [55]. The instrument is “necessary to determine how maturity measurement can occur” using the MIG model by “inclusion of appropriate questions and measures within this instrument” [65].

Empirically founded maturity models are rare [66]. Design science is well-suited to designing maturity models. The development of a maturity artefact should follow a design science approach as it gives a “methodological frame for creating and evaluating innovative IT artefacts” [55]. It is important to involve stakeholders throughout the process of design and thereafter [60], [65].

A maturity assessment instrument can be used to measure the current maturity level of a certain aspect of an organization in a meaningful way [67]. Maturity assessments are highly complex specialized tasks performed by competent assessors, rendering it an expensive and burdensome activity for organizations [67]. There is room for improvement by the provision of easy-to-use assessment guidelines [63]. It is important to test both the model and instrument [65].

Experts agree that design research involves designs that are clearly driven by underlying theories [51], in which theory and experience are engaged in generating new artefacts intended to change social and/or physical reality in purposeful ways. The goodness and efficacy of an artefact can be rigorously demonstrated via well-selected evaluation methods [55], [68]-[70].

### 3.2 Case studies and the case study protocol

The purpose of evaluation in design science is to determine if an instantiation of a designed artefact can “establish its utility and efficacy (or lack thereof) for achieving its stated purpose” [71]. As long as the instrument is in a development stage we combine the use of the instrument with semi-structured interviews. Interviews are often deemed an essential component of case study research [72]. Interviews seek to validate and evaluate [55] whether the results of the instrument correspond with the opinion of the participant and to gather information regarding the reasons why the participant does or does not agree with the resulting maturity level.

The assessment instrument was used in case studies conducted by students and by the researchers. The reasons for choosing this combination are threefold.

*First*, we incorporated triangulation by using different methods to collect data: participants were asked to fill out the assessment instrument, participants were interviewed using the results sheet, and the case studies were conducted by both Dutch and international full-time student-groups and researchers. By cross-validating the instrument when used by students and more experienced researchers, we expect to acquire a better understanding of the usability of the MIG assessment instrument in practice. The case study allowed students to bring topics together and support students to link and apply theory to practice [73], as well as develop useful insights regarding the complex workings and functional interactions of an organization [74], [75]. We adopted Willcocksen's unusual two-way flow of activity and research-based teaching to improve learning outcomes for students and research outcomes for academic staff [76].

*Second*, improving the research and education of Master's degree students registered for the IT management course at our university. This was a two-way process that "may be adapted to any discipline" and will lead to "both improved learning outcomes for students and improved research outcomes for academic staff" [76]. Studies on the nexus between teaching and research reveals that the variables used for teaching/learning quality or output and their operationalization are both diverse and limited [77]. Recent empirical evidence tends however to indicate a positive correlation between research performance and teaching [78]. Students were enabled – but not required – to use the MIG assessment instrument to assess a medium- or large-size organization (1000 FTE or more) in a practical group assignment. By summer 2018, none of the student groups had decided to use a different approach. If they chose to use the instrument, the students were required to follow the case study protocol. By engaging Master's degree students registered for the IT management course in ITG research, we complete an unusual two-way relationship, in which research underpins teaching and learning, and the teaching and learning activity underpins research.

*Third*, the designed artefact was intended for use in practice. The assumption was that if students are able to use the instrument, it can be expected that practitioners — who in general have much more practical experience — will also be able to use it.

For the application of the MIG assessment instrument, we used a case study protocol. The protocol is shown in Figure 2.

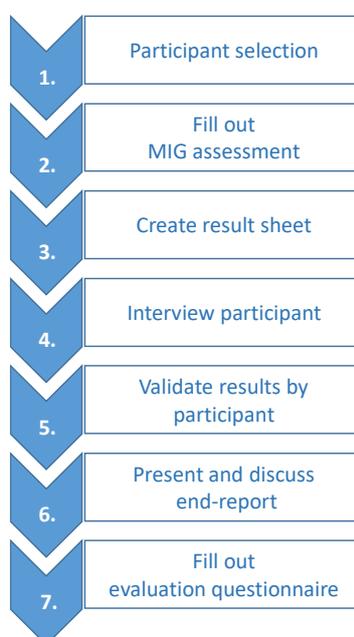


Figure 2. Case study protocol for the MIG assessment

The protocol used for the application of the instrument was as follows:

1. A group of participants in a strategic role from business and IT were selected and invited to participate in the study.
2. Each participant was asked to fill out the MIG instrument before the interview.
3. The researcher created the results sheet using the instrument and brought it as a handout to the interview.
4. During the semi-structured interview, the results for each focus area were discussed. Where relevant, the results were changed based on the opinion of the interviewee. The interviews lasted an average of one hour and were recorded.
5. Following the interviews, the results were summarized and sent to every participant for validation.
6. A report summarizing the results of the study were written, presented and discussed with the client and the participants.
7. The participants (for case studies conducted by the researchers) or students were invited to fill out a short evaluation questionnaire.

Having completed the interviews, the results were combined and analyzed. The results of the analysis, conclusions and recommendations were anonymized, summarized in a report and presented to the sponsor of the case study within the organization. The results of the case studies conducted by the students (cases 3–10) were also presented to the researchers. The student groups were obligated to share the completed customer versions of the MIG assessment instrument with the researchers. The evaluation form used was created based on an evaluation template for expert reviews of maturity models [79]. The participants were invited to fill out the evaluation questionnaire after the interview, while the students were invited following the presentation of the end results to the researchers.

### 3.3 Evaluation strategy

After each cycle the design of the MIG assessment instrument was evaluated and improved. During the design cycles a balance must be found in constructing and evaluating the evolving design artefact. Both activities must be convincingly based on relevance and rigor [80].

The first cycle started with the design of the first version of the MIG assessment instrument. Gregor and Jones' [81] anatomy of a design theory was used to evaluate the design of the MIG model and the MIG assessment instrument. Each year the instrument was changed only minimally. They state that a design theory that includes the first six components is sufficient to create a model of an artefact. Two additional components are needed to be able to implement the artefact in a practical instrument: principles of implementation; and an expository instantiation (= a physical implementation of the artefact). In Table 2 we describe how the design process complies with Gregor and Jones' eight components for the design of the MIG model and the MIG assessment instrument.

Table 2. Evaluation of the MIG model and the MIG assessment instrument based on Gregor and Jones [81]

Component	The way we complied with the component
1. Purpose and scope	The MIG model and the MIG assessment instrument intended to increase the effectiveness of the ITG of an organization by improving the maturity of the ITG focus areas.
2. Constructs	In the MIG model, ITG is represented by a set of relevant focus areas.
3. Principles of form and function	The MIG assessment instrument was created to assess an organization based on the MIG model. A case study protocol was described as a guideline for conducting case studies using the MIG assessment instrument.
4. Artefact mutability	The research was conducted in three cycles and demonstrated the mutability of the MIG model and the MIG assessment instrument.
5. Testable propositions	An element of the case study protocol was that the results of the MIG assessment instrument

Component	The way we complied with the component
6. Justificatory knowledge	were discussed with a participant in an interview. The interviews intended to test if the results of the instrument corresponded with the opinion of the participant and to gather information regarding why the participant did or did not agree with the resulting maturity level.  The MIG model was designed using existing maturity models from the literature for each of the focus areas. The MIG assessment instrument was based on the MIG model and existing definitions of the maturity levels of each focus area.
<i>Additional components</i>	
7. Principles of implementation	The MIG model is a Focus Area Maturity Model (FAMM). An element of an FAMM is the definition of improvement actions for each focus area and each maturity level. These improvement actions are yet to be described but form part of the “Future research” section of this paper.
8. Expository instantiation	In several cycles case studies were conducted using the MIG model and the MIG assessment instrument.

The changes applied were the results of obvious inadequacies or improvements suggested by a substantial proportion of the participants. The intention is that the developed instrument will be used in case studies combined with semi-structured interviews. For the design cycle, the MIG model, the MIG instrument and the interviews of the case study are relevant.

In order to determine the validity of an instrument, “content validity”, “construct validity”, “reliability” and “internal validity” were to be evaluated (Straub, 1989). Given the qualitative nature of the research, we did not test for the relationship between variables (“statistical conclusion validity”). The purpose of evaluation in design science is to determine if an instantiation of a designed artefact can “establish its utility and efficacy (or lack thereof) for achieving its stated purpose” [71]. The semi-structured interviews were intended to validate and evaluate [55] whether the results of the instrument matched the opinions of the participants and to gather information regarding the reasons why they did or did not agree with the resulting maturity level. By using diverse data-gathering methods and comparing results, it became possible to determine the extent to which instrumentation affects the findings, as well as their robustness.

The results section covers:

- a. The results of the evaluation and changes after the second cycle of the design process of the MIG assessment instrument (4.1);
- b. The results of the case studies conducted with the third version of the MIG assessment instrument (4.2).

Thus, the focus of this study is the design and evaluation of the third version of the MIG assessment instrument. A full description of the MIG assessment instrument versions can be found in the PhD dissertation “Hard and soft IT governance maturity” [47].

#### 4. Results

This section summarizes the changes to the MIG instrument after the second cycle and the results of the use of the third version of the MIG instrument. As explained in the previous section, during the third cycle the instrument was only changed minimally for obvious inadequacies or improvements suggested by a substantial part of the participants.

4.1 Evaluation of the second cycle

The changes in the third version of the MIG assessment instrument were based on the evaluation after the second cycle. The selected changes for the third version of the MIG assessment instrument are summarized in Table 3.

Table 3. Selected changes for the MIG assessment instrument after the second cycle

Top 5 suggested improvements	Change?	Motivation
1. Most of the questions are difficult to answer using just a “Yes”/“No” answer.	Yes	We introduced a six-point Likert scale representing 0, 20, 40, 60, 80 or 100% agree.
2. It is not clear to which organizational entity the question refers. An option would be to define two views, e.g. a single department and an entire organization.	Yes	We introduced two views as suggested: a view for a single department and a view for the entire organization.
3. The questions are too general.	No	We will not change the questions but improve the documentation of the instrument.
4. Some questions are too complex or unclear.	Yes	Improve the documentation of the instrument.
5. The results of the assessment and the interview are different. The interview should be leading.	No	We know this, hence we combined the assessments with the interviews.

For the third cycle in 2017 we introduced the following changes to the assessment instrument:

- a. Participants using the previous versions delivered numerous comments about there being “too limited choice” where “Yes” and “No” are the only possible responses. The participants sought the ability to add some nuance to their answers. In 2017 the possible answers to the statements were changed from “Yes” and “No” into a six-point Likert scale using the following percentages: 0, 20%, 40%, 60%, 80% and 100%.
- b. A second perspective was added, resulting in a departmental and organizational view (corporate governance view). Thus, in each of the three assessments, the participant was asked to answer the question from a departmental and an organizational perspective. A definition of both perspectives was handed to the participant to be used when filling out the assessment. As a result of this change, the assessment instrument created two results sheets, one for each view. This change was introduced because participants deemed it easier to answer the questions when they had the ability to compare their own department with other departments of the organization. In the case studies, the second view was always used as corporate perspective. An additional benefit of this second view was that it delivered data from a corporate (governance) perspective.

An examples of the first three assessment statements for *Questionnaire 2 The informal organization* are displayed in Figure 3.

Assessment 2 - The informal organization							
Please divide 100 points between columns D and F for each set of two statements (as shown in the example).							
Focus Area	INFORMAL	My department		The complete organization		FORMAL	Remarks (optional)
		Points	Points	Points	Points		
Example	Our projects are nearly always successful.	70	30	60	40	Our projects have rarely been successful.	I think our department is more successful with projects. (This is only an example and not part of the assessment)
Informal organization	IT decision making is informally organized.					IT decision making is formally organized.	
	We use informal planning.					We use formal planning.	
	Monitoring is an informal process.					Monitoring is a formal process.	

Figure 3. Example of the statements for informal organization (simplified version)

- c. Some questions are too complex or unclear. We improved the documentation of the instrument by adding an extensive list of definitions.

#### 4.2 Results of the case studies during the third cycle

This section discusses the use and evaluation of the third version of the MIG assessment instrument. This third cycle of case studies is based on data collected in 10 case studies. All case studies were conducted in 2017 (see Table 4).

Table 4. Overview of the case studies

#	Sector	#P	Inf. (avg; $\sigma$ )	Culture (1st)	Culture (2nd)	Size (x1000)
1	O; Public administration and defense; compulsory social security	10	58%; 11%	Hierarchy	Clan	57
2	O; Public administration and defense; compulsory social security	7	38%; 14%	Hierarchy	Clan	110
3	N; Administrative and support service activities	4	48%; 9%	Market	Hierarchy	5.5
4	P; Education	5	53%; 9%	Hierarchy	Clan	2.9
5	K; Financial and insurance activities	4	51%; 14%	Market	Hierarchy	54
6	M; Professional, scientific and technical activities	8	60%; 13%	Clan	Adhocracy	15
7	D; Electricity, gas, steam and air conditioning supply	5	46%; 10%	Clan	Hierarchy	64
8	I; Accommodation and food service activities	5	61%; 13%	Clan	Adhocracy	0.8
9	J; Information and communication	5	61%; 11%	Clan	Adhocracy	24
10	N; Administrative and support service activities	7	63%; 14%	Clan	Market	13

# is the number of the case study in 2017.

Sector is the sector of the organization, according to NACE v. 2 (section; description).

#P is the number of participants in the case study.

Inf. represents the average and standard deviation of the percentage informal governance between the answers of the participants.

Culture shows the most dominant cultural perspective (1st = highest value) and second most dominant (2nd).

Size is the number of employees in full-time equivalents (FTE).

All studies were conducted in organizations with more than 1000 employees. Eight were conducted by groups of four or five full-time students, and two case studies were conducted by the researchers (the cases #1 and #2). As an example, the first case study will be described in detail in this section.

During the preparation of the third cycle we used an evaluation form based on an evaluation template for expert reviews of maturity models [79]. The participants were invited to fill out the evaluation questionnaire following the interview, while the students were invited to complete it after presenting the end results to the researchers.

#### Detailed description of case #1: National government

This case study was conducted at a large independent administrative party of the Dutch government. A selection of 10 participants from business and IT were invited to participate in the case study. The participants were chosen in close collaboration with the responsible manager of one value chain of the organization. All participants had a management position (nine) or a key role (one) in the value chain, and were involved in strategic business and IT discussions with respect to the value chain.

Table 5 shows the results before and after the interviews for both views.

Table 5. Results of the hard and soft governance (before; after)

Governance/focus area	Department view						The entire organization					
	A	B	C	D	E	F	A	B	C	D	E	F
<i>Soft governance</i>												
Continuous improvement	10; 7	0; 2	0; 1				10; 7	0; 1	0; 1			
Leadership	6; 2	2; 4	2; 2	0; 2			8; 5	2; 3	0; 1	0; 1		
Participation	10; 2	0; 5	0; 3				10; 3	0; 6	0; 1			
Understanding and trust	10; 6	0; 4					10; 8	0; 2				
<i>Hard governance</i>												
Functions and roles	7; 4	1; 1	2; 5				6; 3	1; 2	3; 5			
Formal networks	8; 6		1; 3	0; 1			8; 6		2; 4			
IT decision-making	9; 8	0; 1	1; 1				8; 8	1; 1	1; 1			
Planning	7; 4	1; 2	1; 3		0; 1		7; 5		2; 4		1; 1	
Monitoring	7; 3	0; 3	1; 3		2; 1		7; 5	0; 1	1; 3		2; 1	

In general, there were considerable differences in the results, as demonstrated by the assessment and opinion of the participant regarding the soft governance part and relatively low number of changes to the hard governance part. Where participants suggested changes, they were always towards a higher maturity level in this case study. The participants thus always desired a change to a higher and never to a lower maturity level, compared to the maturity level displayed on the results sheet.

The rationale behind the changes provides some idea of the ways in which participants interpreted the focus areas. Some participants changed their opinion after an additional explanation of the focus areas, partly accounting for the changes.

Table 6 shows the results after the interviews for the focus areas of the context.

Table 6. Results of the context, view: value chain, after the interview

Governance/focus area	Department view						The entire organization					
	Min.	Max.	Avg.	$\sigma$	Agree	Not agree	Min.	Max.	Avg.	$\sigma$	Agree	Not agree
<i>Culture</i>												
Clan	25.0	48.0	35.8	7.3	9	1	16.7	43.3	28.2	9.1	10	0
Adhocracy	0.0	25.0	13.5	9.2	10	0	0.0	24.2	12.9	8.3	10	0
Market	0.0	24.2	13.4	8.9	10	0	0.0	28.3	15.1	9.7	10	0
Hierarchy	18.3	68.3	37.3	17.1	8	2	24.2	83.3	43.8	21.9	9	1
<i>Informal organization</i>												
Hard and soft governance	31%	57%	46%	9%	10	0	18%	58%	41%	11%	10	0

In the table, Min, Max, Avg. and  $\sigma$  are the minimum, maximum, average and standard deviation of the values/percentages between the participants' answers, respectively. "Agree" and "Not agree" highlight whether the participants agreed with the results of the assessment.

The participants mostly agreed with the results. There were two exceptions: a participant who responded that his score in the department view for "Hierarchy" was too high (31.7) and "Clan" too low (26.7) and a participant who responded that his scores for "Hierarchy" were too low (18.3; 24.2) in both views.

## 5. Discussion

### 5.1 Evaluation of the instrument

The case studies conducted by the researchers were in organizations one of the researchers knows very well. Thus, besides the results of the assessment and the interviews we already knew a lot about the strong and weak points of the organization. This was very useful for the evaluation of the instrument, when interpreting the results, deciding on the topics to go in depth during the interviews, and when assessing differences between the results of the assessments and the interviews.

In general, the comments regarding the use of the MIG instrument were positive: "The way of visualizing the results is very clear"; "The tool delivers very quickly an indicative impression of the maturity of several ITG processes". However, the comments on the statements and documentation were more critical: "Without the interview, the participant might misinterpret questions"; "To get reliable results, it is necessary to interview the participants".

Table 7. Overview of the suggested improvements during the case studies

#	Sector	#Participants	#Students	Improvements suggested:
1	O Public administration and defense; compulsory social security	10	0 (researchers)	2, 3, 5
2	O Public administration and defense; compulsory social security	7	0 (researchers)	2, 3, 5
3	N Administrative and support service activities	4	5	3, 4
4	P Education	5	4	1, 2, 5
5	K Financial and insurance activities	4	4	3, 4
6	M Professional, scientific and technical activities	8	5	3, 4
7	D Electricity, gas, steam and air conditioning supply	5	5	1, 2
8	I Accommodation and food service activities	5	5	1, 2
9	J Information and communication	5	4	2
10	N Administrative and support service activities	7	5	1, 2

# is the number of the case study in 2017.

Sector of the organization, according to NACE v. 2.

#Participants is the number of participants in the case study.

#Students is the number of students conducting the case study.

Improvements are the top 5 suggested improvements for the MIG assessment:

1. The number of assessments is too low.
2. Equivocal, unclear or excessively black and white statements/questions.
3. Participants need further or better explanations of the semantics/terms used in the assessment.
4. Students would welcome a more detailed or standardized interview plan.
5. Basing the results simply on whether a participant agrees 80-100% is insufficient.

The case studies resulted in a long list of proposed improvements for the instrument, some important, some minor. These suggested improvements were analyzed and categorized. The top five most suggested improvements are included in Table 7.

### 5.2 Evaluation of the changes in the third cycle

The case studies of 2017 resulted in a list of suggested improvements (see the section 5.3). However, first we discuss the results of the changes applied in 2017.

During the third cycle we used the same criteria as in the previous cycle. Based on the feedback of the participants and the users of the instrument, we concluded that each change may be considered an improvement. Given that the evaluation of each amendment was positive (column *Keep* in Table 8), there was no reason to reverse any of the changes. Based on the feedback of the participants and the users of the instrument (the students), we can conclude that each change may be deemed an improvement.

Table 8. Evaluation of the changes in the third cycle

Changed during the third cycle	Discussion of the change	Improved?	Critique	Keep
1. Most of the questions are difficult to answer using just a "Yes"/"No" answer.	After changing the Yes/No scale into a six-point Likert, we did not receive any further comments. The only remark was that it would be preferable to have an option such as "Don't know". We did not add this option given the possibility of skipping questions and adding remarks.	Yes, fully resolved.	We received no critique regarding the change.	Yes
2. It is not clear to which organizational entity the question refers. An option would be to discern two views, e.g. a single department and the entire organization.	We added a definition of the views in the documentation. In some of the case studies, participants did not consider this sufficient. The description in the documentation might be retained but additional communication is required to clarify the part of the organization emphasized for the departmental view and corporate view.	Yes, fully resolved.	We received no critique regarding the change.	Yes
4. Some questions are too complex or unclear.	We supplemented the documentation but received the same comments on the questionnaire as in the second cycle. Some questions continued to be considered too unclear or general. Additional improvements to the documentation are thus required. An alternative option might be to alter the process by organizing a kickoff meeting with the participants of the study to explain the research and terminology used. In practice, organizing a meeting attended by all participants is very difficult and time-consuming.	Partly resolved.	We received no critique regarding the documentation (the change) but some questions remain. We need to further improve the documentation of the instrument.	Yes
Improved?	Related comments decrease or stop completely.			
Critique	Critique regarding the change?			
Keep	Keep the change?			

### 5.3 Evaluation of the results and preparation of the next cycle

Having completed the case study, the participants of case studies #1 and #2 as well as the students were invited to fill out a short evaluation questionnaire. The questionnaire used a six-point Likert scale ranging from "Disagree completely" (valued as one point) to "Agree completely" (valued as six points). The questionnaire was returned by eight participants in case #1 (80%) and six participants in case #2 (86%), as well as 20 students (56%).

Table 9. Summary of the evaluation

#	Statement	Case 1	Case 2	Students
10	The MIG instrument is useful for conducting assessments	4.3 (0.8)	4.7 (0.8)	4.4 (1.1)
11	The MIG instrument is useful for practice in my organization	4.3 (1.0)	4.5 (0.8)	3.9 (1.0)
12	The MIG instrument combined with interviews is useful for practice in my organization	4.9 (0.9)	5.2 (1.0)	5.1 (0.9)
17	The results of the MIG instrument can be used in practice in my organization	3.9 (1.1)	4.5 (1.0)	4.0 (1.1)
22	The results of the MIG instrument combined with interviews can be used in practice in my organization	4.6 (0.5)	5.2 (1.0)	5.0 (0.9)
33	Would you suggest any updates or improvements related to the MIG instrument?	N(7); Y(1)	N(6); Y(0)	N(2); Y(18)
37	Would you suggest any other updates or improvements related to the MIG model?	N(7); Y(1)	N(6); Y(0)	N(15); Y(6)

# is the number of the statement on the evaluation form

The results for Case 1 and Case 2 in Table 9 are based on evaluations by the participants. The final column shows the results of the evaluation by the students. The comments for each case study have already been summarized in Table 7. The number in parentheses is the standard deviation. The participants and the students were generally rather positive about the usefulness and usability of the results of the instrument (in most cases being between 4 and 5 on a scale out of 6). Furthermore, the evaluation scores indicate that combining the instrument with interviews consistently results in higher scores. In general, the responses from the students during the practical examinations were positive, such as it was a “great learning experience for our team” (case #3).

## 6. Conclusion

This section summarizes the answers to the research question:

*How usable is the MIG instrument for measuring current hard and soft ITG maturity in an organization?*

The results sheets of the MIG assessment instrument are helpful during the structured interviews in discussing the focus areas. We received many positive comments on the usability of the tool in general: “The way of visualizing the results is very clear” and it “delivers very quickly an indicative impression of the maturity of several ITG processes”. The case studies additionally resulted in a long list of proposed improvements to the instrument. Only two of the 10 case studies stimulated comments regarding the representation of the opinions of the participants in the results. Based on all comments concerning univocal statements, a higher percentage might be expected.

An evaluation survey among participants and students yielded positive results regarding the usefulness and usability of the results of the instrument (in most cases being between 4 and 5 on a scale of 6, see Table). Furthermore, the evaluation scores demonstrated that combining the instrument with interviews resulted in even higher scores (around 5). The results of the evaluation when asked to evaluate “the usability of the results of the MIG instrument in practice in my organization combined with interviews” resulted in scores between 4.6 and 5.2 on a scale out of 6. This accorded with the comments registered during the interviews with participants in the case studies conducted in the previous cycles. We thus conclude that the instrument is usable in practice for measuring hard and soft ITG. The interviews delivered valuable information regarding the reasons why the participants agreed or not with the resulting maturity levels, the graph of the Competing Values Framework, and the percentage for “Informal organization”. This information can be used to improve the instrument. Substantial improvements to the instrument were applied during the design cycles. After the third cycle the top five most important improvements required were: (1) the number of assessments is too low, (2) equivocal, unclear or excessively black and white statements/questions, (3) participants need further or better explanations of the semantics/terms used in the assessment, (4) students would welcome a more

detailed or standardized interview plan, and (5) basing the results simply on whether a participant agrees 80-100% is insufficient.

The third version of the MIG assessment instrument is usable in practice, but further improvements are required to reduce the deviation between the results of the instrument and the opinions of the participants, as well as to fix certain deficiencies. We conclude that a combination of the MIG assessment instrument and structured interviews is useful for measuring current hard and soft ITG.

### 6.1 Limitations

The case studies described in this paper are conducted in the Netherlands and the in-depth case studies were in government organizations. The case studies show that it is possible to use the instrument to map the current ITG of an organization into the MIG model. The investigated organizations differ in terms of size and industrial sector. However, the evaluation was limited to organizations based in the Netherlands and large multinationals, which vary in size and industrial sector. Case studies in other countries or regions with different cultures might deliver different results.

### 6.2 Future research

The evaluation in this study indicates that the MIG instrument continues to require improvements, and this will require several cycles. We conducted case studies with relatively few participants (between three and 10). All cases studies described in this paper were conducted in the Netherlands. It would be interesting to conduct case studies with a larger number of participants or use and validate the model in other countries.

The MIG instrument was created in Excel. An online version of the instrument would be easier to use and represent a good way of creating a case study database that might be usable to create benchmarks. Further improvements to the questionnaire might help achieve the ultimate goal: to create an instrument that can be used by the members of an organization without requiring interviews to correct the results and render the instrument available to the public.

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