

SINIS: A Method to Select Indicators for IT Services

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Abstract. Measurement initiatives support organizations in the control, management and improvement of their processes, products and services. IT services literature suggests proper identification of critical business processes and definition of relevant indicators to support decision-making. However, there is no clear direction about what should be the critical business processes and indicators. Moreover, most organizations consider indicators selection a difficult task. In this paper, we present SINIS, a method that supports the selection of indicators for IT services measurement. The research question that guided this work is: “How to support selection of IT services indicators at different levels and aligned with organizational goals?” We have conducted a case study in industry and the results showed that SINIS can be used to support IT service measurement. However, evidence suggests that it is still hard for organizations to define strategies and indicators to monitor and improve critical processes.

Keywords: Measurement, IT Services, Indicators, GQM+Strategies, COBIT.

1 Introduction

IT service management is a set of specialized organizational capabilities for providing value to customers through services. This practice is increasingly growing by adopting an IT management service-oriented approach to support applications, infrastructure and processes [4].

Guidance on how to develop and improve IT service maturity practices is a key factor to improve service performance and customer satisfaction [3]. Models such as CMMI-SVC [3] and MR-MPS-SV [10] have this purpose. They require appropriate measures to be identified in order to monitor processes executed for delivering service to customers. Thus, selection of processes to be measured must be aligned with organizational goals so that measurement results can provide relevant information for proper decision-making. However, there is no clear direction or strict suggestion about which critical processes and measures should be considered.

Aiming to identify measures that could be used to assess IT service quality, we carried out a systematic mapping study in which a set of measures was obtained [12]. Although the investigated papers suggested some measures applicable to IT services,

there are no details about how these measures had been selected. After the study, we performed a case study in industry [13] to evaluate the applicability of the identified measures in a real context. The company where the case study was performed had corroborated that the selection of IT services measures is not an easy task.

The existence of a set of measures from which is possible to choose the ones useful to an organization can reduce effort and speedup selection [5] [19] [20]. However, it is not enough. It is necessary to define which ones will play the role of indicators, i.e., measures that help monitor a goal achievement [14]. Thus, it is necessary to align measures and goals and define indicators for IT services [21]. Alignment demands understanding stakeholders' information needs and the way IT services processes were designed and are executed in the organization, detecting IT services critical processes and choosing strategies that should be followed in order to achieve established goals. Considering that, we developed SINIS (Select Indicators for IT Services), a method to support selection of indicators for IT services aligned with organizational goals. SINIS is based on GQM+Strategies [1], COBIT [4], the set of measures for IT services defined in [12] and the Reference Software Measurement Ontology [14].

This paper presents SINIS and a case study at the Infrastructure Department of a global company. Section 2 provides presents the theoretical background, Section 3 presents SINIS, Section 4 describes the case study and its results, Section 5 discusses related works, and Section 6 presents our final considerations.

2 Background

In general, definitions of service reflect, at a certain level, the point of view of the academic disciplines and/or of the economic sectors wherein it was defined. Service is "a logical representation of a repeatable activity that has a specified outcome. It is self-contained and is a 'black box' to its consumers" [4] [16]. IT services are defined to support business realization [16] and are important means towards establishing Business-IT alignment [17]. There are several approaches devoted to IT services, such as COBIT [4], CMMI-SVC [3], MR-MPS-SV [10] and ITIL [22], which address processes related to IT services (e.g., Incident Management, Change Management, Problem Management, etc.) and provide guidelines to their implementation.

In order to assess and improve services quality, quality of processes performed to deliver services needs to be evaluated [3]. Measurement plays a key role in process quality improvement initiatives. In general, effective service measurements are planned based on few vital and meaningful indicators (i.e., measures used to quantitatively verify goals achievement [15]) that are quantitative, economical and adequate to support the desired results. Thus, it is important to define what indicators are suitable to support services quality monitoring and customer satisfaction goals [4]. Moreover, it is necessary to focus on indicators related to critical processes and aligned to organizational goals, but this is not an easy task.

There are some proposals that deal with this issue. COBIT Goals Cascade [4] provides a catalog with 17 enterprise goals and IT-related goals and more than 100 indicators that can be reused. However, as different market situations and environments require different measures, COBIT recommends that each enterprise

should build its own goals cascade, compare it with COBIT Goals Cascade and then refine it [4]. Balanced Scorecard (BSC) [6] is an approach that applies measurement concepts to verify whether organization activities meet its goals with respect to vision and strategy. BSC does not provide an explicit way to define goals, strategies and indicators related to different organizational levels, being more applicable at enterprise levels. GQM+Strategies [1] is an extension of GQM [11] and supports an organization in creating a model consisting of goals, strategies, and measures from the business level down to project and operational levels and back up. GQM+Strategies help to identify goals, strategies and indicators that are aligned with high-level business goals and also provide a mechanism to monitor success and failure of goals and strategies through measurement. The main GQM+Strategies components are [1]: Organizational Goals (what does organization want to achieve), Strategies (how to achieve goals), Context Factors (external and internal environments), Assumptions (unknown estimations), GQM graphs [11] (how to measure if a goal was reached and a strategy was succeeded or failed) and Interpretation Model (how to interpret indicators to verify measurement goal achievement and meet information need) [11].

3 The SINIS Method

SINIS (Select Indicators for IT Services) is a method to support indicators selection for IT Services measurement driving a top-down derivation of organization goals into IT Services goals, strategies and indicators. SINIS can be used by managers and systems analysts with knowledge about organization's related IT services. SINIS was developed based on GQM+Strategies components [1], considering the conceptualization provided by Reference Software Measurement Ontology (RSMO) [14] and modeling critical processes. Besides, COBIT Goal Cascade catalog [4] and a list of measures for IT services defined in [12] are considered as databases for reuse and used as inputs to some SINIS activities. Figure 1 shows an overview of SINIS with four phases, represented by different colors. Activities' description for each phase is as follows.

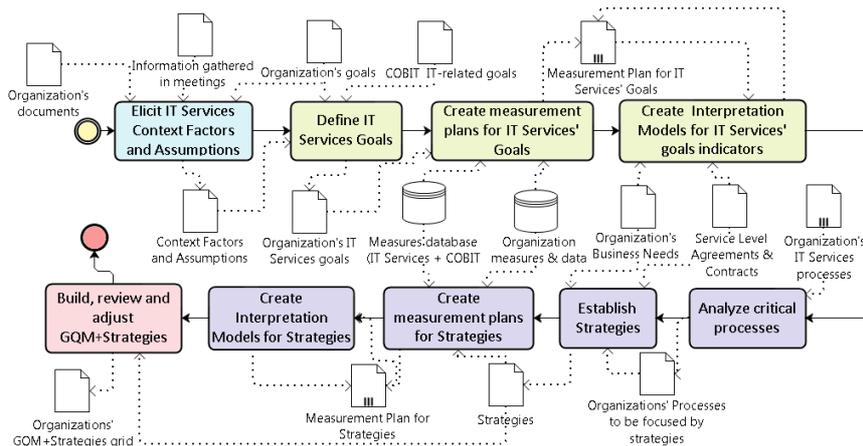


Fig. 1. Overview of SINIS.

(i) Elicit IT Services Context Factors and Assumptions: In this phase, context factors and assumptions describing the organizational scenario are identified. Context factors are aspects factually known (e.g., organization X needs to improve service availability) and assumptions are aspects believed to be true but have little or no evidence about (e.g., in organization X IT Services costs cannot be increase). Context factors and assumptions provide useful information to define the scope of IT Services goals and strategies to be considered. Documents can be used as a source to context factors and assumptions identification, such as containing vision and mission statements, organizational goals, internal and external constraints, market trends, opportunities, staff competences and technological advances. If documents are not available, meetings with organizational stakeholders can be used as a way to gather information.

(ii) Define IT Service Goals, Indicators and Interpretation Models: In this phase, IT Service goals are established, as well as a measurement plan to provide information for goals achievement analysis. It consists of three activities:

ii.1. Define IT Services Goals: During this activity, context factors and assumptions defined in the first phase are used to support definition of IT Services goals. In order to reduce effort, saving cost and time, reuse is supported by consulting COBIT IT-related goals [4] to verify whether they are applicable or can inspire new ones. The identified goals must be recorded by using the template presented in Table 1. The template is based on GQM+Strategies [1] and also requires information regarding the BSC dimensions related to the recorded goal. BSC dimensions' were included in the template mainly because next SINIS activities involve searching for COBIT management practices and indicators, and COBIT Cascade Goals considers goal classification per BSC dimension.

Table 1. SINIS Template for IT Services Goal (based on [1]).

IT Services Goal	<Name of the IT Services goal>
Activity	<Is the goal to Maintain, Increase or Reduce?>
Object	<What is the object the goal is related to?>
Magnitude	<What is the quantity of goal to be achieved?>
Time Frame	<When should the goal be achieved?>
Responsible	<Who is the primary responsible for goal attainment?>
Constraints	<What relevant constraints may prevent goal achievement?>
COBIT IT-Related Goal	<One of 17 available IT-Related Goals from COBIT>
BSC Dimension	<Finance, Customer, Internal or Learn and Growth>
IT Service Process	<Process that can impact goal achievement>

ii.2. Create Measurement Plans for IT Services Goals: In this activity, IT Services goals are made measurable by specifying appropriate questions (following the GQM approach [11]) and measurement plans that define goals indicators and how their data collection is going to be performed. SINIS' template for Measurement Plan is shown in Table 2. Aiming to avoid misunderstanding about measurement concepts due to lack of an agreed terminology and conceptualization, the template is based on the conceptualization provided by RSMO [14]. In order to reduce effort, saving time and cost, reuse is supported by consulting two sources: COBIT IT-related goals sample measures [4] and IT Services list of measures [12] to verify whether they are applicable or can inspire new ones.

Table 2. SINIS Template for Measurement Plan Item (based on [14]).

IT Services Goal	<Name of the IT Services goal - Same to match IT Services Goal>
Measurement Goal	<What is going to be controlled: Maintain, Increase or Reduce?>
Information Need	<What is the information need attended by the measurement?>
Indicator	<Name of the indicator to monitor the recorded goal>
Measurable entity	<What entity is being measured by the indicator?>
Base measures	<Measures from which the indicator is obtained (if applicable)>
Calculation formula	<Formula used to calculate the indicator (if applicable)>
Measurement procedure	<Procedure to be followed to collect and store data for the indicator>
Measurement responsible	<Role performed by people in charge of collect and store data or tool that collect and record data without manual intervention>
Measurement unit	<Measurement unit in which the indicator is expressed>
Measurement moment	<Activity on which measurement should be performed>
Measurement periodicity	<Frequency of measurement >

ii.3. Create Interpretation Models for IT Services' Indicators: During this activity, interpretation models are defined to determine how data collected for the defined indicators should be interpreted in order to support informed decisions about the IT Services goals achievement. Targets can be defined based on previous service level agreement contracts and reports or business's needs. Table 3 shows SINIS template for IT Services' Indicator Interpretation Model.

Table 3. SINIS Template for Indicators Interpretation Model (based on [14]).

Indicator	<Name of indicator – Same to match Measurement Plan>
Target	<Value expected (minimum or maximum) for the indicator in order to achieve the associated goal>
Interpretation model	<Procedure to be followed to analyze data collected for the indicator >
Interpretation Responsible	< Role performed by people in charge of analyze data>
Interpretation Moment	<Activity in which data analysis should be performed>
Interpretation Periodicity	<Frequency in which data analysis should be performed>

(iii) Define Strategies, Indicators and Interpretation Models: Strategies represent ways to achieve goals, which can be initiatives or projects. One or various strategies can be implemented to achieve the same goal. Strategies can be prioritized considering which are more effective and feasible according to the context of each organization. This means considering organization's constraints and capabilities. In this phase, we need to know what is needed to do in order to achieve IT Service Goals, or in other words, how do we get there (Basili et al., 2005). GQM+Strategies does not provide specific directions about how to support strategies selection. SINIS considers that strategies to achieve IT Service goals must focus on processes that impact goals achievement, i.e., the critical processes. In this phase, the strategies to achieve the established IT Service goals are defined as well as indicators to evaluate if the strategies achieve the expected results. Strategies' indicators must be aligned to respective IT Goal indicator. This phase involves four activities:

iii.1. Analyze Critical IT Service Processes: The strategies to achieve IT Service goals must focus on processes that impact goals achievement, i.e., the critical processes. Thus, in this activity processes related to the established IT Service goals are analyzed (as well as relationships between them). By doing this, it is possible to identify where the strategies must be focused on. SINIS advocates that the processes should be

modeled and the relationship among them should be investigated in order to identify critical cause-effect relations that need to be considered when establishing the strategies. For processes that generate activities log database (such as Incident Management), process mining can be used to find which part of the process is causing delay and possibly is a root cause that needs to be addressed by a strategy [18].

iii.2. Establish Strategies to achieve IT Service Goals: In this activity, considering the results of the processes analysis made in the previous activity, strategies are established aiming to achieve the IT Service goals. Service Level Agreements contracts and delivery reports also can be analyzed since they can provide information to help identifying root causes or blockers to attend IT Services goals. The established strategies will be implemented in projects, initiatives or even simple activities. Table 4 presents the suggested template for recording the established strategies.

Table 4. SINIS Template for Strategies.

IT Services Goal	<Name of associated IT Services Goal>
Strategy	<Strategy name>
Description	<Strategy description>

iii.3. Create Measurement Plans for Strategies' Goals: In this activity, similar to the activity *Create Measurement Plans for IT Services Goals*, strategies are made measurable by specifying appropriate questions and measurement plans to define indicators and data collection procedures. COBIT indicators [4] and IT Services list of measures [12] can be used as a source to measurement plans definition. The template used to record the measurement plan items is the same presented in Table 2.

iii.4. Create Interpretation Models for Strategies' Indicators: This activity is similar to *Create Interpretation Models for IT Services' Indicators* described in previous phase. However, in this activity indicators related to strategies' goals are considered.

(iv) Build, Review and Adjust GQM+Strategies Grid: During this phase, context factors, assumptions, goals, strategies and indicators are organized in a GQM+Strategies grid aiming to provide an overview of IT services measurement. Ideally, the grid has to present the cleanest possible view. SINIS template for grid is shown in Figure 2.

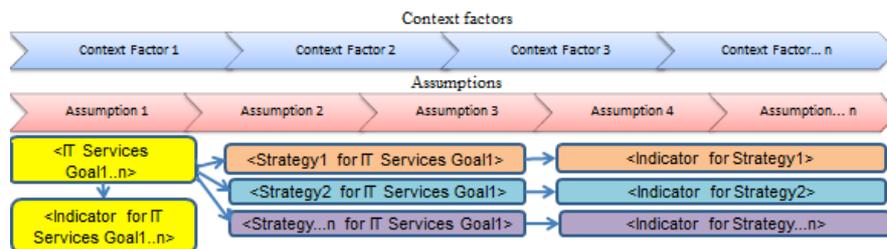


Fig. 2. SINIS template for GQM+Strategies grid (based on [1]).

The template was designed in a way to facilitate viewing in a single page different levels of goals, strategies and indicators. Also, general context factors and assumptions were disposed in this same single page, allowing to verify if they are

current or have changed. If it is necessary to change context factors and assumptions, the grid provides an easy view of goals, strategies and indicators that are impacted by the changes and also might change.

GQM+Strategies Grid and Interpretation Models must be presented to all stakeholders through meetings in which information sources, context factors and assumptions must be validated, and applicability, completeness and consistency of goals, strategies and indicators must be evaluated. Also, discussions can point out potential findings and improvement opportunities.

4 CASE STUDY

Motivated by the research question “How to support selection of IT services indicators for different levels and aligned with organizational goals?” we developed SINIS. In order to verify if SINIS is useful to support selection of IT services indicators from business level to operational levels and aligned to organizational goals, we carried out a case study in which we analyzed if SINIS is suitable for an IT Services measurement initiative in a industrial setting and how can SINIS be further improved. We followed three steps, as follows.

Step 1: Select Organization for Case Study

In the first step, we selected a large global organization headquartered in Brazil (here, called Organization A due to confidentiality issues). It operates in over 30 countries and has offices, operations, exploration and joint ventures across five continents. The selected department to apply SINIS method was Infrastructure, which is part of IT Services Area, and responsible for application servers, databases, backup, storage, security and network. IT Services Area follows ITIL library practices [OGC, 2011] and intends to improve the measurement process because much effort has been spent to select proper indicators and perform services measurement. Infrastructure members do not know how their projects and operational work results influence the department, area or organizational goals. Infrastructure manager does not participate in defining Organization A or IT Services strategic plan and goals. In the beginning of the year he receives a list of goals to be achieved by the Infrastructure and is free to define the department plans to achieve those goals. He derives lower level indicators to support goals monitoring, but he does not follow any specific method. Each department member defines by himself/herself a list of initiatives and keeps working on it during all year, expecting to contribute to indicators targets achievement. It is worth noticing that there is no clear connection between initiatives’ and indicators’ results.

Step 2: Execute SINIS method - SINIS was applied and main results are presented.

(i) Elicit IT Services Context Factors and Assumptions: In this phase, we met with infrastructure manager and coordinators to identify relevant context factors and assumptions from organizational goals and other information about the organization. Table 5 shows the obtained results.

Table 5. Context Factors and Assumptions of Infrastructure Department of Organization A.

Context Factors	Assumptions
CF1: Organization A first goal is to reduce costs.	A1: IT Services cannot increase costs.
CF2: IT Services Area has a subarea “ITIL Office” to manage Service Delivery and Continuity, Incidents, Problems and Changes.	A2: Even having several subareas, ITIL Office works in an integrated way and cross serves all technical subareas of IT Services Area.
CF3: Organization A has critical business processes based on IT Services that need high availability.	A3: There is a Service Continuity team responsible for managing crisis situations that are opened for applications that support critical business processes.
CF4: IT Services Area supports all business units of Organization A.	A4: Evaluation of IT Service quality is driven by a Service Level Agreement.

(ii) Define IT Service Goals, Indicators and Interpretation Models

ii.1. Define IT Services Goals: In this activity, together with Infrastructure manager, we analyzed elicited context factors and assumptions and COBIT IT-Related Goals. Due to space restrictions, in this paper we explore only one of the defined IT services goals. Context factor CF3 reveals that Organization A business requirements include service availability improvement. Considering the COBIT IT-Related Goal “Delivery of IT services in line with business requirements” and the context factor CF3 (“...service availability need to be increased”), we defined the IT services goal “Reduce time in Crisis”. It is directly related to the Crisis process (a subprocess of Incidents Management) that is started in Organization A when a crisis situation (mentioned in the assumption A3) occurs, i.e., when an application classified as high critical for business is unavailable. In this case, a crisis room is opened by the Service Continuity team. When a crisis room is opened, all technical teams connect to a conference room and work together until the issue is solved and the application is back again. This process had been created to minimize service unavailability and to reduce impact to applications considered critical to business. Table 6 shows the IT service goal defined by using the SINIS template. We considered Assumption A1 to establish a constraint during IT service goal definition.

Table 6. IT Services Goal.

IT Services Goal	Reduce Time in Crisis
Guidance	Reduce
Object	Time in Crisis
Magnitude	10%
Time Frame	Annual
Responsible	IT Services Infrastructure Department
Constraints	Do not increase cost
COBIT IT-Related goal	Delivery of IT services in line with business requirements
BSC Dimension	Customer
IT Service Process	Incident Management

ii.2. Create Measurement Plans for IT Services Goals: this activity was carried out with the infrastructure manager, department members and an expert in quality and measurement who knew about data available and possible to be collected. Analyzing the measures associated to the COBIT IT-Related goal “Delivery of IT services in line with business requirements”, which was used as a basis to define the IT service goal considered, the measures suggested in the IT Services list of measures [12] and data available in Organization A, we selected “number of crisis” and “number of hours in

crisis” as the measures to be used. The first measure was based on “number of business disruptions due to IT service incidents” (from COBIT) and the second one on “service interruptions duration” (from IT Services list of measures). “Number of hours in crisis” indicator was selected to monitor the IT service goal “Reduce Time in Crisis”. Table 7 presents the defined measurement plan.

Table 7. Measurement Plan for IT Services Goal “Reduce Time in Crisis”.

IT Services Goal	Reduce Time in Crisis
Measurement objective	Reduce
Information Need	How many hours were spent in crisis?
Indicator	Number of hours in crisis (NHC)
Measurable entity	Crisis
Base measures	Time spent in each crisis (TSC) (being NHC the number of hours in crisis)
Calculation formula	$NHC = TSC_1 + TSC_2 + \dots + TSC_{NC}$
Measurement procedure	TSC: Extract data from incident report and conference call report NC: Extract data from incident report
Measurement responsible	Service continuity analyst
Measurement unit	Hours
Measurement moment	Base measures must be collected after every crisis situation. Indicator must be collected before performance monitoring meetings.
Measurement periodicity	Monthly (indicator)

ii.3. Create Interpretation Models for IT Services’ Indicators: This activity was performed with the infrastructure manager. He defined targets for the indicator and how its data should be interpreted. IT Service goal is to reduce 10% of time in crisis, to previous year. Reports for 2014 year informed that total time in crisis was 765 hours. Thus, decreasing 10% means to get a target of 688.5 hours. Table 8 presents the interpretation model defined by using the SINIS template.

Table 8. Interpretation Model for IT Services Goal Indicator “Number of hours in Crisis”.

Indicator	Number of hours in crisis
Target	Maximum 688.5 hours (annual value)
Interpretation model	If total time in crisis is the target or less, IT Services goal is achieved
Interpretation Responsible	IT Services Continuity team
Interpretation Moment	During managers performance meeting
Interpretation Periodicity	Every month, accumulated data is analyzed and compared to goal taking same month in previous year as a reference. In the end of the year, total value is compared to total value in the previous year.

(iii) Define Strategies, Indicators and Interpretation Models

iii.1. Analyze Critical IT Service Processes: In order to identify possible blockers that can prevent IT Services goals to be achieved and identify processes in which the strategies should be focused on, we accessed available documents for Incident Management process (including crisis), the IT Service process related the “Reduce Time in Crisis” goal (see Table 6), modeled it (Figure 3) and looked for relations with other processes. As a result, Change and Problem Management processes were identified.

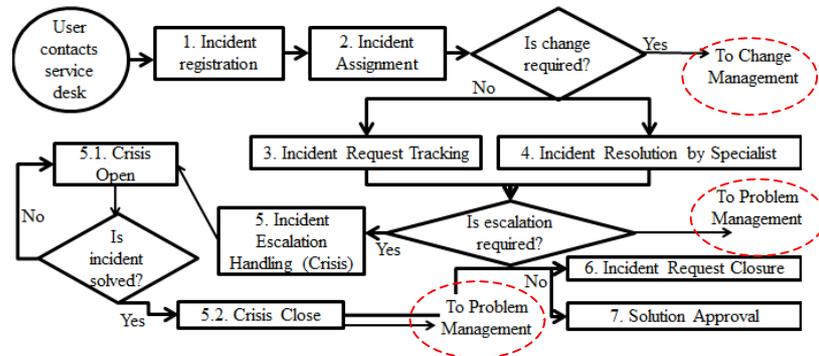


Fig. 3. Incident Management process of Organization A.

iii.2: *Establish Strategies to achieve IT Service Goals*: We start this activity by investigating problems related to the processes identified in the previous activity that could impact goal achievement. We searched for root-cause crisis reports of service level agreement for last year and noticed that several root-causes were recurrent, i.e., several crises were caused by repeated problems. Problem Management is a process related to Incident Management and responsible for investigating root-causes. In this sense, when a crisis is closed, the root-cause that derived it must be found and definitive solution must be implemented aiming to avoid recurrences. Since we noticed that a same issue was causing several crises, we concluded that root-cause investigation was not working properly. By analyzing root-cause crisis reports we also found that many crises were caused by implemented changes. Infrastructure manager informed that Change Management should guarantee proper planning to prevent services being impacted, which means Change Management should not impact Incident Management. However, reports showed evidences that this was not happening, resulting in crisis caused by changes. After understanding possible reasons that are blockers to IT Services goals achievement, strategies were defined to mitigate them. Table 9 presents three strategies defined using SINIS template.

Table 9. Strategies for IT Services Goal “Reduce Time in Crisis“.

IT Services Goal	Reduce Time in Crisis		
Strategies	Reduce crisis caused by changes	Improve changes quality	Reduce crisis caused by repeated issues
Description	Reduce number of hours of crisis caused by changes	Improve quality of changes planning and execution	Reduce number of hours in crisis caused by issues that could have been avoided

iii.3. *Create Measurement Plans for Strategies’ Goals*: This activity was done with infrastructure, services continuity, problem and change managers, and an expert in quality and measurement who knew about available and possible to be collected. Since we identified that the processes to be focused by the strategies were Problem Management, Change Management and Incident Management, we analyzed measures related to these processes in COBIT, the measures associated to these processes in the IT Services list of measures [12] and data available in Organization A. Table 10 shows some of the measures identified in each source and the measures selected to be used, defined considering the identified measures and the available data.

Table 10. Measures Investigated and Measurement Plan for Strategies' Goals.

Source	Measures found	Measures Defined for Organization A
COBIT Indicators	Number of recurring incidents caused by unresolved problems	Percentage of crisis caused by recurrent issues
IT Services list of measures	Successful/failed change requests	Number of changes executed with success
	Emergency/normal requests	Number of emergency changes
	Amount of time to find/solve root cause	Total number of hours to find problems root cause

After selecting measures, the measurement plans were defined. Table 11 presents the plans by using the SINIS template. Due to space limitation, some adaptations were done to present several measurement plans in the same table.

Table 11. Measurement Plans for Strategies' Goals.

IT Services Goal	Reduce Time in Crisis	Reduce Time in Crisis	Reduce Time in Crisis
Strategy	Reduce Crisis Caused by Changes	Improve Changes Quality	Reduce Crisis Caused by Repeated Issues
Measurement objective	Control and Decrease	Control and Increase	Control and Decrease
Information Need	How many hours in crisis were due to failed changes?	How many changes were closed on time, with success and not emergency?	How many hours in crisis were due to repeated issues?
Indicator	Percentage of hours in crisis caused by changes	Percentage of changes closed on time, with success, without rework and not emergency	Percentage of hours in crisis caused by recurrent issues
Measurable entity	Crisis	Changes	Crisis
Base measures	Hours in crisis caused by changes (HCCG); Total hours in crisis (THC)	Number of changes closed on time, with success, without rework and not emergency (NCTSRE); Total number of executed changes (TC)	Hours in crisis caused by recurrent issues (HCCRI); Total hours in crisis (THC)
Calculation formula	$(HCCG/THC)*100$	$((NCTSRE)/TC)*100$	$(HCCRI/THC)*100$
Measurement procedure	HCCG: Extract data from problem report; THC: Extract data from crisis report	NCTSRE: Extract data from problem report; TC: Extract data from change report	HCCRI: Extract data from problem report; THC: Extract data from crisis report
Measurement responsible	Problem management performance responsible	Change management performance responsible	Problem management performance responsible
Measurement moment	Before performance monitoring meetings	Before performance monitoring meetings	Before performance monitoring meetings
Measurement periodicity	Once a month	Once a month	Once a month

iii.4.Create Interpretation Models for Strategies' Indicators: This activity was performed with the infrastructure manager, who defined targets for indicators and how results should be interpreted. IT Service goal is to reduce 10% of time in crisis, compared to previous year. Table 12 presents the defined interpretation model.

(iv) Build, review and adjust GQM+Strategies grid: During this phase, we organized context factors, assumptions, goals, strategies and indicators in a GQM+Strategies grid and presented it to all infrastructure team to gather members' opinion and concerns. Figure 4 presents the resulting grid. As a feedback, infrastructure team commented that a lot of useless measures would be now abandoned. Moreover,

infrastructure team will enhance focus on achieving strategies' indicators. Infrastructure manager stated now he will spend less time managing team activities to achieve IT Services indicators, since now the team knows how to support it.

Table 12. Interpretation Model for IT Services Goal Indicator “Number of Hours in Crisis”.

Indicator	Percentage of crisis caused by changes	Percentage of changes closed on time, with success, without rework and not emergency	Percentage of crisis caused by recurrent issues
Target	Maximum 6%	Minimum 90%	Maximum 8%
Interpretation model	If maximum 6% hours in crisis had root-cause identified as related to changes, they are considered exceptions and target is reached.	If minimum 90% of changes were closed on time, with success, without rework and not emergency, target is reached.	If maximum 8% hours in crisis are related to recurrent issues, target is reached.
Interpretation Responsible	Problem Manager	Change Manager	Problem Manager
Interpretation Moment	Before managers performance meeting		
Interpretation Periodicity	Every month and once a year		

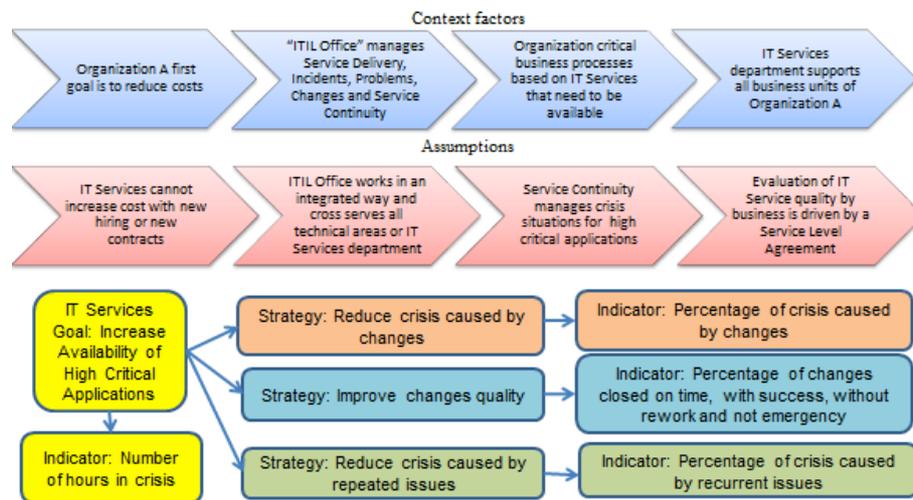


Fig. 4. GQM+Strategies grid.

As examples of indicators usage, Figure 5 shows data collected to “Number of hours in crisis”, which has been monthly evaluated and compared to last years. Figure 6 presents data collected to the indicator “Percentage of crisis caused by changes”, related to the strategy “Reduce crisis caused by changes”, which has been monthly evaluated. Average of percentage is now 8.32%, still not reaching the indicator target (6%). Figure 6 also shows data collected to the indicator “Percentage of changes closed on time, with success, without rework and not emergency” related to the strategy “Improve changes quality”.

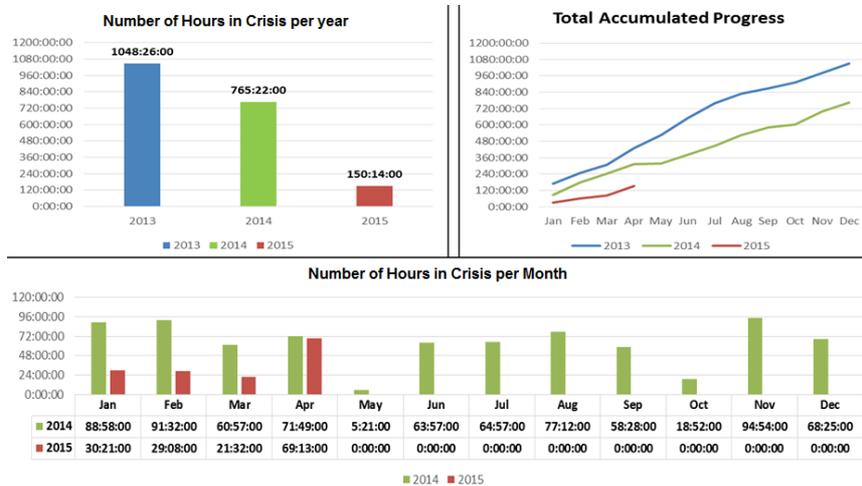


Fig. 5. Number of hours in crisis: indicator of achievement of the “Reduce time in crisis” goal.

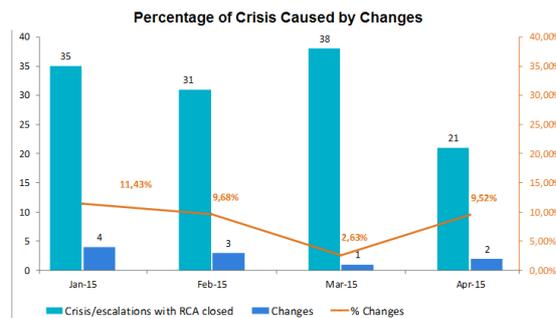


Fig.6. Indicator for “Reduce crisis caused by changes” strategy.

Step 3: Collect Lessons Learned to improve SINIS

In the last step of the case study, we collected lessons learned (Table 13). The positive ones represent SINIS characteristics that could support successful results. The negative ones represent SINIS characteristics that need to be improved.

Table 13. Lessons Learned.

	Impact	Lesson Learned	Future Work
1	Positive	Having available sources to read, support and reuse was good for having ideas and remembering goals, indicators and strategies.	Create a unique catalog of IT services goals, strategies and indicators, using RMSO conceptualization and categorized by maturity models processes, COBIT and ITIL processes, aiming to make easier to directly search and reuse.
2	Negative	Searching different sources for reuse was difficult because sources do not follow a common conceptualization and categorization.	
3	Positive	Having numeric targets for strategies' indicators was good for having a way to measure if strategies are performing as expected.	Start data collection and, after having enough data, submit processes to Statistical Process Control to evaluate if they are stable and able to attend expected targets.
4	Negative	Targets for indicators were created based on past experiences and manager expectations; there is no information if processes are able to attend them.	

5 Related Works

In the literature there are some proposals that help organizations to define IT services indicators. COBIT 5 Goals Cascade [4], for example, is a mechanism to translate stakeholder needs into specific, actionable and customized enterprise goals, IT-related goals and enabler goals, providing a set of goals and measures, which can be used as reference during indicators selection. COBIT recommends that each enterprise should build its own goals cascade, compare it with COBIT and refine it. Although COBIT provides a set of goals and measures to be reused, there is no procedure to be followed to do so.

Lepmets et al. [7] present a framework of measures for IT services, but only a catalog is provided, without a method to select and align measures to business goals. These authors state that alignment between the business goals and IT service quality measurement goals in industry needs to be studied and could provide additional support to their measurement framework. In [19], Jäntti et al. presented a system to support IT service measurement. During a case study they learned that besides a well designed and easy-to-use measurement tool, there is a need for a systematic measurement process, and measures need to be based on business objectives. To answer that need, authors suggest a resumed process framework based on ITIL, but they emphasize that the study was focused on the implementation of the measurement system and the framework was not validated in real cases.

There are some proposals that although not devoted to IT services, can be used in this context. GQM+Strategies [1] is an approach created based on software engineering experiences that has been applied in several domains. GQM+Strategies proposes deriving goals into strategies and measures for different organization levels. However, it does not detail how to identify critical processes to be considered in strategies or how to define proper strategies and measures. In [2] and [5], lessons learned, results and experiences from applying GQM+Strategies approach are presented, but authors did not suggest a method to be used when applying GQM+Strategies to other cases.

Some proposals were not applied to IT services, but could be adapted to do that. For instance, Barreto and Rocha [9] suggest an approach to monitor goals using statistical process control. The approach is related to software processes and does not consider IT services processes.

SINIS reuses knowledge provided by other proposals (mainly COBIT and GQM+Strategies) and addresses some of the cited gaps. It defines a set of activities, guides about what should be done in order to select relevant indicators to goals monitoring, suggests templates and reuses goals and measures recorded in the literature.

6 Final Considerations

In this paper we presented a method to select indicators for IT Services at different levels and a case study in which the proposed method was used in a real company.

Motivation for this work was found in the literature and also in Organization A, which was not able to properly define an appropriate set of strategies aligned with IT Service goals in which teams could focus work on. Employees were wasting time in activities that were not related to IT services goals because they were not clearly informed about which strategies should be defined and related to IT services goals. By using SINIS method, Infrastructure department was able to define strategies for members to work on that could really help attending IT service goals, instead of working in several and unfocused initiatives. When defining strategies related to Changes and Problems to support Incidents (crisis), SINIS had also clarified how relevant is the relationship different IT services processes, as well as explicitly showed contributions of those activities to the achievement of top-level business goals.

There are some limitations in this study. SINIS was applied in only one IT Service department of only one company. Besides, SINIS application was conducted by one of the authors. We are aware that the case study results are not enough to evidence SINIS' applicability. However, results can be seen as a sign of that and can be used to improve SINIS for new applications. Moreover, results suggest that SINIS supported an aligned selection of indicators in different organizational levels. Organization A has already requested to apply SINIS in IT Security Department, which is also unable to align top level goals to lower levels strategies and indicators and is wasting time on measurement without knowing if collected data is really able to support business goals. We have started the use of SINIS in the IT Security Department and we expect to get new results soon. As future work, we intend to apply a survey aiming to get perceptions about SINIS use. We also intend to improve SINIS documentation in order to allow other people to use it without intervention of the authors.

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