The ICT Measurement System

Definition, components and a maturity evaluation approach.

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Abstract— **The measurement of ICT (Information & Communication Technologies) processes and related products / services is often experienced, by the organizations which make them for themselves or for the market, as a too expensive activity that slows down the primary production activities. Nevertheless, the "measurement of ICT" can give a strong support to its governance. Rarely measurement is perceived as an opportunity, most often as a threat. Many measurement initiatives, in the past, were not successful in becoming stable frameworks for supporting software processes. A formalized ICT-Measurement System (ICT-MS) can facilitate to position the "seemingly expensive" measurement activities in the context of corporate governance which, at least, makes them more justified, productive and interesting for the management and for the other involved stakeholders. An ICT-MS is a governance tool for both the contractual relations between customers and suppliers and the internal production processes. This paper outlines the rationale for the construction of an ICT-MS; it focuses on the differences between a Measurement System, a Measurement Program and a Measurement Plan; it analyzes the ICT-MS into its constituent parts; it provides useful indications for a custom path of construction of the ICT-MS. At the end, a simple maturity model is sketched to allow assessing the maturity and adequacy of an ICT-MS as a function of specific context variables.**

Keywords- ICT Measurement System; Metrics Program; maturity model.

I. INTRODUCTION

The measurement of ICT processes and of their related products / services is often perceived, by people in charge of production, as an unnecessary activity disturbing the primary workflow of system deployment. If it is practiced, it is often done to fulfill contractual obligations, sometimes to formally answer to necessary requisites for a certification of quality or of a maturity level (i.e., CMM-I model). Measurement is rarely perceived as a management opportunity, more often as a threat. It is not easy to win this prejudice if measurement remains a facultative and naive task left to the personal initiative of individual analysts or project managers.

A formalized ICT Measurement System allows to position this "apparently useless" measurement activity in a context of business governance that, if nothing else, makes it explicit, integrated into the production processes, cost effective and valuable for the management and for the other involved stakeholders. Measurement may be done at different levels in the ICT organization: at a project level it gives information about the progress and the state of a specific project; at the portfolio level it gives information about the global usage of organizational resources and the progress and the state of the totality of interacting projects; at the process level, it gives information about the general behavior of projects and the statistically derived trends over time, at the Organizational Unit it gives information about the efficiency and effectiveness of the structure.

It is essential, in our opinion, to recognize that "measurement of ICT" can give a strong support to its governance and that, in most organizations, any activity which is not continuously fed with resources and managerial attention is destined to decline or to rapidly reach the cemetery of good ideas and intentions. This is why it is preferable to speak about a "Measurement System" more than a "Measurement Program". As defined in [1], a Program is "a group of related projects, subprograms and programs activities managed in a coordinated way to obtain benefits not available from managing them individually." A Program, by definition, has a start and an end point for activities; it is not a permanent endeavor. On the contrary, measurement should be conceived as a permanent service for the organization so it should be associated with a stable structure. The present paper is composed of seven sections plus references: Section 1 is the introduction; Section 2 is the definition and qualification of an ICT Measurement System; Section 3 is devoted to the description of the main available resources and standards; Section 4 describes the several components of an ICT-MS; Section 5 is centered on the ICT-MS life cycle from start-up to on-going operations; Section 6 presents a draft of a capability model for ICT-MS; Section 7 contains a short Case Study description; Section 8 presents the conclusions.

II. ICT MEASUREMENT SYSTEM DEFINITION

Very often, terms like Metrics Program and Measurement Plan are used by the software engineering community [1]-[8], but what are the differences among a Metrics Program, a Measurement Plan and an ICT Measurement System?

A Metrics Program is an initiative to promote the usage of a measurement process in the organization: it is a project oriented effort; in other words, it is temporary. A Measurement Program has a specific and obtainable set of goals to be achieved within a limited and predefined budget and time. Resources are not assigned to a specific

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permanent organizational unit on a repetitive and regular base but dynamically allocated to the Program according to a specific plan. A Metrics Program usually deploys deliverables and not continuous services.

A Measurement Plan is a project related document describing all that is needed to implement the measurement process within a specific ICT project. It lives with the associated project and does not survive to it.

Fredreiksen H.D. and Mathiassen L. in [7] stated that "To be successful, a metrics program should be planned in context with an organization's processes, structures, climate, and power". This leads toward a more extensive approach to the subject, an approach which is not limited by the projects constraints and capable to survive to its start up phase.

An ICT Measurement System is something more than a process: it may be defined as a *living operational sociotechnical system deputed to the management of the measurement aspects of the ICT processes and products / services* [9]. It represents a governance tool both of the contractual relationships between clients and suppliers and of the internal production processes. An ICT-MS contributes to the enhancement of the processes involved in the management, design, implementation and delivery of projects and ICT services. Its purposes are mostly devoted to support process improvement, the governance of the incoming / outgoing supplies, benchmarking, calculating and monitoring of productivity, cost, time and quality.

The adoption of a metrics system involves the definition, collection and use of a set of metrics and rules of use related to the various organizational levels which will be composed in such a way as to favor the understanding of the business performance. The ICT-MS is the best tool to develop the culture and practice of measurement of ICT business in organizations and include them in their 'genetic code'.

An ICT Measurement System (Figure 1) is composed of various elements: Processes, Methods, Techniques, Tools, Infrastructures, Information Systems, Organizational Structures, Competencies, Motivations. An ICT Measurement System is the only permanent entity capable to supply adequate measurement services to the staff that needs them.

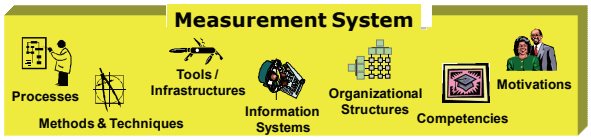

Figure 1. ICT Measurement System components

Measuring ICT systems and related services thus requires dedicated resources, expertise, time, equipment and organization. This activity is often seen as a too expensive task that slows down the primary development activities. Just because of the actual difficult market conditions, unfortunately, public and private organizations are less motivated to stake resources to ensure the performance of the measurements, without having a confidence about the extent of the economic return associated with such resources. A paradoxical situation, then, occurs: not investing resources in the culture and practices of measuring generate wastes in the management of projects that affect willingness and capability to invest in areas that are not clear in terms of returns, thus creating a vicious cycle that is difficult to break. A formalized ICT-MS can facilitate to position the "seemingly expensive" measurement activities in the context of corporate governance which, at least, makes them more justified, productive and interesting for the management and for the other involved stakeholders.

III. Relevant Resources and Standards for an ICT Measurement System

Several detailed resources are available to guide the implementation of a measurement process. Unfortunately, they do not cover adequately the constitution of the ICT-MS as a company's permanent system but are, anyway, precious sources of information for some of the major components of that system. Specifically, there are some de facto and de jure standards helping the identification of: stakeholders, information requirements, activities, tools, deliverables of a measurement process. Figure 2 clarifies the relationships among the main standards and models.

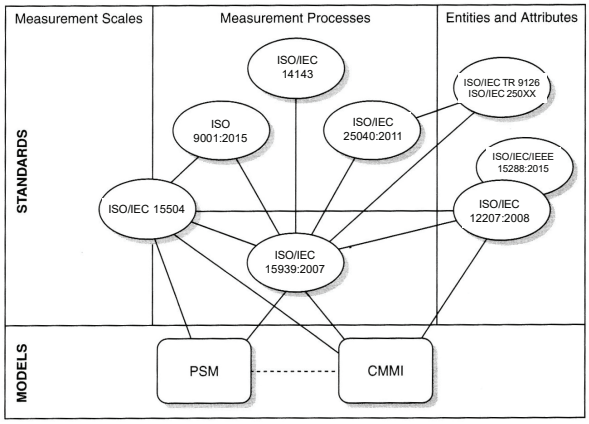

Figure 2. Available Standards & Models for ICT measurement

The ISO/IEC 15939 standard [10] and the Practical Software Measurement framework (PSM) [7], describe a Measurement Process and its related Measurement Information Model (MIM). These models are the reference guides for anyone involved in the field. They outline a project oriented measurement process in terms of information models, activities and results. Other important available resources are: the Capability Maturity Model Integration (CMM-I) [11], the "Guidelines to Software

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Measurement" by IFPUG [4] and the Software Engineering Body of Knowledge (SWEBOK) [12].

A. ISO/IEC 15939

Figure 3, extracted from the standard documentation, shows the flow of activities and their relations.

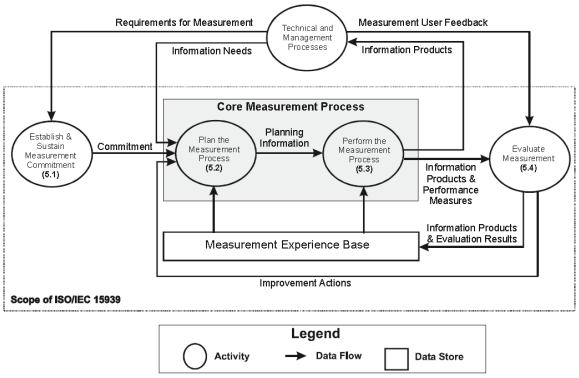

Figure 3. Measurement activities according to ISO/IEC 15939

The ISO approach muddles up activities needed to build up a permanent ICT-MS with activities needed at the temporary project level. Actual practices suggest to keep them separate to be more effective and efficient. The cycle shown in Figure 3 could be covered at various levels: the project level and the portfolio level (both of them being temporary), the functional level and the ICT-MS level (both of them being permanent). Information needs are different at all levels and feedback loops have different timings.

B. Practical Software Measurement (PSM)

In this model, the differentiation between actions at the system level and actions at the project level is clearer although a permanent system is not explicitly identified and suggested. Section 5 of the First Part of the Practical Software and System Measurement guide is devoted to the 'Enterprise and Organizational Context' from which the following Figure 4 has been extracted. PSM approach is still very "project" oriented and the global organizational context is not completely covered at the same detailed level as the project is.

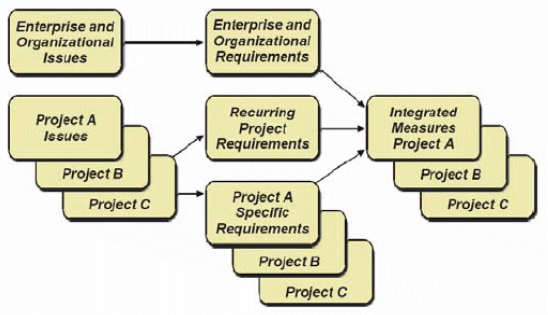

Figure 4. Enterprise & Organizational Context

C. CMM-I.

CMM-I is a set of best practices used to help an organization succeed. Best practices are grouped by activities (Process Areas) like Requirement, Risk, Configuration, Planning, etc. One of the Support Process Areas is "Measurement & Analysis", whose purpose is to develop and sustain a measurement capability that is used to support management information needs. This area is positioned at Maturity Level 2. This means that it is considered as a basic subject that should be metabolized by most organizations. Also this framework is process / project oriented (Figure 5) and it is not centred on permanent structures to perform measurement activities.

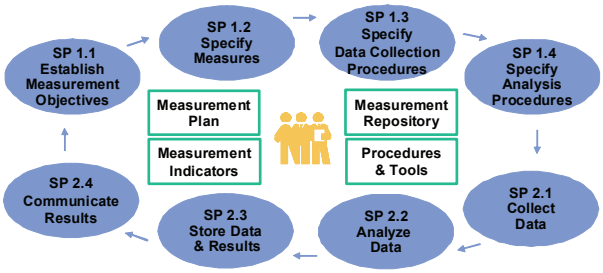

Figure 5. CMM-I – PA "Measurement & Analysis"

D. Guidelines to Software Measurement (IFPUG)

This document has a section named " Implementing and Sustaining a Software Measurement Program", which "provides guidelines for both implementing and sustaining a software measurement program using a project based approach. " The main sections are:

- Introduction
- Stakeholders and Participants
- Features, Benefits and Applicability
- Implementation Methods
- Considerations and Issues
- Sustaining a Software Measurement Program

In this document, too, a project oriented approach is outlined. No information about how to build and run a permanent measurement system.

E. SWEBOK

The Software Engineering Body of Knowledge (SWEBOK) covers the measurement theme in a light way. The measurement issues are embedded into the Engineering Foundations and in other related areas like Software Requirements, Software Engineering Management, Software Quality but a general framework is missing and a "project/process" view is adopted.

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F. *Resources Summary*

To summarize, it is possible to state that there is a large amount of useful information and models about how to run a Metrics Program or initiative and about how to measure and analyse specific products and processes, but there is less documented knowledge about the building of permanent ICT-MS. Specifically, the following points are not clearly addressed:

- support a project manager in using measures to manage a project;
- support a service manager in using measures to manage continuous services
- support a line manager to use measures to manage the business units
- create and maintain a permanent structure capable to supply measurement services in an explicit and recognizable way and to evolve itself to follow the business needs.

This paper describes a model/framework that could help organizations in defining their own paths to achieve permanent results in the goal of adopting measurement as a common practice to make ICT governance.

IV. ICT-MS COMPONENTS

In this section, the main components of an ICT-MS (Figure 6) will be highlighted: Services, Processes, Methods & Techniques, Tools, Information System, Organization, Competencies and Motivations.

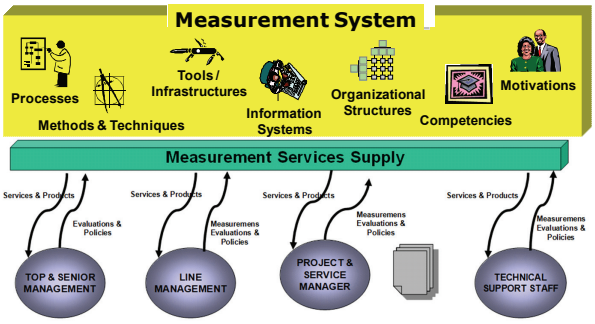

Figure 6. ICT-MS on-going components

A. *Services*

An ICT-MS should supply, as a priority, the following general services:

- identification of indicators and metrics required at various levels of the organization
- choice of measurement standards and definition of internal guidelines
- maintenance of measurement processes and tools
- creation and maintenance of the database of ICT measures
- management of a metrics documentation centre (paper / intranet)
- active promotion and dissemination of standards, methods and tools
- internal promotion and search for consensus on measurement initiatives
- on line helpdesk
- internal / external (suppliers) auditing
- collection, processing and interpretation of the collected data (reports, statistics, studies, analysis, benchmarking)
- modelling productivity and internal / external benchmarking
- reports to the Management and Organizational Units
- overall improvement of the metric system itself (model of productivity calibration, development of procedures, guidelines update, etc.)

and hopefully:

- research / testing / publication in measurement subjects
- external representation
- participation in technical conference events and external initiatives

The main services to the project *and ICT service management* should be the following:

- sizing Products and ICT Services
- supporting effort, time, cost and staff forecasts
- consulting projects or service units on measurements, estimates, surveys of interest on projects and applications
- support in the drafting of documents for (active and passive) procurement and contracts
- support in the negotiation and management of disputes

The main services to the top management should be the following:

- internal benchmarking
- external benchmarking
- asset sizing
- multilevel reporting
- feeding of Balanced Scorecard or dashboards

B. *Processes*

The processes of a ICT-MS should be identified, shared and described in documents of the Quality Management System. Documenting an ICT-MS requires both writing specific procedures and changing those ruling the production and delivery of ICT products and services. If measurement is integrated in the usual production processes then more reliable data will actually be collected. If measurement is perceived as a task that does not contribute to the project then involved stakeholders may resist providing reliable data.

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C. Methods, Techniques and Tools, Infrastructures

The choice of methods, techniques and tools must be done in strict accordance with the goals and objects of measurement. The techniques are specific business approaches, described by objectives, deliverables, work steps, means, standards used etc. that can achieve limited results within a broader methodological framework. For example 'the structured interview' is a technique for data collection that can be adopted in different methodological framework. Tools are usually software applications that support the use of techniques and methods or they are collections of templates or documents.

Organizations often reverse the correct sequence that starts from information needs, derives necessary metrics, sets out the responsibilities of measurement and identify the techniques and tools needed.

Pressed by market forces and victims of too simplified approaches, so captivating as inconclusive, the manager who is not particularly well-informed believes that with the purchase of last generation tools, all the problems of measuring ICT are automatically and magically solved.

Despite the bitter disappointments in the ICT history when technologies have substituted "system thinking", it is always much easier to acquire a tool than designing a major organizational change.

If properly attributable to the role for which they were born - helping and not replacing human expertise - the tools are invaluable for several reasons: they

- ensure greater uniformity and standardization of measurements made in different contexts;
- can automate repetitive and boring work parts of measurement, accelerating related processes and making them, consequently, less expensive;
- can automatically detect some measures from the products or services;
- allow cross-checks that are difficult to achieve manually;
- reduce the possibility of errors and render the measurement more reliable;
- can 'capture' knowledge and make it available to people with little experience.

According to the PSM framework, tools can be classified as follows:

TABLE 1 CLASSIFICATION OF TOOLS TO SUPPORT THE MEASUREMENT FUNCTIONS

Type of Tool	*Support Function*
Database, Graphing and Reporting	Store and manage measurement data to produce graphical and text-base reports
Estimation Models	Provide predictive capabilities, such as cost estimation models and reliability models
Statistical Analysis	Provide enhanced analytical capabilities such as regression
Schedule and Project Management	Assist in project scheduling and tracking resource allocations and expenditures
Financial Management	Support collection and storage of funding Data
Product Analysis	Generate automated analyses of specific product characteristics (e.g., complexity)
Data Collection	Automatically extract measurement data from elements of the engineering process

D. Information System

The information system of the organization should be prepared or modified to permit, as smoothly as possible, the collection, processing and distribution of basic data and indicators. Sometimes it is necessary to juxtapose "official" data and "unofficial but real" data. This is why the connection between business information systems and support systems for measurement can not be mechanistic but should have to be flexible and configurable. For example, it is possible that in some organizations it is not officially allowed to register and charge the staff overtime to the projects, however, this does not mean that the overtime is not done. Very often professionals are involved beyond the pure material compensation and they prefer to release a good product even if it will cost some or many hours of unpaid work. In this way the accounting figure does not keep track of what actually happens and the apparent productivity will be better than the real one. In this way the estimates that will be made on future projects from the current actual data will contain a systematic underestimation.

Since there are many stakeholders in the process, the tools should be modular:

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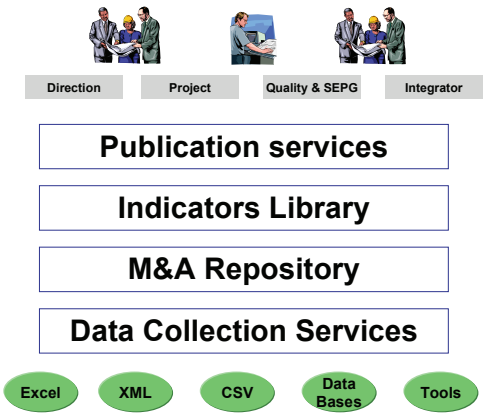

Figure 7. Information System architecture

If we have a look at Figure 7, [13] and we start from the bottom, we can identify:

Data Collections Services: in any office environment there are a lot of sources which can provide data. There will be many Excel files, sometimes some XML or Text files (CSV), usually a lot of data bases (ERP, etc.), and a lot of tools (configuration management, change request management, planning, requirement management, test, ….).

It is very important that the M&A solution provides services that help one easily build a new data collector and reuse it at any time. It should be possible to adapt it to a new situation. The data collector should automate the collection of data, as frequently as one needs, and wherever the sources are.

M&A Repository: this is the knowledge database. Histories of projects will help to predict the future with accuracy. In general, this is an SQL database.

Indicators Library: once an indicator is specified, it must be possible to reuse it on another project. The other project could also reuse an extractor. The entire M&A system must be designed with a "reuse" approach. In large organizations having a lot of projects and a good level of process maturity, it is important to build a project dashboard in a few seconds. In the Library, it should be also possible to find templates of indicators, like curves' profiles.

Publication services: the purpose of this component is to provide the information products to the allowed people, with security management. The dashboard must be accessible through the web, wherever the user is, always updated.

E. Organization

The organization of an ICT-MS can take different forms and structures depending on a number of variables to be considered. The main structural options concern the degree of centralization / decentralization of the measurement function with respect to the production structures, its size in terms of human resources and the mixture of insourcing / outsourcing.

A centralized function concentratesamong under one manager all the necessary professional resources devoted to the provision of metrological services, has a budget for the procurement of products and consulting and is particularly suitable to attract and retain talent in the field of software measurement. A structure of this type provides services to the rest of the organization as any other supporting techno-structure. It can define service level agreements and internal protocols of services engagement.

Among the advantages of a centralized organization, with respect to a distributed one, we include the following points:

- guarantee of greater consistency in measurement
- development of specific professional roles
- better management of interproject priorities
- reduction of redundant costs
- easy sharing of the know-how

Among the disadvantages:

- greater organizational effort
- dependence of the projects by an "external" body
- greater complexity of planning
- less awareness on the issues of measurement by productive staff
- possible rejection as a "foreign body" by the production facilities

With respect to the dimensioning of the measurement organizational units, observe that it must be calibrated in function of the requests for service which, in turn, depend on the number of projects / services to be performed, the degree of maturity of the processes, from the extension of the field of application of measures / estimates, the number of measures to be taken, the degree of turbulence of the processes, the degree of formality of the contractual aspects associated with products / services ICT and other factors.

Finally, regarding the mixture of outsourcing / insourcing options, it can be said that, being the measurement service associated with a process that does not belong to the repertoire of "core processes" and being very easily measurable in itself, it is an ideal candidate for a full outsourcing. Any choice, going from a total delegation to an exclusively internal service, is possible. Full outsourcing may be a starting point in order to have a very quick activation of the system using external expertise. As soon as the maturity of organization and internal skill grow up at a sufficient level it is possible to internalize many activities. A balanced outsourcing may be an arrival point using external resources to complement internal capabilities for peak

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workloads or the provision of very specialized and unusual skills at the state of the art. In any case the government of the whole process must remain an internal capability.

Factors to consider when choosing organizational options are:

- Company size
- Frequency of use of the measures
- Average level of measurement experience
- Cultural maturity in measurement subjects
- Level of awareness and managerial support
- Specificity of application domains
- Resources overload
- Confidentiality domain.

In an ICT Measurement System, there are at least 3 categories of persons.

- Project : People who are developing and maintaining the software or system
    - Provide objective information
    - Provide subjective information
    - Attend training
    - Produce lessons-learned experience
    - Use provided processes and models
- Measurement & Analysis Team: people who understand, assess and refine the ICT-MS
    - Analyse experiences
    - Develop models and relationships
    - Produce standards and training
    - Provide measurement services
    - Provide feedback
- Technical Support: people who maintain the information repository
    - Write data collection procedure
    - Establish database structure
    - Quality Assurance
    - Archive data and documents

F. *Competencies*

Staff skills are critical to the success of the measurement process. Depending on the adopted organizational solutions it may be possible to engage new already trained personnel otherwise it will be necessary to identify internal candidates and to develop their professional skills. The level of rapid obsolescence of the industry is such that training must be continued and implemented both through traditional classroom interventions and through e-learning and self-training options. It is often necessary or appropriate to pursue certification of competencies regarding specific methods. Of course, the learning path will be different for every position in the ICT-MS.

To be able to manage its tasks, the M&A team should have a lot of technical skills for building measurement plans, Balanced Score cards, Tableaux de Bord, GQ(I)M (Goal Question (Indicator) Metric), SPC (Statistical Process Control), ETL (Extract Transform Load Techniques), Estimate, benchmark, causal analysis, Function Point Analysis, SLOC (Source Line Of Code), Earned Value Analysis, etc.

In addition to technical competencies it should be considered that the measurement professional must play a consultant role interacting with people not often very happy to be involved and sometimes impatient to go back to programming and "producing". Soft skills are then as important as technical knowledge.

G. *Motivations*

As written, a metric system that does not provide motivation (rewards and penalties), for the application of measurement procedures will not be used reliably. We must develop the whole project of creation of the Metric System around the understanding of the true goals of the people involved, their interests, attitudes, approaches, cultural and operational needs. The measures, once developed the correct preparation of the field, may also become an instrument of evaluation of individual performance, but this takes time and organizational maturity: it is not advisable to start with this goal in mind, it is an arrival point and not a starting point. The system of measures should be designed so that all persons involved in the process of collecting, processing and distribution of information and metrics understand why and what they are doing and, possibly, what benefits brings them.

V. ICT-MS LIFE CYCLE

As we have seen, an ICT-MS is a permanent entity that provides services throughout the organization on an ongoing basis. No organizational system, however, is created and evolves on its own, there must be an organized and temporary effort whose purpose is the design, construction and start-up of the system itself. The supporting activities that have not responsible in the organization and resources allocated to them tend to fall on deaf ears after an initial period of general curiosity. A key to success, for the establishment of an ICT-MS, is the ability of the sponsor to set a credible cost / benefit analysis. We need to imagine the extent of intervention on ICT business support as a systemic initiative in which the various cultural, organizational and technical elements are combined in a harmonious and structured way. So the evolution of the ICT-MS, once started, will be guaranteed by specific improvement initiatives, i.e., change projects (Figure 8).

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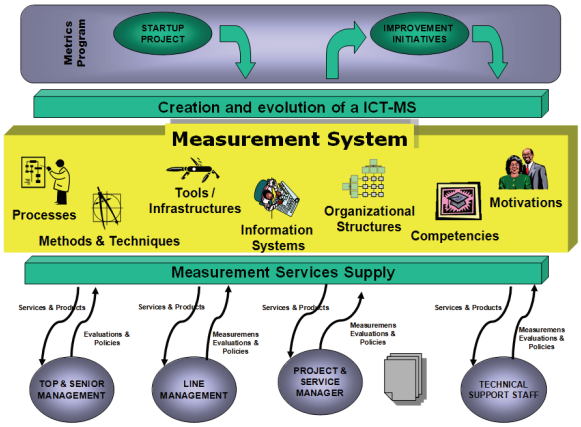

Figure 8. start up and improvement of an ICT-MS

The basic prerequisites for the success of an ICT-MS are:

- the metric system and its objectives are supported by the management;
- measurement must provide added value to all parties involved in the collection, measurement and analysis of historical data;
- the ICT-MS must cooperate and do not come into conflict with other operating systems in an organization, reusing as much as possible of existing assets.

A master plan for a metrics program (building an ICT-MS) may include the following points:

- Setting goals and benefits of the metrics system and its creation project
- Identification of the relevant stakeholders
- Obtaining sponsorship
- Communication and promotion of the initiative
- Identify roles and responsibilities of project
- Preliminary definition of the metrics to be adopted
- Defining procedures and measuring tools
- Definition and management of training plans
- Releasing into operations the ICT-MS

VI. ICT-MS CAPABILITY ASSESSMENT

As in many other ICT areas, it is possible and useful to define a model to assess the capability of an ICT-MS. Currently, there is no specific model for Measurement Systems but measurement is present in many frameworks to assess the global capabilities of ICT organizations like CMM-I, OPM3 [14], Prado [15]. A capability assessment is useful to benchmark an organization in this area and to design an evolutionary path for improvement.

A. *Capability*

Measurement capabilities depend significantly on how the ICT-MS was designed and created, but also by the three other factors shown in Figure 9: commercial practices, competitive context and managerial commitment.

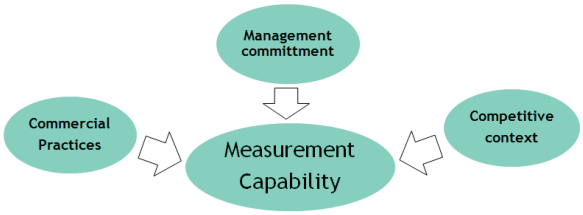

Figure 9. Measurement Capability

The first factor is the mode of relationship between customers / suppliers. If they are focused on management of social relational and adaptive behaviour based on mutual compromises and agreements of a 'political' type, hardly the measure will emerge as a real need, because it takes away flexibility in the implicit/explicit negotiations. Conversely, if the relationships are based on the clear identification of the reciprocal rights / duties and explicit assessment of the interdependence of the factors of negotiation then the measure will become essential to give practical support to the negotiation process.

The second factor mentioned is the competitive context in which a company or public administration is immersed. Monopolistic demand or supply can lead to the superfluity of the measure while the presence of a high number of competitors pushes up the mechanisms of transparency and quantitative comparison.

Finally, the orientation of management is crucial to ensure sponsorship and directions for practical use of the resources made available by the ICT-MS.

B. *Maturity and Adequacy*

Maturity is a general level of evolution of the system, which is demonstrated by the possession of some practices and properties considered as advanced by general consensus. Adequacy is a different concept. It is related to the relationship with the environment and its requests on the organization but it is also a measure of internal consistency of the different ICT-MS components. To be adequate means to be consistent with the environment requests and that the different components show an homogeneous level of evolution. If the context of customers and rulers is informal then a too formal measurement process is a threat instead of an opportunity. The reverse is true too. If we have very skilled measurement professionals but no defined processes and no measurement tools then the ICT-MS is not adequate. In order to be adequate, the organization must be flexible in terms of the system components. Maturity and Adequacy are not related one to each other: it is possible to be mature

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and not adequate or the opposite or any combination of the two variables [16].

VII. A SHORT CASE STUDY

The framework outlined in this paper has been adopted by the largest Italian regional ICT public company. In 2010 it started a project to build up an ICT-MS outsourcing the services to start up the system and involving heavily internal resources to go live with the system. The management was satisfied with the results and after 5 years of life the ICT-MS is a stable part of the organization. All the components of the system were addressed properly starting from knowledge evolution (traditional training and on the job training) for more than 140 staffing units and progressing to process and methods definition, tools adoptions, a partially distributed organization (a central competence reference staff and a distributed responsibility in organizational units), administrative data definition, data collection procedures, links to requirements management and analysis, formal outsourcing documents and processes. Measurements goals were added to Management By Objective (MBO) framework to assess manager's performance over the years. The initial start up project ended after 2 years but the measurement activities are part of the ordinary production processes and supported by ordinary budget. The evolution of the ICT-MS is granted by the central functional staff.

VIII. CONCLUSIONS

This paper has presented a relatively new concept named ICT-MS, which is different from Metrics Program that is largely described in literature and standards. The highlight is on the systemic approach and the permanent nature of the system with respect to the "project" oriented approach. An ICT-MS is crucial for the exploitation of the ICT governance because it gives evidence, objectivity and independence from individuals. Any organization interested in the incorporation of measurement in its core processes should devote adequate resources to the set up and maintenance of an ICT-MS taking care of all the components in an integrated way. To help grow in the most efficient and effective way an ICT-MS Capability Model may help in defining the "as is" situation as well as an evolutionary path for improving.

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