Approaches to ITSM level measurement and evaluation

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Abstract. The paper examines ITSM (IT Service Management) which is based on the internationally accepted ITIL standard (IT Infrastructure Library). Within the domain of ITSM special attention is given to constant improvements in IS/IT services. The aim of the paper is to identify and characterise ITSM metrics and metrics models among which ITSM Maturity Models play an important role. Standard methods of scientific work such as analysis, synthesis, comparison and selection are used for the paper. The main findings are based on the analysis of literature proving the importance of effective IS/IT service management in supporting the business goals of enterprises and organisations. Several authors criticised the extent and detailed character of ITIL.They suggested solving the problems of SME sector by simplifying the processes of ITSM implementation. This is closely related to the proposed system of ITSM metrics and metrics models. The paper provides a detailed elaboration of complex metrics models together with a derived, reduced model with 8 main metrics and other often used tools for IS/IT services measurement, namely ITSM Maturity Models. They are applicable for both a diagnosis of the level of IS/IT services in the companies and eventual correction of plans and for benchmarking the enterprises within their specific branch.

1 Introduction

Effective use of information technology systems and information technology (IS/IT) requires high-quality and systematic management. The area covering those activities is known as IT Service Management (ITSM). According to Winkler and Wulf: “Information technology service management (ITSM) has become the prevalent management approach to the provision of IT services worldwide” [1]. The management of IT services requires, besides the standard maintenance of technology and applications, a definition and description of the services the organisation offers to its consumers of the services, and discovery of their hidden value and reasons why they use the provided services. Subsequently, these services need constant administration and improvement at all levels of management [2-6].The concept of IT Service is based on the ITIL framework (IT Infrastructure Library) which describes the best practices and methods to achieve effective IS/IT services management [7-9].

ITSM represents a management method for information and communication technologies, their operation and development using the principles of management based on services from the perspective of both customers and providers of IS/IT services [10]. Development of IS/IT services, their implementation and support through the whole IS/IT services lifecycle are components of ITSM [11].

ITSM should be considered from 4 perspectives: organizations & people, information & technology, partners & suppliers, and value streams and processes [12]. Value streams and processes are the most important dimensions for the measurement and evaluation of ITSM. They contain all the organisational and process components of IT services, notably, definitions of terms, specifying activities, roles and responsibilities, the definition of input and output activities and processes, the definition of channels of communication, roles, metrics, reporting and documentation of the whole system.

According to Hunnebeck et al. [13], the main areas of ITIL for ITSM are:

- service strategy – representing the core of the services' lifecycle, it includes definitions, recipients, ways to measure the efficiency of the services, service portfolio management
- service design – contains operational processes such as management of services catalogue, capacity, availability, continuity, information security, service design package, …
- service transition – its function is to supply the proposed services to the premises, including management of change, service asset & configuration, release and deployment, transition planning and support, service validation and testing, change evaluation, and knowledge management
- service operation – all elements concerning the operation of IS/IT services: management of incidents, event, access, problem, request fulfilment, and service desk
- continual service improvement – includes service improvement, measurement and reporting.

To achieve the aim of ITSM, namely, supply and effective use of high-quality IS/IT services supporting entrepreneurial goals, it is important to measure and evaluate the level of IS/IT services. Several metrics models [14-15] and methods of measurement and evaluation [16 - 20] have been developed for that specific reason. ITSM Maturity Model [2], [5], [10], [21-22] belongs among the most often used ones.

2 Research Framework and Methods

The research framework consists of the formulation of the main aim of the paper, partial aims and the applied methods. The main aim of the paper is to examine the approach to measurement and evaluation of ITSM based on published scientific works at home and abroad, accentuating the synchronisation of the IS/IT aims with the business goals of the enterprise or organisation.

To support the main aim, the following partial aims have been set:

- analysis of relevant scientific literature,
- identification and characterisation of ITSM metrics and ITSM metrics models,
- identification and characterisation ITSM Maturity models,
- formulation of conclusions.

Standard methods of scientific work such as analysis, synthesis, comparison and selection have been used to elaborate the paper.

3 Results and Discussion

We provide the results in the following order: analysis of scientific literature, ITSM metrics and ITSM maturity models.

3.1 Analysis of literature

The importance of ITMS is accentuated by a high number of papers in renown journals. As the ITSM topic is quite extensive, the authors tend to focus either on solving a specific problem within the ITSM processes (Table 1) or on a chosen area, processes and specific research methods (Table 2).

Table 1. Survey of analysed literary resources focused on ITSM in general.

Author (s)	Area of research	Focus, method
Küller et al., 2012	ITSM for SME	All processes, SME, Maturity model
Machado et al., 2012	Towards a maturity model for ITSM for SME	All processes, SME, Maturity model
Iden & Eikebrokk, 2013	Implementing ITSM	All processes, literature review
Steinberg, 2013	ITSM metrics model	All processes, metrics model
Cots et al., 2016	Benefits of ISO 20000 ITSM	All processes, ISO 20000
El Yamami et al., 2017	ITIL Processes Performance Evaluation in SME	All processes, multicriteria decision making, focus on SME
Chunpir, & Ismailzadeh, 2019	Comparison of ITSM Practices in Public Administration and the Private Sector	All processes, analysis, comparison
El Yamami et al., 2019	Introducing ITIL Framework in SME	All processes, ITSM design for SME
Rocha et al., 2019	Theory of agency and outsourcing of ITSM	All processes, agency theory, outsourcing
Schmidt et al., 2019	ITSM Frameworks	All processes, simplification of ITSM for SME
Varga et al., 2019	Increasing Information Systems Availability Through ITSM	All processes, analysis, SME
Winkler & Wulf, 2019	Effectiveness of ITSM Capability	All processes, effectivity

Table 2. Survey of analysed literary resources focused on chosen ITSM areas and processes.

Author (s)	Area of research	Focus, method
Wan et al, 2011	Evaluation of ITSM Processes	7 processes, method analytical hierarchy process
Tang & Todo, 2013	Service Desk Setup in ITSM	Service desk, Maturity Model
Berrahal & Marghoubi, 2016	Lean Continuous Improvement of ITSM	Continuous Improvement, Maturity Model

Sukmandhani et al., 2017	Measurement Effectiveness and Efficiency to Improve ITSM	6 processes, Maturity Model
Ruiz et al., 2018	Optimization in the context of ITSM change process	Change Management, simulation models
Costa, et al., 2019	ITSM Automation	Incident Management, Machine Learning
Cusick, 2019	Survey of Maturity Models	Continuous Improvement, Maturity Model
Obwegeser, et al., 2019	Continual Process Improvement for ITIL Service Operations	Continuous Improvement,

All authors studying the topic of ITSM and ITIL agree that correctly implemented ITSM is an important element of the support of entrepreneurial goals in enterprises and organisations and they try to approach the topic from different perspectives such as implementation, metrics model, benefits, frameworks and standards, evaluation, effectiveness.
Several authors criticised the extent and excessively detailed character of ITIL and ITSM especially from the perspective of small and medium enterprises. In their published works, the authors proposed simplifications for SME [4], [7-8], [16], [21-22]. Varga also adds that the complexity of ITSM prevents a more holistic view on the enterprise/organisation and thus it makes the support of business goals more complicated [4].

3.2 ITSM Metrics Model according to Steinberg

To ensure the support of entrepreneurial goals of a specific enterprise, the implementation of ITSM requires both management of IT services and quality measurement of IT service efficiency. We can use a variety of approaches for the measurement of ITSM level. Application of ITSM metrics models published by R.A. Steinberg belongs among the most interesting approaches [14]. The purpose of using ITSM metrics models is the measurement of benefits ensuing from ITSM implementation for entrepreneurial activities.
The ITSM metrics model consists of several metrics categories: operational metrics, key performance indicators (KPI), tolerance thresholds, critical success factors (CSF), dashboards, and outcomes. The individual categories mutually influence each other so that the entry operational metrics are gradually transformed into output indicators based on which decisions can be made about the IS/IT management as well as about the whole enterprise (Fig.1).

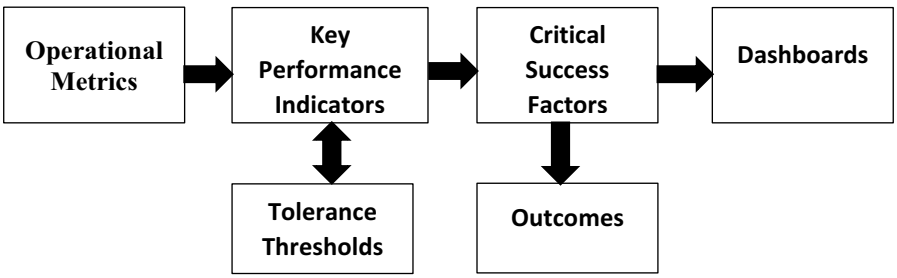

Fig. 1. ITSM Metrics model.

The operational metrics are the basic observations of the operational events in all areas of ITSM. They are the starting point of the model and are subsequently used for KPI calculations. Examples of operational metrics are overall number of changes, number of open incidents, number of problems with the execution of tasks, number of phone calls, evaluation of client satisfaction and total cost of IT.

The key performance indicators (KPI) are metrics used to mark the level of operation or process efficiency. KPI is derived from one or more operational metrics. The results are compared with the tolerance thresholds to establish whether the results are within the acceptable tolerance limits. Examples of KPI are the degree of efficiency of changes, changes in the use of labour force, degree of reoccurrence of incidents, level of capacity management or a total of reimbursed penalisation for services.
Tolerance thresholds are the top and bottom lines for acceptable and unacceptable values of KPI. They should be set by the IT manager based on an agreement with the managers of other departments of the enterprise. The tolerance thresholds are important because their role is to alert the company management to the threshold levels of KPI requiring measures to be taken.
The critical success factors (CSF) are those metrics which show the key requirements of operational efficiency. The CSF value shows whether the processes or operations are successful from the perspective of both the client and the enterprise. CSF is calculated or derived from one or more KPI by comparison of KPI values with the stated tolerance thresholds. CSF is usually indicated in levels required for success, such as high, medium or low.
Dashboards are used to display integrated metrics with the aim to unite information from several metrics into a united picture. Usually, those are important metrics suggesting the success, risks or failure of an operation. They are used for quick evaluation of the condition of IS/IT operation and for early measures to correct operational inadequacies. Dashboard metrics are usually derived from the results of CSF.
The results show the key indicators concerning general entrepreneurial risks. They are related to the efficiency indicators which define success, risk or failure of KPI or CSF. The results are used for quick evaluation of risk levels caused by process or operational inadequacies. In other words, the results category contains those facts which the area of IT tries to avoid.
In addition, Steinberg proposes examples of specific indicators for each process that an enterprise /organisation can choose from to create their portfolio.

3.3 ITSM Metric Model according to Rumburg

The approach of J. Rumburg, consultant of the MetricNet company is based on his experience collected from his consultancy. According to Rumburg [15], enterprises and organisations with effective IS/IT management declare that the rule of 80/20 is applicable in IT metrics and IT support. An average organisation shows around 20 IS/IT metrics in six areas (Fig. 2).

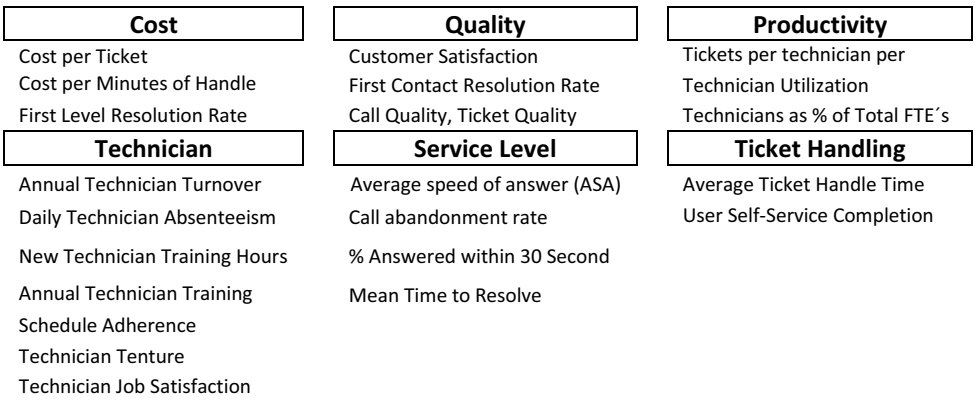

Fig. 2. Metrics for IS/IT services.

Based on empirical research of 4,000 completed benchmarks in the area of IS/IT services, it was found that a company needs only 8 criteria to collect enough information to manage IS/IT services related to support of the enterprise [15].
These important metrics are:

- Cost per ticket - is the best indicator of efficiency in service and support. It is calculated by dividing the total monthly operating expense of a service desk or desktop support group by the monthly ticket volume.
- Customer satisfaction - is the best indicator of effectiveness in service and support. One goal of every business is to achieve the highest possible quality at the lowest possible cost. It stands to reason, therefore, that cost per ticket and customer satisfaction should be measured on an ongoing basis. In fact, many would argue that cost and quality are the only two things that really matter.
- First-contact resolution - It turns out that customer satisfaction is affected by a range of other performance metrics, including call quality and mean time to resolve, to name just a couple. But the single biggest driver of customer satisfaction—by far—is first-contact resolution rate.
- Technician utilization - is the best measure of labour efficiency. Because labour costs represent the overwhelming majority of IT support expenses, if technician utilization is high, the cost per ticket will inevitably be lower.
- First-level resolution - the next KPI on the short list of metrics that really matter. This metric is a proxy for total cost of ownership (TCO) and is a critical measure of overall IT support efficiency.
- Mean time to resolve - Mean time to resolve (MTTR) is a service-level metric that measures the average elapsed time from when a ticket is opened to when it is closed. It is typically measured in business hours, not clock hours.
- Technician job satisfaction - is a bellwether metric that is strongly correlated with many other metrics in service and support. High levels of technician job satisfaction lead to lower turnover, lower absenteeism, lower handle times, and higher first-contact resolution rates.
- Balanced score - The balanced score aggregates the seven metrics we have just discussed and combines them into a single, overall measure of performance. The value of this metric, when tracked over time, is that it enables IT support to determine whether overall performance is improving or getting worse.

3.4 ITSM Maturity models

Maturity models show the level of IT service or process. Usually, it is the optimal level for IT service or process administration. The maturity models have usually four or five levels, but before reaching the next maturity level, the activities and processes of the lower level must be completed creating conditions for shifting to the higher level. In general, maturity models are very useful for both diagnoses of the level of IS/IT services in enterprises and potential corrections of plans and for benchmarking enterprises within a branch of industry.
Maturity models follow a method derived from a maturity model for software design CMM (Software Capability Maturity Model) [5]. It has spread into various areas. One of them is the ITSM Maturity Model serving for identification of the level of IS/IT services utilisation. The Model consists of 5 levels and Tang and Todo labelled them Chaotic, Reactive, Proactive, Service and Value [23]. Their model does not include all the ITSM services, only the Service Desk.
The complete version of ITSM Maturity Model, according to ITIL4, published by Cusick [5] (Fig.3) modified the names of the levels (Chaotic, Reactive, Stable, Proactive and Value

Driven), the characteristic features of each level, as well as the "important elements in the process of continual improvement", into which the levels are placed (Process Standardization, Business Alignment, Strategic Integration).
KPI based on a Likert scale is usually used to measure the achieved degree of individual indicators and then evaluated by implementing statistical methods [17].

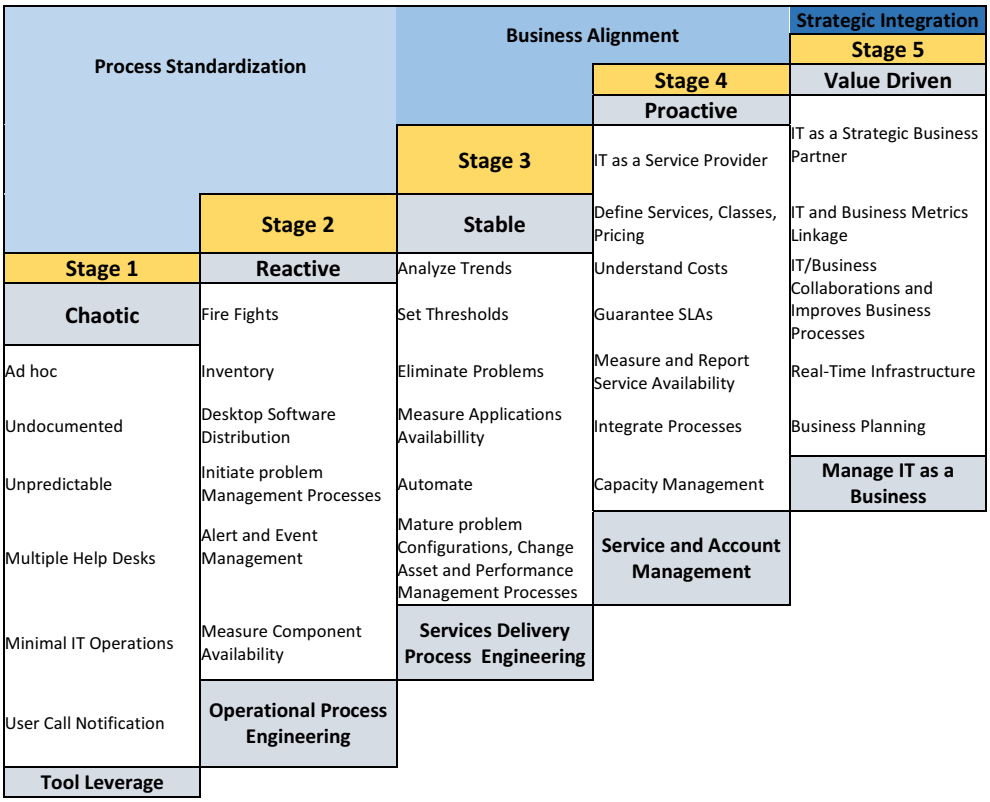

Fig. 3. ITSM Maturity Model.

4 Conclusion

The aim of the paper was to examine the approach to measurement and evaluation of ITSM with special emphasis on coordinating the IS/IT goals with the entrepreneurial goals of enterprises or organisations. The analysis of the literature has proven the importance of ITSM implementation in enterprises and organisations due to the necessity of effective management including measurement of IS/IT of the enterprise. The published metrics do not exclude each other, they rather differ in the extent of operation. Steinberg's complex model can serve as an example and inspiration for specific companies which can define their portfolio based on its metrics. On the other hand, Rumburg's metrics model is based on real entrepreneurial experience and consists of 8 main metrics (cost per ticket, customer satisfaction, first-contact resolution, technician utilization, first-level resolution, mean time to resolve, technician job satisfaction, balanced score) sufficient for effective ITSM and are applicable especially in the SME sector. The individual metrics specified in the metrics models can be also used in the ITSM Maturity Models that are appropriate for both diagnostics of the IS/IT services in

the enterprises and potential plan corrections, and benchmarking of enterprises within their branch.

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