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O. Arsenijević, I. Podbregar, P. Šprajc, D. Trivan in Y. Ziegler

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Development of the Methodology for Monitoring Implementation of Strategic Decisions in Higher Education Based on Capability Maturity Model

VALENTINA KIRINIĆ & MELITA KOZINA

Abstract Decision-making is demanding, especially when referring to strategic decisions. The higher education sector and its institutions are specific in their three main pillars: education, research and knowledge transfer (i.e. contribution to society), which are different to the priorities of a typical business/corporate environment. This makes strategic decision-making and implementation in higher education even more demanding.

No matter how sound it is, a strategic decision is not successful if its implementation is unsuccessful, inadequate or of poor quality. As the basis for defining and assessing ability to implement a strategic decision the maturity model for a strategy (decision) implementation may be used. The maturity model is a theoretical model by which the guidelines are given to organizations or institutions about how their abilities can be transformed from the initial levels to the desired level of maturity in some (key) areas.

The paper describes the capability maturity model as the basis for the development of the methodology for monitoring the implementation of strategic decisions in higher education (institutions) as one of its key success factors.

Keywords: • strategy • implementation • higher education • capability maturity model • monitoring • performance •

CORRESPONDENCE ADDRESS: Valentina Kirinić, Ph.D., Associate Professor, PhD, University of Zagreb, Faculty of Organization and Informatics, Pavlinska 2, 42000 Varaždin, Croatia, e-mail: valentina.kirinic@foi.hr; Melita Kozina, Ph.D., Full Professor, University of Zagreb, Faculty of Organization and Informatics, Pavlinska 2, 42000 Varaždin, Croatia, e-mail: mkozina@foi.hr.

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1 Introduction

Nowadays, even more than before, higher education institutions are facing demanding decision-making, especially when referring to strategic decisions. Higher education itself faces many challenges. According to (Brennan et al. 2014) "three main challenges that the higher education sector faces across the globe and that are also driving innovation in this sector have been identified: (i) pressures from globalisation; (ii) changing supply of and demand for higher education; and (iii) changes in higher education funding." A more extensive list of challenges and key trends impacting higher education is given by Pucciarelli and Kaplan (2016).

The higher education sector and its institutions are specific in their three main pillars: education, research and knowledge transfer (i.e. contribution to society), which are different to the priorities of a typical business/corporate environment.

Divjak (2016) emphasized the differences that influence the making and implementation of strategic decisions within higher education (HE) in comparison to corporative environments:

- "HE institutions are specialized institutions that „manufacture" knowledge
- owners of the products are experts (researchers and professors)
- value system that is usually crucial in strategic decision
- long-term timeframe including the period of 5 years, opposed to the 2-3 years in industry
- need to reach consensus for top-down decisions requesting the participation of all stakeholders
- the final client is not clearly determined
- tradition preservation and slow process of change
- special status of HE as a public good."

This makes strategic decision-making and implementation in higher education even more demanding.

No matter how good, reasonable, grounded, innovative or even visionary it is, a strategic decision is not successful if its implementation is unsuccessful, inadequate, and/or poor. A literature overview on many factors that influence strategy implementation and affect its success is given in the paper by Li, Guohui, and Eppler (2008), while a framework to implement strategies in organizations is given by Okumus (2003). Additionally, models of capability as well as maturity models are used as the basis for defining and assessing ability to implement a strategic decision/strategy, eg.: capability maturity models related to strategy management (Balanced Scorecard Institute, n.d.) and its implementation (Huber, 2011) as well as performance measurement (Chelniciuc, 2010b) and management (Chelniciuc, 2010a; Verweire, 2004; Aho, 2009). The value of maturity models in performance measurement is presented by Bititci at al. (2015). An example of maturity assessment of strategy implementation in higher education institutions is presented in (Kirinić and Kozina, 2016). The actual use of performance measurement by universities

and an examination of the development of performance measurement maturity in New Zealand universities using components of a seven-element maturity model is presented by Alach (2017).

The aim of the research presented in the paper is to examine, validate and document the capability maturity model as the basis for the development of the methodology for monitoring the implementation of strategic decisions in higher education (institutions) as one of its key success factors.

2 Strategy implementation and monitoring related capability maturity models, frameworks and standards for process capability assessment

2.1 Strategy implementation and monitoring

Strategy implementation is putting strategy into practice, its realization and, as Hrebiniak (2005) emphasized, "making strategy work is more difficult than the task of strategy making".

Cater and Pucko (2010), using an extensive literature review, identified twelve of the most commonly addressed strategy implementation activities and classified them in four broad groups: *planning*, *organising*, *leadership* and *controlling* activities. The controlling activities group (in the focus of this paper) consists of *Using an efficient tactical control system* and *Applying the BSC (balanced scorecard)* activities (Čater & Pučko, 2010) both addressed/grounded in the literature. The finding of the same authors (Pučko & Čater, 2001) is that, in Slovenian companies, controlling activities are also more problematic than planning activities (as cited in Čater and Pučko, 2010). Successful implementation of strategic decisions and strategies strongly depends on the controlling activities created to regularly and continuously evaluate and control implementation progress.

The Committee of Sponsoring Organizations of the Treadway Commission (COSO) (as cited in Verweire & Van Den Berghe, 2004) describes the five components of internal control among which *monitoring component* is defined as "the process of assessing the quality of the internal control system's performance over time".

Related to the term *monitoring*, besides *controlling*, are the terms *assessment*, *evaluation* and *appraisal*. *Monitoring* refers to "Supervising activities in progress to ensure they are on-course and on-schedule in meeting the objectives and performance targets." (BusinessDictionary, 2018), *controlling* is defined as "The basic management function of (1) establishing benchmarks or standards, (2) comparing actual performance against them, and (3) taking corrective action, if required." (BusinessDictionary, 2018), assessment refers to "The evaluation of a situation or person". *Evaluation* (in Management) is defined as "Rigorous analysis of completed or ongoing activities that determine or support management accountability, effectiveness, and efficiency. Evaluation of completed activities is called ex-post evaluation, post-hoc evaluation, or

summative evaluation. Evaluation of current or on going activities is called in-term evaluation." (BusinessDictionary, 2018). Appraisal refers to "Impartial analysis and evaluation conducted according to established criteria to determine the acceptability, merit, or worth of an item." (BusinessDictionary, 2018).

In the context of monitoring and evaluation strategy (Department for Transport, 2013): *"appraisal* occurs after the rationale and objectives of the policy have been formulated; the purpose is to identify the best way of delivering a list of options which meet the stated objectives and assessing these for the costs and benefits", *"monitoring* seeks to check progress against planned targets and can be defined as the formal reporting and evidencing that spend and outputs are successfully delivered and milestones met (also providing a valuable source of evidence for evaluations)", *"evaluation* is the assessment of the initiative's effectiveness and efficiency during and after implementation; it seeks to measure the causal effect of the scheme on planned outcomes and impacts and assessing whether the anticipated benefits have been realised, how this was achieved, or if not, why not".

In the context of the Information Technology Infrastructure Library – ITIL (Cabinet Office, 2011) there are four reasons to monitor and measure:

- to validate - monitoring and measuring to validate previous decisions;
- to direct - monitoring and measuring to set the direction for activities in order to meet set targets (this is the most prevalent reason for monitoring and measuring);
- to justify - monitoring and measuring to justify, with factual evidence or proof, that a course of action is required;
- to intervene - monitoring and measuring to identify a point of intervention including subsequent changes and corrective actions.

According to ITIL (Cabinet Office, 2011) the common procedures to follow in monitoring are:

- "define monitoring and data collection requirements;
- define frequency of monitoring and data collection;
- determine tool requirements for monitoring and data collection;
- develop monitoring and data collection procedures;
- develop and communicate monitoring and data collection plan;
- update availability and capacity plans;
- begin monitoring and data collection".

Alias et al. (2009) emphasized that "monitoring and measuring the implementation process is responsibility of the stakeholders", "by understanding the elements in strategy implementation such as the complexity of environment and dynamic changing in decision-making can be considered as metrics to develop a performance tool and measurement kit". Furthermore, "the transformation of strategy into its implementation is beginning by understanding the barriers or problems in the process of strategy

implementation" and "these "inhibitors" or "barriers" or "impeders" or "problems" can be factors in the measurement and monitoring of the success of strategy implementation".

In (Hanover Research, 2014) it is emphasized "monitoring implementation, tracking progress, and revising the strategic plan as necessary", that "this step requires that the strategic plan include measurable criteria for success, assessment methods, and clear accountability" and, in addition, "it is important for the institution to routinely report its progress toward achieving its goals to all stakeholders".

As stated in (Chaffey, 2009) „to improve results for any aspect of any business, performance management is vital". Neely (as cited in Chaffey, 2009) defines performance measurement "as the process of quantifying the efficiency and effectiveness of past actions through acquisition, collation, sorting, analysis, interpretation and dissemination of appropriate data", while "performance management extends this definition to the process of analysis and auctioning change in order to drive business performance and returns".

The concepts mentioned and described above were used to select capability maturity models, frameworks and standards (described in the following text) to develop the methodology for monitoring implementation of strategic decisions in higher education and associated capability models.

2.2 Strategy implementation and monitoring related capability maturity models

Models of capability and maturity used as the basis for defining and assessing ability to implement a strategic decision/strategy are:

- Strategic Management Maturity Model (Balanced Scorecard Institute, n.d.);
- Performance Management Maturity Model (Chelniciuc, 2010a);
- Integrated Performance Management (with maturity alignment/dimension) (Verweire, 2004).

The models, its selected processes (relevant to strategy implementation monitoring) according to capability/maturity levels are presented in the Table 1.

2.3 Strategy implementation and monitoring related frameworks and standards for process capability assessment

Since the aim of the research is to develop a methodology for monitoring the implementation of strategic decisions in higher education based on the CMM model, the below-mentioned frameworks and standards have been used as well known mechanisms for assessing and improving the maturity of business processes mainly from IT. However, their measurement framework can be used for any business process(s), as well as for the

process of monitoring the implementation of a strategic decision that is the focus of our research. Such mechanisms work on the principles of the current state analysis of monitoring the implementation of strategic decisions, and the definition of the necessary improvements to increase the maturity of monitoring the implementation of strategic decisions.

The mechanisms used are:

- ISO/IEC 15504-5:2012 Information technology - Process assessment - Part 5: An exemplar software life cycle process assessment model (ISO/IEC, 2012);
- COBIT Process Assessment Model (PAM): Using COBIT 5 (ISACA, 2013).

2.1.1 Information technology - Process assessment - Part 5: An exemplar software life cycle process assessment model (ISO/IEC 15504-5:2012)

ISO/IEC 15504-5:2012 Information technology - Process assessment - Part 5: An exemplar software life cycle process assessment model (ISO/IEC, 2012) provides a detailed description of the structure and key components of the Process Assessment Model, which includes two dimensions: a process dimension and a capability dimension, and it also introduces assessment indicators (process outcomes, base practices and work products) for determination of a process capability level.

Regarding a process dimension, ISO/IEC 15504-5:2012 (ISO/IEC, 2012) uses process definitions from ISO/IEC 12207:2008 (ISO/IEC, 2008) to identify a Process Reference Model, i.e. the set of processes defined and classified into process categories.
Regarding a capability dimension, there are six capability levels defined and nine process attributes (PAs) (ISO/IEC, 2012):

- Level 0: Incomplete process (the process is not implemented, or fails to achieve its process purpose, there is little or no evidence of any systematic achievement of the process purpose);
- Level 1: Performed process (the implemented process achieves its process purpose):
  - PA 1.1 Process performance
- Level 2: Managed process (*Performed process* – already on level 1, is now implemented in a managed fashion, ie. planned, monitored and adjusted and its work products are appropriately established, controlled and maintained):
  - PA 2.1 Performance management
  - PA 2.2 Work product management
- Level 3: Established process (*Managed process* is now implemented using a defined process that is capable of achieving its process outcomes):
  - PA 3.1 Process definition
  - PA 3.2 Process deployment

- Level 4: Predictable process (*Established process* now operates within defined limits to achieve its process outcomes):
  - PA 4.1 Process measurement
  - PA 4.2 Process control
- Level 5: Optimizing process (*Predictable process* is continuously improved to meet relevant current and projected business goals):
  - PA 5.1 Process innovation
  - PA 5.2 Continuous optimization.

From Level 2 onwards, each level implies a lower level of satisfaction/fulfillment.

From ISO/IEC 15504-5:2012 (ISO/IEC, 2012) the *measuremen*t process and its assessment indicators are chosen as being fundamental to all other processes of measuring and managing. In the context of ISO/IEC 15504-5:2012 (ISO/IEC, 2012) "the purpose of the measurement process is to collect, analyze, and report data relating to the products developed and processes implemented within the organizational unit, to support effective management of the processes, and to objectively demonstrate the quality of the products". The *measurement* process defined in ISO/IES 15504-5 (ISO/IEC, 2012) is represented by Table 2 , which encompasses the process outcomes, base practices and work products as assessment indicators needed to confirm/document capability level 1: Performed process (PA 1.1).

Table 1. Strategic and Performance Management Maturity Models (prepared by authors, based on the sources stated in the first column of the table)

	Capability/Maturity Levels / Process(es)	Level 1: Ad hoc & Static	Level 2: Reactive	Level 3: Structured & Proactive	Level 4: Managed& Focused	Level 5:Continuous Improvement
(Balanced Scorecard Institute, n.d.)	Performance Measurement	No data, or only ad hoc performance measures are collected	Performance data collected routinely, but are mostly operationally focused	Strategic performance measures are collected, covering most strategic objectives	Strategic measures are broadly used to improve focus & performance and inform budget decisions	Measurements comprehensively used and routinely revised based on continuous improvement
	Performance Management	No emphasis on using performance as a criterion to manage the organization	Performance reviews required but not taken seriously; no accountability for performance exists	Measures are assignedowners and performance is managed at the organizational and employee level	Measurement owners are held accountable and performance is managed at all levels	Organizational cultureis measurement and accountability focused; decisions are evidence-based
	Capability/Maturity Levels / Process(es)	Level 1: Ad-hoc	Level 2: Beginner	Level 3: Intermediate	Level 4: Advanced	Level 5: Proficient
(Chehniuc, 2010a)	Performance Management	A performance management and measurement system not set in place; the mission and organizational objectives not clearly defined; processes underdeveloped and usually not documented, success is based on key individual competencies rather then orgmizational wide knowledge	Performance managment usually occurring within the strategic and operational level and less at invidual level - no coordination between levels, strategies to achieve each organizational goal start to being articulated, activities and associated resources are identified to achieve goals, operating unit's performance measures/metrics are identified, no IT system for data collection, no capability to disseminate the information across the organization	Performance management practices start to be integrated at the strategic and operational level, measures for organizational mission and goals have been created, measures tracking strategic and operational efficiencies established to evaluate activities and work processes, technology is used to support formal data integration and dynamic reporting, enhanced data access and reporting, data transformed into actionable information, learning and improvement start to occur	The organization can fully report status of mission, goals, and efficiency of activities, data systems produce timely, relevant and accurate performance information, performance management is strategy- and mission-driven throughout the enterprise, KPIs map to goals & drive program effectiveness & operational efficiency, performance management at individual level, performance ties resources to strategic plans' success and stakeholder satisfaction, learning and improvement is seriously considered	Performance management becomes an enterprise-wide philosophy, the performance management system is integrated at all levels, executive- and enterprise-level accountability, performance information promotes collaboration and dynamic decision-making, performance information helps pinpoint everyone's contribution to goal attainment, organization provides clear transparency of cost and performance achievements to internal and external stakeholders, learning and improvement activities become natural processes

Table 1: Strategic and Performance Management Maturity Models (prepared by authors, based on the sources stated in the first column of the table) - cont

(Verweire, 2004) Capability/Maturity Level / Process(es)	Start maturity level: 'Pioneer environment of launching and trying'	Low maturity level: 'Artisanal habits'	Medium maturity level: 'Structured professional approach'	High maturity level: 'Competent do environment'	
Evaluation and control	Informing. The only concern is to get some initial results: to see if the product or service works or is in accordance with expectations, the control system itself is very informal, control principles are primarily interactive	Coordinated measuring. The operating budget is the main control and evaluation tool, control principles are primarily diagnostic, and quality checks are installed to see whether there are any unacceptable incidents or deficiencies, efficiency is a major goal	Correcting Besides managing the budget, the control system also includes beliefs systems and a range of diagnostic control tools, performance measurement is an important activity: key performance indicators, derived from the organization 's strategy, are identified and measured, the performance measurement system also provides the input for the targets and objectives of the next period, system audits are common and the organization tries to find out about good practice and to obtain professional advice from outside experts	Learning Performance is extensively monitored and managed by a series of performance indicators, measurement procedures are applied in a consistent and efficient way, using appropriate IT tools, trends are carefully analysed and targets are closely monitored, actions plans are dynamically reviewed, in case of abnormal results, a detailed diagnosis is performed to determine the underlying causes of this variation, control systems are broad and include beliefs systems, boundary systems, diagnostic and interactive controls, the interactive control system implies that attention is paid to peer reviews and benchmarking. all this input is used to review the direction and objectives when change is necessary - this can lead to alterations in the mission, vision or action plans, and process re-engineering or re-orientation of support activities, costs can be accurately defined and allocated, and are used to determine the budgets for the various activities.	

2.1.2 COBIT Process Assessment Model (PAM): Using COBIT 5

As the basis for the assessment of an enterprise's IT process capabilities against COBIT 5 (and a training and certification programme for assessors) COBIT Process Assessment Model (PAM): Using COBIT 5 (ISACA, 2013) offers and describes a process assessment model (PAM) based on COBIT 5 that is compliant with ISO/IEC 15504 previously described.

In accordance with ISO/IEC 15504, the assessment process is evidence-based to enable a reliable, consistent and repeatable assessment process in the area of governance and management of IT and to support process improvement.
For the purpose of defining strategy implementation monitoring capability, only the process *Monitor, evaluate and assess performance and conformance (MEA01)*, having the purpose of providing "transparency of performance and conformance and drive achievement of goals" (ISACA, 2013), was considered.

At the core of the *Monitor, evaluate and assess performance and conformance* process is collecting, validating and evaluating business, IT and process goals and metrics and monitoring that processes are performing against agreed-upon performance and conformance goals and metrics and providing reporting that is systematic and timely (ISACA, 2013).

The process outcomes encompass (ISACA, 2013):

- goals and metrics are approved by the stakeholders;
- processes measured against agreed-upon goals and metrics;
- enterprise monitoring, assessing and informing approach being effective and operational;
- goals and metrics being integrated within enterprise monitoring systems;
- process reporting on performance and conformance being useful and timely;

The base practices defined are:

- establish a monitoring approach;
- set performance and conformance targets;
- collect and process performance and conformance data;
- analyse and report performance; and
- ensure the implementation of corrective actions.

An extensive list of both input and output *work products* of the *Monitor, evaluate and assess performance and conformance* process is also given in (ISACA, 2013).

3 Using Capability Maturity Model to Develop the Methodology for Monitoring Implementation of Strategic Decisions in Higher Education

Fig. 1 shows the process dimension to be used to develop the methodology for monitoring the implementation of strategic decisions in higher education.

The *measurement* process whose capability at Level 1 is described in Table 2, as shown in Fig. 1, provides outputs to the *performance measurement* process (generally described by the capability levels in Table 1).

Furthermore, *performance measurement* is a part of the *performance management* process that forms the basis for monitoring the implementation of the strategy.

The methodology development at this stage of the research focuses on the *measurement* process and its assessment indicators to assess the current capability and to define the necessary improvements. In future research *Strategy implementation monitoring* should be described based on the base practices and work products (assessment indicators) of both *performance measurements* and *performance management* processes, to facilitate Strategy implementation management. Description of the *strategy implementation monitoring* process will also include its purpose and outcomes, base practices and related input and output work products.

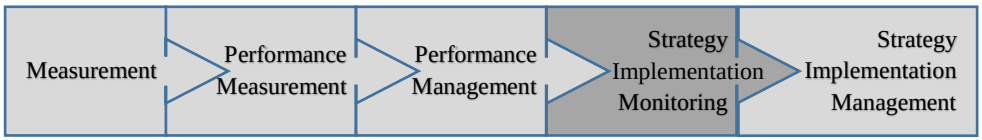

Figure 2: Process dimension to be used for development of the Methodology for monitoring implementation of strategic decisions in higher education

4 Conclusion

The research presented contributes to the development of the methodology for monitoring the implementation of strategic decisions in higher education based on the CMM model. For this purpose have been used:

- Strategic Management Maturity Model (Balanced Scorecard Institute, n.d.);
- Performance Management Maturity Model (Chelniciuc, 2010a);
- Integrated Performance Management (with maturity alignment/dimension) (Verweire, 2004);
- ISO/IEC 15504-5:2012 Information technology - Process assessment - Part 5: An exemplar software life cycle process assessment model (ISO/IEC, 2012); and

- COBIT Process Assessment Model (PAM): Using COBIT 5 (ISACA, 2013).

All of them basically use the principles of assessing the existing capability (maturity) of the process and identifying improvement goals and they are very useful mechanisms for strategy management.

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Table 2. Measurement process outcomes, base practices and work products (assessment indicators) according ISO/IEC 15504-5:2012 – Level 1: Performed process (prepared by authors, based on ISO/IEC 15504-5:2012)

Work Products (Inputs)	Process outcomes (results of successful implementation of the Measurement process) Base Practice(s)	Work Products (Outputs)
09-02 Quality policy 10-00 Process description 13-17 Customer request	a) the information needs of technical and management processes are identified PRO.7.BP1 Develop a measurement strategy PRO.7.BP2 Identify measurement information needs	
07-02 Field measure 13-17 Customer request	b) an appropriate set of measures, driven by the information needs are identified and/or developed PRO.7.BP3 Specify measures	
10-00 Process description	c) measurement activities are identified and planned PRO.7.BP1 Develop a measurement strategy PRO.7.BP4 Collect and store measurement data	
03-03 Benchmarking data 03-04 Customer satisfaction data 03-06 Process performance data 07-01 Customer satisfaction survey 07-02 Field measure 07-04 Process measure 07-05 Project measure 07-06 Quality measure 07-08 Service level measure	d) the required data are collected, stored, analyzed, and the results interpreted PRO.7.BP4 Collect and store measurement data PRO.7.BP5 Analyze measurement data	03-04 Customer satisfaction data 03-06 Process performance data 07-01 Customer satisfaction survey 07-02 Field measure 07-04 Process measure 07-05 Project measure 07-06 Quality measure 07-08 Service level measure 15-01 Analysis report 15-05 Evaluation report 15-18 Process performance report
03-03 Benchmarking data 07-01 Customer satisfaction survey 14-10 Work product distribution register	e) information products are used to support decisions and provide an objective basis for communication PRO.7.BP6 Use measurement information products for decision-making PRO.7.BP7 Communicate measurement results	03-03 Benchmarking data 07-01 Customer satisfaction survey 07-04 Process measure 07-05 Project measure 07-06 Quality measure 07-08 Service level measure 15-01 Analysis report 15-05 Evaluation report
03-01 Assessment data 03-03 Benchmarking data 10-00 Process description	f) the Measurement Process and measures are evaluated PRO.7.BP8 Evaluate and communicate information products and measurement activities to process owners	10-00 Process description 13-07 Problem record
03-01 Assessment data	g) improvements are communicated to the Measurement process owner PRO.7.BP8 Evaluate and communicate information products and measurement activities to process owners	10-00 Process description

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