How Sustainable is COBIT 5? Insights from Theoretical Analysis and Empirical Survey Data

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ABSTRACT

Increasing consideration of the concept of sustainability within information technology (IT) organizations and information systems (IS) management has lead to rising challenges regarding the application of existing, non- or partially sustainable IT process models. Although IT reference models exist within the scope of sustainable IS management, the integration of sustainability aspects into well-established IT reference models of IS management and IT governance still lacks theoretical foundation. The purpose of this paper is to explore the specificities of sustainability in the current COBIT 5 process reference model. Based on an argumentative-deductive analysis of COBIT 5, enriched with results of a survey, we examine the significance and specificities of sustainability in COBIT 5 from the user perspective. Our findings provide valuable insights referring to sustainability-related deficits of COBIT 5. Furthermore, this paper can serve as a theoretical basis for further research that eventually takes a sustainability-oriented adjustment of COBIT 5 into account.

Keywords

Sustainable IT Governance, sustainable COBIT 5, sustainability.

INTRODUCTION

The concept of sustainability receives increasing attention from different areas of academic research, in particular from management sciences (Elkington, 1997; Epstein und Roy, 2001; Lubin and Esty, 2010; Stead and Stead, 2008). Likewise, the IS research community has recently acknowledged the importance of sustainability and the potential of IS to shape the path towards a more sustainable economy (Chen, Boudreau and Watson, 2008; Elliot, 2011; Melville, 2010). Sustainable IS management takes economic, ecological and social aspects into account to generate and maintain competitive advantages and a long-term performance of IS (Dao, Langella and Carbo, 2011). To implement a sustainable IS management within IT organizations, a suitable IT governance, which is reliant on appropriate sustainability frameworks, is urgently needed. Accordingly, a sustainable IT governance should entail principles, procedures and processes which ensure that the application of a sustainable enterprise strategy, the sustainable use of resources, the appropriate monitoring of technology- and environment-related risks, and the contribution of IT to corporate sustainability is achieved with the support of IT, taking economic, environmental and social concerns into account (Erek, Loeser and Zarnekow, 2012).

Sustainability in IS management and IT governance implies a number of challenges with regard to the application of existing IT process models. Although IT reference models exist within the scope of sustainable IS management (Larsen, Petersen and Andersen, 2006), the integration of the concept of sustainable IS management and IT governance in well-established IT models still lacks theoretical foundation. To integrate the concept of sustainability into current reference models of IT governance and IT management, the degree to which the given IT reference models are already sustainable must be determined in a first step.

In this paper, we focus on the widely used reference model COBIT (Control Objectives for Information and Related Technology) in its current version, COBIT 5, and address the following research questions:

1. How sustainability-oriented is COBIT 5 as a reference model of IT governance and IT management?
2. What type of relationship exists in practice between the suitability, usage and sustainability characteristics of COBIT 5?

For this purpose, we analyze the COBIT 5 process reference model on the basis of its ontological meta-model. Furthermore, a survey was conducted to investigate the significance and specificities of sustainability in the COBIT reference model from the user's point of view to gain practice-oriented insights with regard to sustainability-related deficits in COBIT 5. The insights contribute to research in the field of IT reference models and the findings can guide potential adjustments of COBIT 5 for sustainability-oriented IT governance which allows for sustainable IS management practices.

RELATED RESEARCH

Sustainable IS Management

The term sustainability was coined by the WCED (1987): "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Although numerous definitions for the term sustainability have evolved, most of the definitions of corporate sustainability focus on the simultaneous optimization of economic, ecological and social aspects. This concept, which takes the three main pillars of sustainability into account, is known as the "triple-bottom-line" concept (Elkington, 1997). Dao et al. (2011) argue that sustainable IS management must consider economic, ecological and social aspects to generate and maintain competitive advantages and long-term performance of IS. The purpose of sustainable IS management is twofold: on the one hand, it aims at efficiency increases, cost reductions and the minimization of risks (Epstein and Roy, 2001; Epstein, 2008); on the other hand, sustainable IS management contributes to the establishment of a proper workplace and responsible staff policies in IS organizations, and improves the firm's image by creating transparency and credibility (Corbett, 2010).

Following the value chain of IT organizations, sustainable IS management involves five important processes (Erek et al., 2012):

- The govern function, which ensures that IT is managed sustainably through (see section 3).
- The source process, which covers all tasks within sustainable supplier relationship management.
- The make process, which comprises all tasks for the management of sustainable IS service production.
- The deliver process, which includes all tasks for the management of sustainable relationships, including managing sales and distribution of sustainable IT services.
- The return process refers to all tasks related to the recycling, preservation, and reuse of tangible and/or intangible resources, including waste management and the reutilization of products.

Sustainability in the Context of IT Governance

IT governance comprises principles and procedures as well as management and organizational structures which ensure that a firm's IT sustains and extends the organization's strategies and objectives, that the IT's resources are used responsibly, and that its risks are mitigated and monitored (Weill and Woodham, 2002; Van Grembergen, 2003; ITGI, 2009). To achieve the proposed outcomes, it is recommended to apply different mechanisms which, in this paper, will be referred to as "instruments of IT governance". The following instruments have been described in the literature: IT strategy, IT risk and compliance management, IT resource management, IT performance management, IT architecture management, IT service management, IT sourcing management, IT demand and portfolio management.

Thus, integrating the concept of sustainability into IT governance necessarily implies integrating sustainability into the instruments of IT governance:

- A sustainable IT strategy should be aligned to the company-wide sustainability strategy (Erek et al., 2012). Loeser, Erek, Schmidt, Zarnekow and Kolbe (2011) identify the fundamental alignment capabilities that are required within organizations for the development of coherent Green IS Strategies. In this context, the authors propose a Strategic Green IT Alignment Framework.

- Sustainable IT risk and compliance management ensures that all technology-, environment-related and social risks, as well as all internal and external compliance guidelines and regulations, are considered and addressed appropriately (Hart, 1997).
- IT resources have to be adequately provided and utilized effectively and efficiently. The IT infrastructure should facilitate an optimal support for business and production processes while the input resources for operating the IT infrastructure should be managed in the most efficient way, both from the environmental and financial perspective (Wade and Hulland, 2004).
- The instrument of sustainable performance management covers all tasks that ensure the monitoring and control of the degree to which IT-related sustainability goals were achieved. Therefore, key performance indicators (KPIs) have to be extended by ecological and social indicators.
- Sustainable architecture management establishes the settings for the design and modification of a future-oriented IT landscape. Thus, principles, procedures and processes to effectively satisfy demands regarding the application of environment-friendly and socially acceptable technologies at optimal costs as well as data retention- and architecture policies have to be developed.
- The instrument of sustainable IT service management aims to enhance the IT service portfolio with sustainable IT services. Furthermore existing indicators of service level agreements (SLA) which are mainly focused on economic needs have to be enhanced by ecological and social indicators.
- Sustainable IT sourcing management comprises all aspects to ensure that specific environmental and social criteria are incorporated in the IT supplier selection, management and monitoring process through the application of sustainability procurement guidelines and policies.
- The aim of sustainable IT demand and portfolio management is to identify, prioritize and structure IT requests from customers as well as claims of other stakeholders and to integrate and transform them into the IT portfolio, taking economic, environmental and social concerns into account. Hence, existing validation methods and criteria have to be enhanced by ecological and social factors.

COBIT 5

COBIT is one of the most widely applied IT governance and management frameworks. It has evolved from a framework mainly used from IT auditors and experts in control systems into a holistic framework for governing and managing enterprise IT (ISACA, 2012a). COBIT 5 is based on five principles: *meeting stakeholder needs*, *covering the enterprise end-to-end*, *applying a single integrated framework*, *enabling a holistic approach* and *separating governance from management* (ISACA, 2012a). The centerpiece of COBIT 5 is the process reference model, which separates governance from management processes by introducing a *governance* area with five processes and a *management* area with 32 processes. Within these areas, a further distinction is made by introducing five domains: 1) *Evaluate, Direct and Monitor*; 2) *Align, Plan and Organize*; 3) *Build, Acquire and Implement*; 4) *Deliver, Service and Support;* and 5) *Monitor, Evaluate and Assess.* Domain 1) refers to the governance area while the four other domains are assigned to the management area.

The application and the characteristics of COBIT 5 depend on the stakeholders and their drivers. The mechanism, which translates stakeholder needs into specific, actionable and customized enterprise goals, IT-related goals and enabler goals (e.g., processes) is called the COBIT 5 goals cascade (ISACA, 2012a). COBIT 5 provides 17 generic enterprise- and IT-related goals, which are structured along the dimensions of the IT Balanced Scorecard (IT-BSC). IT-related goals are directly mapped to the COBIT 5 processes. The processes consist of 210 practices and more than 1,100 activities.

METHODOLOGY

Assessment of the Sustainability of the COBIT 5 Process Reference Model

The analysis of the COBIT 5 process reference model builds on the ontological meta-model of COBIT 5. Meta-models are basically models of models and describe the syntax of the underlying model system (Goeken and Alter, 2008). The metaization principle, which "defines the primary abstraction mechanism for structuring the objects of the lower level" (Goeken and Alter, 2009), is essential for the construction of a meta-model. For our purposes, the ontological metaization principle is used because of its focus on the semantic relationships of the underlying model (Goeken and Alter, 2009). The construction of the ontological meta-model of COBIT 5 is based on the meta-model of COBIT 4.1 from Goeken and Alter (2009). Figure 1 illustrates the ontological meta-model of the COBIT 5 process reference model. In addition, meta-objects of the COBIT 5 framework which directly influence or are linked to the process model were included in the meta-model and the analysis.

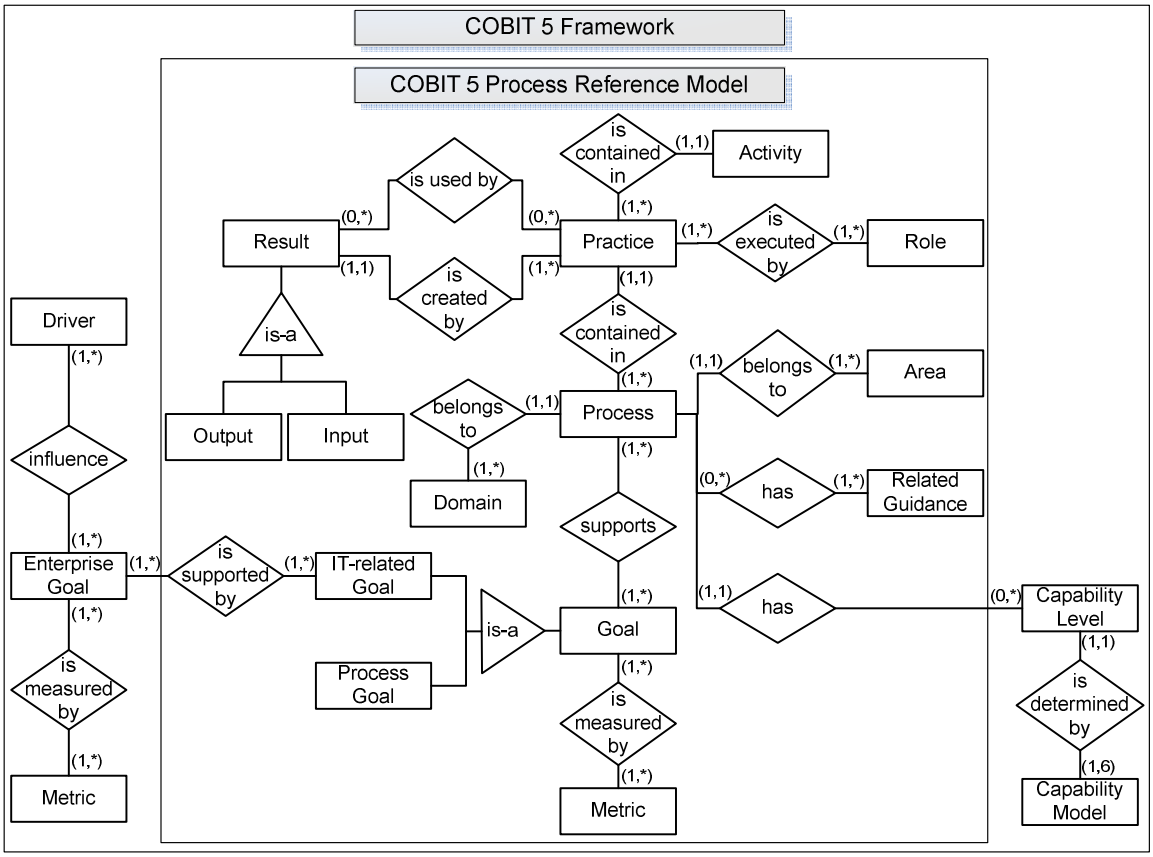

Figure 1. Ontological meta-model of the COBIT 5 process reference model (Goeken and Alter, 2009)

The meta-model focuses on *processes* which belong to one *domain* and one *area*. The processes themselves consist of different *practices* and *activities*. Practices are executed by different *roles*. Furthermore, practices create *results* as *outputs* for other practices or can use results of other practices as *input*. Following the COBIT goals cascade, the processes support different *goals* which are separated into *IT-related goals* and *process goals*. Goals are measured by different *metrics*. Nearly every process is linked to a *related guidance*. Based on the COBIT 5 framework, different *drivers* influence different *enterprise goals* which are supported by different IT-related goals. Furthermore, the *capability model* of the COBIT 5 framework offers six different *capability levels* for one process.

To assess the sustainability of the COBIT 5 process reference model based on an argumentative-deductive approach, appropriate evaluation criteria need to be defined. The first dimension of evaluation criteria is related to the concept of sustainability: economic, ecological and social characteristics. Additionally, a generic characteristic is offered. The degree of realization of each pillar is indicated as follows in a 3-point scale: largely, partially and none. Furthermore, the concept of sustainable IS management and IT governance (see section 2) is taken into account to analyze to which degree the COBIT 5 reference model meets the content-wise requirements for being a reference model of sustainable IT governance and IT management. These criteria cover in detail the goals, processes, practices, activities, metrics and roles of the COBIT 5 process reference model in terms of:

- The realization of sustainable goal orientation.
- The realization of a life-cycle orientation.
- The realization of a sustainable IT strategy, IT risk and compliance management, IT resource management, IT performance management, IT architecture management, IT service management, IT sourcing management, and IT demand and portfolio management.
- The realization of determining specifications for sustainable IS management in the areas of sustainable IT procurement, -production, -delivery, and -disposal.

Survey Data Collection

In addition to the argumentative-deductive assessment of the sustainability of the COBIT 5 process reference model, a cross-sectional online-based short survey was conducted between July 2012 and September 2012 to explore the significance and specificities of sustainability in IT governance and of the IT governance reference model COBIT according to COBIT users to gain valuable practical insights on deficits of sustainability in COBIT. The link to the online-based questionnaire was published on the ISACA homepage (www.isaca.org). The survey addressed CIOs, IT managers, IT consultants and auditors, as well as IT specialists who have been using COBIT within their organization. To minimize content-wise or formal flaws, a pre-test of the survey was conducted beforehand.

355 people participated in the survey, of which 212 completed the entire questionnaire. 186 of the respondents stated that they use COBIT in their organization (7 COBIT 4.0 users; 98 COBIT 4.1 users and 81 COBIT 5 users). The questionnaire was designed on the basis of a literature review and exclusively consisted of closed questions which were answered by participants on a 5-point Likert scale. Table 1 presents the relevant items for the data analysis.

Items
Sustainable information management requires control and support via sustainable IT governance (#1).
The use of IT governance reference models would provide a good opportunity to implement sustainable IT governance in a structured way and to establish it in the organization (#2).
COBIT as a reference model of IT governance supports the control and implementation of sustainable information management (#3).
We use COBIT as a reference model of IT governance to support and control sustainable information management (#4).
The following COBIT components are sustainable: COBIT Enterprise Goals (#5.1); COBIT IT-Related Goals (#5.2); COBIT Processes (#5.3); COBIT Process Goals (#5.4); COBIT Indicators/ Metrics (#5.5); COBIT RACI Chart/ Role Description (#5.6); COBIT Practices/ Control Objectives (#5.7); COBIT Activities (#5.8); COBIT Maturity Model/ Capability Model (#5.9)

Table 1. Questionnaire relevant items

The relevant items were analyzed descriptively as well as inductively using correlation analysis following Spearman's rank-order correlation (Corder and Foreman, 2009). Spearman's approach is used to compare the relationship between ordinal or rank-ordered variables (Corder and Foreman, 2009) as given in the response anchors of the relevant items. The correlation between two variables is measured by correlation coefficient r_s (Corder and Foreman, 2009). Correlation coefficient r_s=-1 indicates a perfectly negative correlation, whereas r_s=1 represents a perfectly positive correlation and r_s=0 indicates that the two variables do not correlate (Corder and Foreman, 2009). The significance of r_s for a directional correlation hypothesis is examined by p (probability of error that the null hypothesis is mistakenly discarded). A value $p<.01$ indicates that the correlation is statistically highly significant, whereas $p\leq.05$ signifies a statistically significant correlation (Corder and Foreman, 2009). If $p>.05$, there is no statistically significant correlation of the alternative hypothesis.

The statistical analysis was conducted using the software SPSS Statistics 20. The objective of the correlation analysis was to determine how users perceive the sustainability-orientation (item #5) of COBIT 5 and how they estimate the suitability of COBIT 5 as a reference model to support a sustainable information management (item #3). Furthermore, we analyzed how many users apply COBIT 5 as a reference model of IT governance to support and control sustainable information management (item #4).

FINDINGS

The findings are based on the theoretical analysis of the COBIT 5 process reference model as well as a relevant survey sample of 186 participants from a wide range of industries, such as IT (27.4%), financial services (16.7%), chemicals (5.4%), transport (5.4%), biotechnology (4.3%), logistics (4.3%), telecommunications (3.8%), and others (32.8%). 57% of respondents work in enterprises with less than 1.000 employees and 60.7% of participants work in organization with an annual turnover of less than one billion Euro.

The analysis of COBIT includes an analysis of 25 stakeholders and 22 stakeholder needs, 17 enterprise- and IT-related goals, 112 metrics of the enterprise- and IT-related goals, 26 roles, more than 20 related standards, 37 processes, 129 process goals with 266 process goal metrics, 210 practices, and more than 1,100 activities.

Sustainability of the COBIT 5 Process Reference Model

86% of survey participants (43.5% strongly agree and 42.5% moderately agree) state that sustainable information management requires control and support via sustainable IT governance.

Furthermore, more than 80% (36.6% strongly agree and 45.7% moderately agree) assert that the use of IT governance reference models would provide a good opportunity to implement sustainable IT governance in a structured way and to establish it in the organization.

Taking the suitability of COBIT as a reference model for sustainable IT governance and IT management into account, less than 40% of all COBIT users and less than 20 % of COBIT 5 users claim that COBIT supports the control and implementation of sustainable information management (see Table 2).

COBIT as a reference model of IT governance supports the control and implementation of sustainable information management				
	All COBIT users		COBIT 5 users	
Strongly disagree	4	2.2%	2	2.5%
Moderately disagree	62	33.3%	41	50.6%
Neutral	50	26.9%	24	29.6%
Moderately agree	50	26.9%	12	14.8%
Strongly agree	20	10.8%	2	2.5%
	N=186		N=81	

Table 2. Support of COBIT for sustainable information management

Furthermore, only 24.2% (17.2% strongly agree and 7% moderately agree) of all COBIT users and 11.1% (7.4% strongly agree and 3.7% moderately agree) of COBIT 5 users state that they use COBIT to support and control sustainable information management. Underpinning these results with the investigations from the analysis of the COBIT 5 reference model based on the COBIT 5 meta-model (see table 3), it becomes clear that the COBIT 5 model instances are mainly generic. Thus, they are suitable to only a limited extent to support the control and implementation of a holistic sustainable information management.

COBIT 5 aggregated model instances	**Assessment of sustainability**			
	Economic	Ecological	Social	Generic
Driver	◔	○	◔	◕
Enterprise goals	◔	○	◔	◕
IT-related goals	◔	○	◔	◕
Metrics of the enterprise- and IT-related goals	◔	○	◔	◕
Roles	◔	○	◔	◕
Related guidance	◔	◔	◔	◕
Processes				
a) Description, purpose statement, domain, area	◔	○	◔	◕
b) Goals and metrics	◔	○	◔	◕
c) Practices, inputs and outputs	◔	○	◔	◕
d) Activities	◔	◔	◔	◕
Process capability model	○	○	○	◕
Legend: ◕ = largely ◔ = partially ○ = none				

Table 3. Assessment of the sustainability of COBIT 5 model instances

Besides the economic pillar of COBIT, which focuses primarily on cost reduction and efficiency enhancement, the focus lies on the social pillar of the "triple-bottom-line" concept. Social factors are limited to issues such as data security,

knowledge management, a responsible staff policy and compliance with ethical principles. The social responsibility of an (IT) organization toward society, the social requirements of IT suppliers or disposers, ensuring equal rights, the prevention of child labor or non-discrimination are not addressed in the COBIT 5 reference model. Ecological aspects are also not the focal point of COBIT 5. Only one activity in COBIT 5's reference model refers to the secure disposal of assets, considering, e.g. "potential damage to the environment" (ISACA, 2012c). Although ecological aspects are mentioned in the related guidelines, particularly in the referenced OECD Principles of Corporate Governance or the King Report on Governance for South Africa (King III), they are only minimally reflected in the COBIT 5 processes, i.e., in the activities. The lack of the ecological, and also partially in the social, alignment of COBIT 5 is mainly attributable to the absence of ecological and the partially absence of social stakeholder drivers, stakeholder needs and objectives within COBIT 5, which directly influence the defined processes of the current COBIT 5 process reference model.

Taking the results of the survey into account, only 12.3% (3.7% strongly agree and 8.6% moderately agree) of COBIT 5 users state that the COBIT 5 enterprise goals are sustainable, and only 14 % maintain that the IT-related goals are sustainable. This assessment of the COBIT 5 users applies to nearly all COBIT 5 model instances: COBIT 5 processes (19.8%), process goals (12.3%), metrics (13.6%), the RACI chart (32.1%), practices (17.3%) and the activities (14.8%). Among the model instances, the COBIT 5 process capability model (39.5%) is considered the most sustainable.

Coming back to the analysis of the COBIT 5 reference model and the value chain of sustainable IS management, the model focuses first on the make process and then on the delivery process, mainly taking generic and partially economic and social aspects into account. Ecological aspects such as the application of energy-efficient data center infrastructure or hardware, the application of a virtualization model etc. are not taken into consideration. The return process, being an important part of the value chain of sustainable IS management, plays a subordinate role in COBIT 5. Social aspects mainly focus on the already addressed issues of data security and knowledge management, as well as aspects of staff development, talent management and employee compensation.

Taking the concept of (sustainable) IT governance and its instruments into account, the COBIT 5 model instances mainly focus on IT resource, IT service, IT risk and compliance, as well as on IT performance management. The instruments of IT demand and sourcing management are less considered. Economic aspects within the instruments focus primarily on the cost-effective implementation of IT resources and IT services, as well as the creation of (economic) IT value, based usually on a benefit-cost analysis within the IT product life cycle. Social factors within the instruments mainly focus on the secure and adequate generation, processing, implementation and usage of information, data and knowledge. Furthermore, ensuring appropriate qualification and training of staff is an important aspect of the social pillar within the instruments of (sustainable) IT governance in COBIT 5.

In line with these results it must be stated that COBIT 5 does not meet the requirements for exemplifying a reference model for sustainable IT governance and IT management until now.

Relationship between suitability, usage and sustainable characteristics of COBIT 5

The findings are based on the correlation analysis, shown in Table 4.

The table illustrates that there is a statistically highly significant positive correlation between item #3 and item #5. This means that COBIT 5 users who consider the COBIT 5 components to be less sustainable (items #5.x), rank the suitability of COBIT 5 as low (item #3) to support the control and implementation of sustainable information management.

Furthermore, there is an almost consistent statistically highly significant positive correlation between item #4 and item #5. This, for example, means that COBIT 5 users who consider the COBIT 5 components to be less sustainable (items #5.x) also consider the usage of COBIT 5 to support and control sustainable information management (item #3) as being low. The strength of the relationship between the items varies since item #5 addresses the different COBIT 5 components (items #5.x).

Item #5		Item #3: COBIT as a reference model of IT governance supports the control and implementation of sustainable information management	Item #4: We use COBIT as a reference model of IT governance to support and control sustainable information management
COBIT Enterprise Goals (#5.1)	r_s	.665**	.535**
	N*	81	81
COBIT IT-related Goals (#5.2)	r_s	.642**	.514**
	N*	80	80
COBIT Processes (#5.3)	r_s	.659**	.494**
	N*	81	81
COBIT Process Goals (#5.4)	r_s	.650**	.523**
	N*	81	81
COBIT Indicators/ Metrics (#5.5)	r_s	.589**	.442**
	N*	80	80
COBIT RACI Chart/ Role Description (#5.6)	r_s	.486**	.264**
	N*	81	81
COBIT Practices/ Control Objectives (#5.7)	r_s	.622**	.471**
	N*	80	80
COBIT Activities (#5.8)	r_s	.621**	.360**
	N*	80	80
COBIT Maturity Model/ Capability Model (#5.9)	r_s	.313**	.211***
	N*	80	80

* Deviations within the number of participants result from non-consideration of the answer "prefer not to say".
** Correlation is statistically highly significant ($p<.01$).
*** Correlation is statistically significant ($p\leq.05$).

Table 4. Results of the COBIT 5 correlation analysis of items #3, #4 and #5.

CONCLUSION AND FURTHER RESEARCH

This research study reveals sustainability deficits in the current COBIT 5 process reference model. The deficits mainly relate to ecological and partially to social factors when taking the pillars of the "triple-bottom-line" concept into account. The lack of ecological and also partially social alignment of COBIT 5 is primarily caused by the absence of ecological and social stakeholder drivers, stakeholder needs and objectives within COBIT 5, which directly influence the defined processes of the current COBIT 5 process reference model.

Taking the COBIT users' views into account, demand for reference models in the field of sustainable IT governance and IT management does exist. COBIT, and especially COBIT 5, is not perceived as being a reference model of IT governance to support the control and implementation of sustainable information management. Hence, only a minority of COBIT users actually use COBIT as a reference model of IT governance to support and control sustainable information management. The research has further shown that COBIT 5 users, who perceive the COBIT 5 components to be less sustainable (item #5), also consider COBIT 5 in its current form to be less suitable as a reference model to support sustainable information management (item #3) and use COBIT 5 less to control and support sustainable information management (item #4). The results require further investigation on the identification of dependent and independent variables explaining why COBIT users do not use COBIT as a reference model of sustainable IT governance and IT management. Furthermore, investigations can be refined with a larger number of participants.

This research is a first step to generate valuable insights concerning the deficits of sustainability in the current COBIT 5 reference model. Nonetheless, we argue that a modified and extended version of COBIT could be an appropriate basis for the implementation of a holistic, sustainability-oriented IS management. Further research should aim at illustrating best

practices in the field of sustainable IT governance and IT management as essential input for the adaptation of COBIT 5. Additionally, the applied research approach can be adapted to other best practice IT management frameworks, such as ITIL or TOGAF, to find out how sustainability-oriented these are and to compare sustainability orientation between them. Detailed analysis, especially regarding the cause and effect relationships between the usage of IT management frameworks which were enhanced by sustainability aspects and their implications to sustainability characteristics within IS management in enterprises, is required.

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