Examining the Relationship between IT Governance Software, Processes, and Business Value: A Quantitative Research Approach

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Abstract

What is the impact of information technology (IT) governance software on the actual processes of IT governance and through that on realizing the business value of IT? This article examines the conceptual foundations underlying this question and analyzes the available evidence based on a quantitative research approach. Using global survey-data from 41 companies that have implemented IT governance software we investigate both whether this is linked to better IT governance practices and, in a second link, to improved business value outcome. Examining each of the IT governance tool modules and considering the request, prioritize, fund, monitor, enforce, and realign processes comprising IT governance, our analysis shows that this reaction chain indeed exists. We also found that this can only be effective under certain conditions; implementation factors play a vital role, both in the improvement of IT governance processes, as well as in business value creation.

1. Introduction and Research Question

This article examines the theoretical perspectives and available evidence regarding the impact of information technology (IT) governance software on the effectiveness of IT governance processes and subsequently on realizing the business value of IT. Furthermore, the role of the implementation process itself, as well as the environmental contingencies, are examined following a quantitative survey-approach. Congruent with Korac-Kakabadse and Kakabadse, as well as with Weill and Vitale [1, 2] we define IT governance as the set of enabling mechanisms to request, prioritize, fund, monitor, enforce, and realign IT investment decisions.

Top executives and researchers alike agree that IT governance plays a vital role for corporate success and that its importance will continue to increase in the future. As discussed in Heier et. al. [3] and Heier et al. [4] several drivers fuel this increased importance: 1. Increasing IT pervasiveness, i.e. growing difficulty for executives to avoid IT decision making;

2. Legislative compliance demands, i.e. recent legislation and business policies demanding more transparency in corporate decision-making;

3. IT productivity paradox; i.e. IT investments failing to provide measurable value to business sponsors;

4. IT sourcing complexity, i.e. preparations for governing complex offshoring and outsourcing arrangements;

5. Mounting human and financial consequences from IT investment decisions.

As a result of this increased importance we are now beginning to see more implementations of IT governance software applications, allowing for the first time to undertake a quantitative study (using a global survey) of the aforementioned link between the degree of IT governance software implementation, IT governance process maturity, and return on investment (ROI) realized from such tools.

The remainder of this paper is organized as follows. In section two the literature streams relevant to the research question are assessed and a research framework is developed. The elements of this framework are broken down in conceptual variables in section three after which operational variables and hypotheses are developed in section four. Sections five and six present and discuss the research results and propose future research steps.

2. Research Framework

In order to arrive at a full perspective of IT governance applications and business value creation - as well as to analyze our research findings in a structured way - we have developed a research framework that depicts the relationship between the IT governance software implementation level, IT governance processes, and business value outcomes. As shown in Figure 1, it also includes critical success factors (CSFs) for the implementation, as well as environmental contingencies as moderators. This research framework builds on the original framework by Ribbers et al. [5] and on the extension Heier et al. [3] had built for the conceptual research phase.
Beachboard [6] states that there are two distinct but interrelated streams in contemporary IT governance research: the first stream following a structural approach and the second stream featuring a process approach. The “structure” research stream covers IT governance strategies and structures; it explores and addresses factors influencing the choice between a centralized, decentralized, or federal IT governance structure. Prescriptions are generated for the design of stakeholder responsibilities, often distinguishing between different layers of IT, e.g. business applications, shared services/architecture, and technology components/platforms [7, 8].

The “process” research stream focuses on IT governance processes and competencies associated with implementation success and use [9]. It is this area which is addressed by the IT governance applications that are central to this study as they aim at streamlining and enforcing a better IT governance process. The “structural” IT governance choices are of course relevant for the overall result of the IT governance processes but for the purpose of exploring the impact of IT governance applications they can be seen as separate and can be assumed as a given, a choice made by the organization prior to implementing an IT governance application.

Following Figure 1, this research provides insight into the relationships between the independent and dependent variables, the mediators and moderators, as well as into the strength of these links. The framework provides a focus on practitioner problems while being closely linked to academic constructs, providing the basis for future research particularly in the “process” research stream. In the proposed research model the implementation degree of IT governance applications - or individual modules - constitutes the independent variable (IV).

We posit that the IV will show positive impact on IT governance processes which in turn will enhance business value creation, the dependent variable (DV). Based on Baron and Kenny [10], a variable may act as a mediator to the extent that it accounts for the relation between the predictor DV and the criterion IV. Based on this assumption we regard IT governance processes as the mediator between degree of implementation and IT governance outcomes.

Furthermore, we regard implementation factors and environmental contingencies as moderator variables based on the definition of Stern et al. [11]. Moderator variables are assumed to reduce or enhance the influence that specific independent variables have on specific responses in question: “[a] moderator effect can be represented as an interaction between a major independent variable and a factor that specifies the appropriate conditions for its operation, that is, the effect of the major independent variable depends upon the value of the moderator variable.” All five major building blocks depicted in the research framework are described in more detail in the following section.

3. Conceptual Foundations and IT Governance Building Blocks

3.1 Tool Implementation Degree

IT governance software is designed to digitize and automate typical IT governance processes.
Consequently they support our IT governance working definition with the six major processes/decision areas: request, prioritize, fund, monitor, enforce, and realign. IT governance software ensures that agreed-upon steps are followed. Workflows automatically route decisions and needed input to process participants; exceptions and delays are escalated when reaching a certain threshold [12]. There are four main software features - or specific modules: demand management, portfolio management, program/project management, as well as resource/time management. The IV measures the degree to which those four modules have been rolled out in the respondents’ organizations.

The demand management capability serves as a single point of contact (SPOC) for all IT needs and defines how the IT organization receives requests, categorizes them into projects, enhancements, or ad-hoc changes, and subsequently manages the queue [13, 14]. All requests - first ideas or already formalized proposals - are stored in a central database, or demand repository. Consolidated information from web-based request forms is routed through review, evaluation, and prioritization processes - allowing for the tracking of demand statuses [15].

The portfolio management capability helps organizations to manage interdependent initiatives simultaneously which often compete for scarce corporate resources [14, 16, 17]. Portfolio management is concerned with project evaluations and the way in which investment decisions are made - picking between “must-have” and “nice-to-have” [18]. Common goals are to maximize the IT portfolio’s value, to align business and IT strategies, to ensure a fit with a firm’s architectural roadmap, as well as to mediate risk. IT governance tools support prioritization processes through clear processes and responsibilities for consolidating, evaluating, and approving collected requests [19].

The program/project management capability takes over when portfolio decisions are finalized. They support IT professionals in managing a set of projects by creating delivery schedules, as well as by analyzing, controlling, and aligning individual project tasks with business objectives. IT governance tools mandate the creation of program schedules, budgets, and resource plans. Individual projects are then tied to programs for day-to-day task management and tracking. The authorization of funds is tied to specific lifecycle stages and checkpoints [20, 21]. In addition, project-related risks and issues are collated and reported frequently.

The resource/time management capability helps organizations to get a clear picture of resource utilization across project and line activities. Sourcing decisions can be made in a timely manner and ought to be based on demand forecasts. In addition, IT governance software can support scheduling decisions per role, skill, location in order to staff the right people to the right projects. During the project duration, labor and non-labor costs are charged to the right sponsors for a (potential) later billing to the original requestors.

### 3.2 IT Governance Processes

Beachboard [6] states that the process-oriented stream of IT governance research aims for describing the implementation of IT governance and its operation - thus IT governance processes are tightly linked with the way business and IT decision making, as well as monitoring are implemented [5, 22]. The first of the six processes/decision areas - “request” - deals with the demand for new IT services and functionality, or enhancements to current IT products and operations. IT governance applications provide standardized and defined processes mainly by defining the way IT organizations can manage their work requests queue while guaranteeing high quality data by organizing the information flow [13, 14].

The second process - “prioritize” - comprises the filtering and ranking of requests according to their importance to the portfolio decision makers. Requests are classified into discretionary (optional) and non-discretionary (must have). The prioritization process always takes place for all discretionary requests. There are many criteria for prioritizing and selecting the right projects, but as Light [13] and McFarlan [23] argue, those criteria may and should vary according to the project classification. The goals on which those criteria are based are derived directly from the objectives of portfolio management, which are the maximization of the portfolios’ value, the balance of that portfolio, and the link to the strategy [14, 16, 24].

The third process - “fund” - refers to the commitment of resources to the previously selected architecture, business application, or infrastructure projects. This can be put in practice by predefined and enforced processes that should be linked to the company’s overall budgeting process. Specific request lifecycle stages and checkpoints should be in place in order to regulate the authorization process, i.e. who is responsible for funding which projects and when [13, 20, 21]. Light et al. [13] argue that in order to balance the entire IT portfolio the prioritized projects can be optimized in sequence and time spans by having required resources compared to available resources.

The fourth process - “monitor” - should incorporate both outcome and process control features, as well as a predefined set of key performance indicators (KPIs) [7-9]. Congruent with Debreceny [25] we posit that applications are central to information gathering,
monitoring, and communication. The use of dashboards focuses management attention on the outcomes of past decisions and prevents opportunistic behavior through transparency [26, 27]. IT governance applications provide views - for the top management - on the performance of processes and individual projects and thus provide indications on where to focus management’s attention [28, 29].

The fifth process - “enforce” - deals with any misalignment of IT initiatives with business strategy and IT architecture roadmaps. According to Van Der Zee and De Jong [30], IT governance applications can act as an IT balanced scorecard “similar to the initial balanced scorecard’s intention to serve as a tool for strategy implementation”. It can provide performance measurements for IT organizations to prove and demonstrate its performance to the respective internal or external clients. Additionally, IT governance applications can be directly linked with incentive systems holding managers accountable for misaligned projects, and for lacking business deliverables, forcing them to direct value to the business [29, 31, 32].

The sixth and last process - “realign” - brings IT initiatives and operational IT assets back in line with business objectives and architecture goals. It ensures that IT resources are still in line with strategic requirements. Durst [33] argues that once the corporate strategy is revised, the evaluation system and hence the components of an IT portfolio have to be adjusted. Through constant realignment, funds are freed up and can be reallocated to projects aiming at innovation and competitive advantage [3, 34]. According to Niemann [35], IT governance has to ensure that IT resources are planned, controlled, and optimized continuously. IT governance will not able to live up to its goals without a process for refreshing the alignment of IT assets.

3.3 Implementation Factors

Previous research [4] has identified a series of implementation factors which can affect the outcomes of an IT governance software implementation in one way or another. These implementation factors - clustered into six major categories - are the following: project planning and analysis (PPA), executive support (ESU), user involvement (UIN), user training (UTR), commitment (COM), and organizational integration (OIN).

- Executive support (ESU) demonstrates that managerial support is crucial for any successful IT governance initiative [39-41];
- User involvement (UIN) describes the participative design and rollout of selected IT governance arrangements and tools [42];
- User training (UTR) entails formal and informal training, practice fields, as well as support groups during the first weeks of use [39];
- Commitment (COM) comprises a general commitment to change, as well as a more specific commitment to the project [41, 43];
- Organizational integration (OIN) suggests that the implemented IT governance software should be tightly embedded in the company’s structures and processes [38, 44].

3.4 Environmental Contingencies

Considering the context in which this research takes place, the environmental contingencies and their influence on this study have to be taken into consideration [5]. The environmental contingencies analysis for the scope of this study is based on Sambamurthy and Zmud’s [45] tripartite categorization of environmental contingencies: corporate governance, economies of scope, and absorptive capacity [45].

Corporate governance refers to the already existing organizational control arrangements, such as firm size, and centralized or decentralized decision-making structures. Sambamurthy and Zmud’s [45] statement that organizations’ subunits tend to mirror the overall corporate governance, is complemented by Brown and Magill’s observation [46] that organizations following a centralized model of corporate governance tend to have a centralized IT governance model as well. Van Grembergen [22] states that IT governance is actually driven by the corporate governance mode a company is following.

Economies of scope are defined as the benefits realized from utilizing shared resources, knowledge, and managerial competencies [47]. Sambamurthy and Zmud [45] contrast two diversification modes. The first mode is realized through internal growth - occurring naturally as organizations evolve - and the second mode is achieved through external acquisitions. Organizations that grow solely through external acquisitions run the risk of expanding in unrelated fields and might not be able to achieve satisfying asset consolidation and thus fail to leverage economies of scope.

Absorptive capacities refer “[…] to the ability of a firm’s employees to develop relevant knowledge bases, recognize valuable external information, make
appropriate decisions, and implement effective work processes and structures” [45, 48]. Absorptive capacities reflect the level of IT knowledge in the line management of a firm. According to Sambamurthy and Zmud [45] a firm’s capacity to effectively implement and sustain a decentralized IT decision-making framework, is largely dependent and predicated on the extent of its line managers’ IT-related absorptive capability. We have added organizational culture as a fourth environmental contingency but it remains unclear whether and how fast this can be altered [comp. 29, 49].

3.5 Business Value Creation

As a last step in the research framework the business value outcomes from successful IT governance software implementations need to be investigated. For the purpose of this study the business value outcomes introduced in our previous study [3] will be used. Those benefits are classified into three distinct domains/categories: portfolio management optimization, project visibility and control, and IT services automation.

Measurements in the category of portfolio management optimization can provide evidence that IT-enabled portfolio management processes lead to improved alignment between business and IT, as well as to better executive communication and decision-making. Besides those qualitative benefits, monetary savings can be expected through revised investment decisions and repurposed capital investments. IT governance applications bring the same set of IT evaluation metrics and methods to each proposed initiative, while repurposed capital investments can free up cash for other strategic initiatives.

Qualitative measurements in the category of project visibility and control include a higher capability maturity level (CMMi) [50] and increased project sponsor satisfaction. Quantitative outcomes comprise an increase in healthy projects, better "on-budget" and "on-time" performance, as well as reduced project management costs. Finally, qualitative outcomes in the category of IT services automation are associated with improvements in the quality of audit and regulatory compliance [51] and the reduction of overall operational IT spending. Higher productivity and lower IT personnel costs are directly linked to working time reductions though faster incident handling while compliance with architectural standards is enforced.

Based on our research question and the research framework presented above, we have developed five hypotheses - listed as H1 to H5 in Figure 1. Each hypothesis is subdivided into a series of sub-hypotheses. The first hypothesis (H1) tests the direct impact of IT governance software implementations on the underlying IT governance processes and incorporates all six IT governance processes/decision areas detailed as H1.1 to H1.6 in Table 1; request, prioritize, fund, monitor, enforce, and realign. The second hypothesis (H2) tests the direct impact of IT governance processes on the business value realized from IT governance software implementations: portfolio management optimization, project visibility and control, and IT services efficiency.

The third hypothesis (H3) tests the indirect impact of IT governance software implementations on the business value realized from IT. It constitutes a direct consequence of the first two hypotheses - H1 and H2 - and can only be verified if those two hypotheses can be proven to be true. The last two hypotheses test the influence of IT governance software implementation factors and environmental contingencies on IT governance processes and the business value realized from IT governance tools. The implementation factors hypothesis (H4) embraces our six implementation factors: PPA, ESU, UIN, UTR, COM, OIN. Finally, the environmental contingencies hypothesis (H5) explores corporate governance, economies of scope, and the absorptive capacities.

Considering the fact that IT governance is a relatively new field, empirically - quantitatively - validating the business value realized from IT will play an important role and will provide the basis for further research. The empirical research and testing of the hypotheses was conducted via a questionnaire survey sent out worldwide to one or two named individuals in 80 major companies which utilize IT governance applications. As our study requires data from companies that have already implemented and used IT governance tools for some time, the total population was small and - according to the tool vendors which cooperated with us - our final mailing list included close to all companies worldwide meeting our conditions.

Contact data were obtained through one of the author’s consulting practice, as well as through the cooperation of several IT governance tools vendors. The surveys were mailed out in late February 2008 with responses arriving in the period from March 1, 2008 thru July 15, 2008. The companies that took part in our survey comprised firms in financial and insurance activities, manufacturing, information and communication, as well as in electricity, gas, steam,
and air conditioning supply - in most cases major players in their markets.

The targeted respondents had a good knowledge of the company’s IT related status prior and after the tool implementation, and were both involved in the development and implementation of the IT governance software while also being active users of those tools. These preconditions meant that in most cases the (targeted) respondents were high level managers in IT or in the business with a close link to IT. A professionally designed and personally addressed written questionnaire, an online questionnaire, combined with a small reward (iPod nano) and telephone followup were used to obtain a high response rate. Privacy was ensured and where possible multiple respondents per company were targeted to minimize any "personal bias".

The survey questions were constructed around the variables in Figure 1, with each variable typically covered in three different questions to check for internal consistency as an indicator of construct validity. Figure 2 shows part of the questionnaire, here with questions relating to hypothesis H1. The response rate of the survey lies at 53 fully answered questionnaires, from which 17 were written answers and 36 were filled out online. In total 41 companies took part in the survey, placing the response rate/quota at approximately 50% of the total population, and providing us with sufficient data to safely arrive at the results analyzed in the following section.

In addition to the high response rate, the fact that no company type/group was systematically left out of the sample, improves the representativeness of the gathered data. Furthermore, and in order to ensure that there is no data distortion caused by the given response rate, the early responses were compared against the last responses. According to this method, t-tests were conducted for all variables indicating only small differences between the early and late responses ensuring that the probability of data distortion caused by the given response rate is relatively low.

5. Research Results and Discussion

5.1 Interdependence Analysis

We began our data analysis with an investigation and testing of the previously established hypotheses through an interdependence analysis based on Pearson’s bivariate product-moment correlation. This correlation indicates the strength of the interrelation between two variables, and is obtained by dividing the covariance of the two variables by the product of their standard deviations. The significance level was set at 0.05 or better. Table 1 presents the results - showing support for the main hypotheses H1, H2, H3 and H4 - but not for H5. The results are explained in detail below.

Starting with the first hypothesis, four of H1’s sub-hypotheses were confirmed indicating a significant relationship between the degree of IT governance software/module implementation and the improvement in all six IT governance processes. Looking in more detail at the implementation level of specific modules - presented in Table 2 - we see that portfolio management is correlated “broadest”, i.e. to almost all IT governance processes. This can be contrasted with
demand management where we only find a correlation with the request process. It may well be that implementing the portfolio management functionality is the “sweet spot” for improving IT governance processes, although it should be stated that correlations should not be interpreted as causal relationships.

The implementation level of program management functionality did not seem to have any correlation to the request process, indicating no linear relationship between those variables. This result is to be expected since programs and projects are typically run once IT requests have been passed through the review, evaluation, and prioritization processes. Moreover, resource management is significantly correlated to the fund and prioritize processes. Thus, the main hypothesis H1 was confirmed (p < 0.01).

Continuing with hypothesis H2, we see a strong relationship between the IT governance processes and the business value realized from IT. Table 2 shows how IT governance processes play an important role in all three areas of business value realized from IT. In Table 3 this is broken down by looking at the link between each of the six identified IT governance processes and the three business value indicators. Across the board all correlations are strong, with the highest correlation (0.73) between the enforce process and project visibility and control, and the weakest correlation between the realign process and project visibility and control.

That practically all correlations are strong and positive suggests that a concerted broad approach to IT governance initiatives may be the best approach to attain desired business value outcomes, and that no single process improvement is linked to a single business value outcome indicator. A more detailed statistical analysis, ideally with a larger sample size, might shed more light on this. In summary, hypothesis-model H2 (H2.1-2.3) could be confirmed indicating an overall strong correlation between each of the IT governance processes and the business value realized from IT.

The third hypothesis H3 tests the indirect impact of IT governance software implementations on the business value realized from IT (H1 and H2 test the two direct parts of this link via IT governance processes - the mediator variables). As indicated in Table 1, we find a correlation of 0.402 (p < 0.01). We posit that this correlation is caused by the embedded process knowledge inherent in most IT governance software modules, i.e., they enforce a way of working that helps to attain business value outcomes associated with proper IT governance processes.

Continuing with the first moderator variables - tested with hypothesis H4(I) and H4(II) - our analysis shows a very clear influence of IT governance software implementation factors on both the IT governance processes and the business value realized from IT. Regarding the fifth hypothesis H5 only absorptive capacities show a direct positive relationship with the business value realized from IT. We hypothesize that environmental contingencies have a stronger relationship with IT governance structures which we have assumed as a given, a choice made by the organization prior to implementing an IT governance application. When those decisions are made prior to embedding processes and tools, the H5 moderator variables no longer seem to have any direct impact.

5.2 Regression Analysis

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Independent Variable</th>
<th>Dependent Variable</th>
<th>Expected Direction</th>
<th>Correlation r</th>
<th>Regression R²</th>
<th>Hypothesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>Implementation degree</td>
<td>Governance processes</td>
<td>+</td>
<td>0.396**</td>
<td>0.157</td>
<td>Confirmed</td>
</tr>
<tr>
<td>H1.1</td>
<td>Implementation degree</td>
<td>Request</td>
<td>+</td>
<td>n.s.</td>
<td>-</td>
<td>Not confirmed</td>
</tr>
<tr>
<td>H1.2</td>
<td>Implementation degree</td>
<td>Prioritize</td>
<td>+</td>
<td>0.338**</td>
<td>0.114</td>
<td>Confirmed</td>
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<tr>
<td>H1.3</td>
<td>Implementation degree</td>
<td>Fund</td>
<td>+</td>
<td>0.439**</td>
<td>0.193</td>
<td>Confirmed</td>
</tr>
<tr>
<td>H1.4</td>
<td>Implementation degree</td>
<td>Monitor</td>
<td>+</td>
<td>0.287</td>
<td>0.083</td>
<td>Confirmed</td>
</tr>
<tr>
<td>H1.5</td>
<td>Implementation degree</td>
<td>Enforce</td>
<td>+</td>
<td>0.356**</td>
<td>0.127</td>
<td>Confirmed</td>
</tr>
<tr>
<td>H1.6</td>
<td>Implementation degree</td>
<td>Realign</td>
<td>+</td>
<td>n.s.</td>
<td>-</td>
<td>Not confirmed</td>
</tr>
<tr>
<td>H2</td>
<td>Governance processes</td>
<td>Business value</td>
<td>+</td>
<td>0.722**</td>
<td>0.521</td>
<td>Confirmed</td>
</tr>
<tr>
<td>H2.1</td>
<td>Governance processes</td>
<td>Portfolio mgt. optim.</td>
<td>+</td>
<td>0.665**</td>
<td>0.442</td>
<td>Confirmed</td>
</tr>
<tr>
<td>H2.2</td>
<td>Governance processes</td>
<td>Project visibility</td>
<td>+</td>
<td>0.692**</td>
<td>0.479</td>
<td>Confirmed</td>
</tr>
<tr>
<td>H2.3</td>
<td>Governance processes</td>
<td>IT services efficiency</td>
<td>+</td>
<td>0.573**</td>
<td>0.328</td>
<td>Confirmed</td>
</tr>
<tr>
<td>H3</td>
<td>Implementation degree</td>
<td>Business value</td>
<td>+</td>
<td>0.402</td>
<td>0.162</td>
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<tr>
<td>H4(I)</td>
<td>Implementation factors</td>
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<td>0.584**</td>
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<td>H4(II)</td>
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</tr>
<tr>
<td>H5</td>
<td>Environmental cont.</td>
<td>Business value</td>
<td>+</td>
<td>n.s.</td>
<td>-</td>
<td>Not confirmed</td>
</tr>
</tbody>
</table>

Table 1. Quantitative Results Summary (significance level: *< 0.05, **< 0.01)
In addition to the interdependence analysis a regression analysis was conducted for testing the first two and most important hypotheses H1 and H2. In order to confirm the statistical model’s goodness-of-fit, as well as the statistical significance of the estimated parameters, we utilized R-squared \((R^2)\), regarding adjusted \(R^2\) values above 0.2 as acceptable, values greater than 0.4 as good, and values greater than 0.5 as very good.

Starting with hypothesis H1 and taking into consideration that there is only one predictor - the level of IT governance software implementation - \(R\) represents the simple correlation between the predictor and the IT governance processes (\(R = 0.396\)) and thus matches the result of the interdependence analysis presented in the previous section. With \(R^2 = 0.157\) the tools’ implementation degree accounts for 15.7% of the variation of the IT governance processes.

The second hypothesis H2 regression analysis shows that the simple correlation between the IT governance processes and the business value realized from IT was \(R = 0.722\). In addition, it shows that IT governance processes improvement accounts for 52.1% of the total variation in the business value areas with \(R^2 = 0.521\). This is very high, indicating that more than half of the business value realized from IT can be explained by considering only the improvement in IT governance processes.

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Summarizing the regression results relating to our first two main hypotheses we see that while H1 is supported (the link between IT governance software implementation and IT governance processes) we can explain only 15.7% of the variance in IT governance processes by looking at this variable. Simply implementing a software tool to get IT governance processes in order may help but only a little bit, when done in isolation. A larger sample size that would have allowed for a complete multiple regression analysis would have been beneficial here.

For the second major hypothesis H2 - linking IT governance processes with business value outcomes - we find that IT governance processes account for over 50% of the variance in business value outcomes from IT. Together with the interdependence analysis this is an important outcome, emphasizing the need for managers to very seriously address IT governance processes.

The \(R^2\) for H3, H4 and H5 is shown in Table 1. For H3 (combining H1 and H2) the regression coefficient is low (0.162) which is not surprising given the low value associated with H1. For both H4(I) and H4(II), linking implementation factors respectively with IT governance processes and business value outcomes, we find regression coefficients of 0.341 and 0.360, indicating a very clear influence of these factors. Managers are clearly well advised to consider these factors as part of their IT governance initiatives. Lastly, H5 was not confirmed.

### 6. Conclusion and Further Research

This study shows how the adoption of IT governance applications is related to improved IT governance mechanisms and how these, in turn, are strongly related to an increase in business value realized from IT. Our data shows that this reaction chain can only be effective under certain conditions; implementation factors play a vital role on both the improvement of IT governance processes through the implementation of applications, but also on the business value creation. Our data indicate that companies that are willing to dedicate the necessary resources to an IT governance application implementation can utilize the tool better and eventually create a much larger benefit in the form of a measurable business value.

<table>
<thead>
<tr>
<th>Request</th>
<th>Prioritize</th>
<th>Fund</th>
<th>Monitor</th>
<th>Enforce</th>
<th>Realign</th>
</tr>
</thead>
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<td>Demand management</td>
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<td></td>
<td></td>
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<td>Portfolio management</td>
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<td>0.42**</td>
<td></td>
<td>0.25*</td>
<td>0.35**</td>
</tr>
<tr>
<td>Program/project management</td>
<td>0.27*</td>
<td>0.39**</td>
<td></td>
<td>0.43**</td>
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</tr>
<tr>
<td>Resource/time management</td>
<td>0.24*</td>
<td>0.43**</td>
<td></td>
<td></td>
<td>0.24*</td>
</tr>
</tbody>
</table>

Table 2. Detailed Correlations for Hypothesis 1.1 - 1.6

(significance level: *< 0.05, **< 0.01)
Business value in the form of monetary benefits is only a small part of the benefits that a company can achieve by implementing an IT governance application and supporting it the right way. Companies that are able to formalize, align, and enforce processes can better align their IT and business strategy, reduce shadow IT requests, and achieve better audit and regulatory compliance. Environmental contingencies do not appear to play an important role in successful IT governance implementations nor in their business value potential. Nonetheless, our data indicate that environmental contingencies and especially absorptive capacities - in the form of users' IT knowledge - do have some influence over the overall IT governance processes efficiency and the generated business value.

For the next research steps a larger cross-sectional sample could be selected, incorporating companies with different sizes and a larger selection of IT governance vendors. Secondly, companies that do not follow any IT governance structure can be compared against those that have an IT governance setup but no applications implemented, which in turn could be weighed against those that have a full set of applications supporting their IT governance structure.

Thirdly, a longitudinal design could be used in order to analyze the natural evolution of IT governance processes over time. This would help providing a broader basis for comparison - both to academics, as well as practitioners - and would provide an even better understanding of the actual effect of IT governance application implementations on the underlying processes and business value creation mechanisms.

### References


