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ANTECEDENTS OF IT-ENABLED ORGANIZATIONAL CONTROL MECHANISMS

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Abstract[1]

Organizational control is one of the fundamental management functions. Literature on control design suggests two underlying antecedents for designing organizational controls: 'knowledge of the transformation process' and 'ability to measure output'. We conducted an exploratory case study, drawing on archival data and interviews to test organizational control theory (OCT), taking into account the role of Information Technology (IT) in control design. We operationalized OCT as characterized by literature and classified 525 organizational controls. We found OCT correctly predicted the control type based on the antecedent conditions in approximately two out of three cases. We found the other third being influenced by automation, centralization, and mass data analysis. We argue that IT allows management to implement behavior controls in situations, where processes and procedures are unknown and therefore 'knowledge of the transformation process' is low. As contribution for theory, we reveal exploring capabilities of organizational control in addition to exploiting activities. As contribution for practice, we introduce new antecedents for designing organizational controls. This research is in line with others to test control theory, but it is the first to explain the catalyzing functions of IT on organizational control design within a case study.

Keywords: Organizational control, GRC IS, control strategies, exploratory control, behavior control

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1 Introduction

Organizational control is one of the fundamental management functions (Cardinal et al. 2010). Controls ensure that members of an organization act according to the organization's goals (Merchant & Otley 2006). Fast-pacing developments, globalization, and competition both exacerbate and require the implementation of proper organizational controls to ensure organizational performance. Compliance regulations and standards present the challenge to organizations to implement a plethora of organizational controls to meet these requirements. Organizations implement IT-supported control management systems to cope with the increasing numbers of requirements. These systems allow IT-enabled design and management of controls. One prominent example are so-called information systems for Governance, Risk, and Compliance (GRC IS), which allow organizational control management within an information system.

Although the particular design of organizational controls help managers to attain organizational goals the antecedents of effective design are still considered as an unsolved issue in management research (Cardinal et al. 2010, Jensen 1993). IT has been suggested as a promising research endeavor in this area (Rom 2008, Sutton 2010), the catalyzing function of IT in organizational control research has not yet been researched in depth (Granlund 2009). As recent literature (Wiesche et al. 2011b, Wiesche et al. 2012) suggests, IT catalyzes the exploiting capabilities of organizational controls, but also allows new capabilities for exploring organizational behavior and outcome. This research seeks to further explore the effect of IT on designing organizational controls. Therefore, we ask the research question of *how does information technology influence the design of organizational control mechanisms?* To answer this question, we conducted an exploratory single case study, using interviews and archival control data. We found that organizational control theory (OCT) correctly predicted the control type based on the antecedent conditions in approximately two out of three cases. We found the other third of the cases are being influenced by automation, centralization, and mass data analysis. We argue that IT allows management to implement behavior controls in situations, where processes and procedures are unknown and therefore 'knowledge of the transformation process' is low.

This paper is organized as follows: The next section outlines the theoretical background regarding organizational design recommendations and initial research on IT in organizational control design. The third section describes the methodology we followed in the course of our research. After documenting the operationalization of the considered framework, we present the results of our analysis. The fifth section discusses our results considering theoretical and practical implications and limitations. The last chapter summarizes our findings.

2 Background

2.1 Organizational Control Theory

The understanding of organizational control varies, depending on the different research streams followed in management, organizational, IS, and marketing literature (Cardinal et al. 2010, Merchant & Otley 2006). Three major perspectives can be distinguished: the cybernetic perspective, the management perspective, and the risk perspective. The cybernetic perspective on control draws on the goals of achieving organizational objectives, adapting to environmental factors, collecting, processing, and reporting information, and influencing the behavior of organizational members (Flamholtz et al. 1985, Ouchi 1979). The management perspective focuses on a rather strategic perspective, focusing on organizational uncertainty and managerial requirements (Simons 1995). In contrast to the cybernetic perspective, the management perspective on control sees the scarcity of resources as drivers for managerial decision preparation instead of using the cost-analysis as suggested by the cybernetic perspective. Drawing on both, the cybernetic and management perspectives, the practice-driven risk perspective focuses on the exterior of the organization, by identifying potential threats that may affect the organization (COSO 2004).

For the purpose of this research, we understand organizational control as the interpersonal influence relations within organizations, which can be seen as arrangements of individual human interactions (Ouchi 1979). Control mechanisms are based on two underlying control strategies. Formal control strategies manipulate rewards and sanctions. This control strategy requires explicit, formal rules, procedures, and policies to both monitor and reward organizational performance. Informal control strategies aim at minimizing the divergence of personal and company goals (Cardinal et al. 2010). For the purpose of this research, we focus on formal control strategies. Therefore output and behavior control will be introduced in the following as the two control mechanisms implementing formal control.

When implementing output control mechanisms, the principal monitors the agent's achievements at the end of the given tasks. The monitoring of the output of the value creation process implements the formal control strategy through analyzing the output of the performed tasks. Executing output control requires understanding the results of the value creation process and the ability to evaluate the outcome (Ouchi 1979). Behavior control implements control mechanisms that help the principal evaluate the agent's behavior. It enforces the formal control strategy through evaluating the tasks that the employee performs on appropriateness and alignment with the overall strategy. Behavior control requires the knowledge of the transformation process and understanding of the involved resources (Ouchi 1979).

2.2 A Decision Model for Control Mechanisms

Literature suggests that the underlying element of a management's decision of how to control is inevitably linked to the feasibility of measuring the performance that ought to meet required standards (Cardinal et al. 2010, Kirsch 1996, Ouchi 1979, Snell 1992).

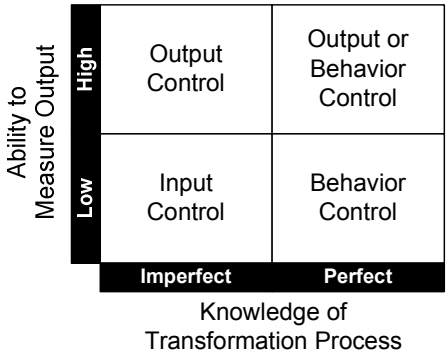

Figure 1: Framework of control antecedents (Ouchi 1979)

Outcome measurability is thus seen as an antecedent condition that determines the mode of control that is implemented. In this paper, this dimension will be referred to as the ability to measure output (Ouchi 1979). The ability to measure output refers to task programmability – i.e. the agent's ability to determine the output of the value creation process. If output cannot be measured, another option to control if a task is satisfactorily performed, is surveillance. This dimension refers to the principal's knowledge of how the value creation tasks have to be performed by the agent (Ouchi 1979). If the principal knows exactly, which tasks the agent has to accomplish, the knowledge of the transformation process is high. When the principal does not know, which factors influence the value creation and therefore the tasks the agent has to perform, the knowledge of the transformation process is low.

It is indeed intuitively comprehensible that controls cannot be performed, unless there is adequate information at hand. Ouchi (1979) has depicted contingencies of the ability to measure either output or behavior with thee control mode in a matrix, which ought to serve as advice for the management (figure 1).

2.3 Empirical Work on Ouchi's Framework

Empirical research has extended the framework of antecedents of control as predictors of the chosen control mode and tested it in real-life contexts, sometimes adapting the dimensions of the matrix to the

setting of their study. For example, Snell (1992) tested correlations between the ability to measure output or behavior and the selected control mode of executives in bureaucratic control systems.

Kirsch et al. (2002) empirically investigated predictions on the chosen control mode from a client's point-of-view. Similarly to the above, findings suggest associations of outcome measurability with exercising output control in the context of client-company relations (Kirsch et al. 2002). The hypothesis on positive relations between behavior observability and the application of behavior control was also supported (Kirsch et al. 2002). In this context, behavior observability replaced the usual dimension of 'knowledge of the transformation process' proposed by Ouchi (1979), due to the fact that clients do not usually know processes.

The influences of 'knowledge of the transformation process' and ability to measure output were analyzed especially in the context of marketing (Jaworski & MacInnis 1989). Also according to this study, tendencies to the performance of behavior or process controls correlate positively to a person's knowledge about the process (Jaworski & MacInnis 1989).

2.4 The Role of IT in Organizational Control Design

Previous research has thus suggested that Ouchi's framework (1979) adequately predicts or advises a certain type of control to be implemented. Studies report on the relevance and capabilities of IT in designing organizational controls (Chapman & Kihn 2009, Wiesche et al. 2011a).

Although study results indicate IT in organizational control design as an interesting métier (Rom 2008, Sutton 2010), the impact of IT on organizational control design has not been researched in detail (Granlund 2009). A literature review by Efendi et al. (2006) within the top accounting journals provides evidence that confirms these findings. Although an ongoing stream of research focuses on designing controls in IS projects (Conboy 2010, Kirsch 1997, Tiwana & Keil 2009), the research on the impact of information systems on organizational control systems is still fragmented (Rikhardsson et al. 2005). Little research exist on the explorative use of IT within control systems (Debreceny & Gray 2010, Jans et al. 2010), while IS research focuses on the impact of IT on clan control (Kohli & Kettinger 2004, Kuckein et al. 2010).

Information systems dedicated to plan, control, and report on the compliance with regulations create significant potentials for coping with regulations more effectively (Wiesche et al. 2011a). Commonly, features of such information systems are discussed under the label of GRC (governance, risk management, and compliance). Driven by regulatory compliance, companies established such GRC IS to prevent fines and penalties imposed by regulatory agencies. Today, companies focus on integrated solutions of GRC without a clear value proposition for their individual situation. Still, market research predicts that US-based companies spend almost $30B on GRC related technology and solutions and its perceived importance continues to grow (Hagerty & Kraus 2009). GRC IS provide a variety of controls ranging from procedures to monitor user access to information systems, to monitor process performance and provide enterprise-wide risk management (Wiesche et al. 2011a). Other than controls, GRC also implements mechanisms to report on compliance and to manage existing business processes. The most common platforms include *BWise*, focusing on quantitative and qualitative risk and compliance management, *SAP GRC*, providing an integrated platform for role management, process control, and risk management, and *Thompson Reuter's eGRC*, providing advanced audit services such as regulatory content services, change and policy management and regulatory tracking services.

Several value drivers for the potentials of IT were introduced in this context (Wiesche et al. 2011b). IT drives the exploitation as well as the exploration of organizational controls. This influence is made possible by IT's impact on data collection, efficiency and effectiveness of controls. Facilitation of new capabilities concerning the development of effective control systems and the provision of additional support for management resilience are two further important points. Audit efficiency can be further supported by IT when designing organizational controls, as it ensures control standardization. Moreover, IT ensures control coherence: Automation and mass data processing foster the monitoring of the controls' effectiveness and therefore the pick for the right control arrangements. In addition, IT enables accounting toward knowledge service providers by allowing interpretation of weak signals and providing decision support,. IT creates transparency through ubiquity of information and therefore

enhances management's absorptive capacity, directed towards more effective controls. Interpretation of weak signals from management can thus be improved. The suggestion of measures and actions for mitigation is facilitated by IT. IT enables decision makers within the organization to use decent and reliable information and benchmarks in order to provide decision alternatives to management, instead of the plain preparation of information concerning compliance.

3 Research methodology

This paper reports on the results of a single case study. The method was selected in order to formulate answers to the research question as stated in the first section. A single case study is a research design, which makes it possible to gain qualitative and quantitative information on the application of a phenomenon in the setting in which it occurs (Yin 1994). An exploratory design that would combine interviews with the analysis of archive data was chosen to develop a profound understanding of the complex phenomenon of implemented controls within their original context (Yin 1994).

3.1 Case Selection and Data Collection

The case company - Beta - is Germany-based, of medium size and operates in the industrial and building sector. In 2008 the company implemented an IT-based control management system as a reaction to rising challenges in the business and due to its international activities. It is one of few of their size that have already implemented and gained experience with this method of meeting external and internal requirements, designing a GRC IS and implementing their organizational controls within. To assure actuality, Beta reviews existing controls on a regular basis. Controls which are marked as inefficient, e. g. because there have not been any incidents within a certain time period, are removed from the dataset. This ensures clarity and quality of the implemented controls.

Beta's board has decided to implement an IT-based control management system. This approach ought to provide the company with the possibility to supervise business processes and risks. In order to formulate controls, the company first determined and recorded the functional processes that tasks can be assigned to. All relevant processes were depicted as flowcharts and documented within the GRC IS. It collects data from various systems throughout the organization, including the global ERP system, a self develop tool for assessing control information, and other data sources. Beta implemented some of the predefined controls within their ERP system. In addition, Beta implemented operational controls with the tool for assessing control information meeting the requirements of their line of business and connected it to the GRC IS. Hence, IT is incorporated within Beta's management control system in two different ways: it manages existing controls and allows centralization, automation, and real-time monitoring. On the other hand, it uses mechanism for automatic evaluation of data and only reporting anomalies. Thus, it reduces control efforts.

We retrieved a subsidiary's full control set, comprising 525 controls ranging from strategic to financial, operational, and compliance controls. Each control is characterized along three main dimensions: a defined risk, an objective that should be reached and a control, in order to match the risk and the objective. Further information includes test instructions, character of control, corresponding, information system, and potential errors. This data set was analyzed as the central empirical evidence in this case. Interviews were held with co-workers of Beta who are involved in the control system process, in order to supplement missing information. These interviews lead to a more profound insight into the performed controls by providing additional insights and experience. Within the interviews, co-workers were encouraged to provide their own view of high importance information on this matter.

In order to test and extend existing theory with the control set at hand, we operationalized the framework introduced above using the items as introduced in the next chapter. The first author coded each control according to the criteria developed in the next chapter. To ensure impartiality, the second author likewise coded the controls independently. The two codings resulted in an average inter-coder reliability of 0.72.

3.2 Operationalizing the Control Design Framework

Previous research has designed empirical studies in order to test the control design framework. For the purpose of testing it in this context, we constructed criteria to measure Ouchi's (1979) dimensions, as well as the realization of controls in terms of their mechanism: output and behavior control. We will present literature in order to operationalize the dimensions of knowledge of the transformation process and ability to measure output. We will then present measurements of output and behavior control.

Measurement of the dimension of knowledge of the transformation process, was conducted with the construct behavior observability as a new contract to supplement knowledge of the transformation process as a predictor of behavior control (Kirsch 1996). The items of behavior observability consist of the controllers effort and time spent monitoring if goals were met, how often he participated in review of goal achievement meetings, how often the controller visited with the controlee, and how often the controller received written review documents (Kirsch 1996, Kirsch et al. 2002).

Using these items, we synthesized three criteria that would be determinable by the available data. First, a controller's knowledge of a task would be given if the task is formulated and documented. This would be the case for example, if a guideline for the underlying task exists. The second is based on the supposition, that knowledge about a task can be assumed if tasks are very simple. For instance, if a control consists of checking the stamp of a bill, the process of generating a stamp is probably comprehensible by the controller, as the task is very simple. The scale's third item is based on the understanding of the "bigger picture" that can be assumed for the controller. This is the case, if a control has been integrated in the depicted processes, the formulation of the control suggests a connection to other tasks, or the context of other tasks is easily comprehensible.

Furthermore, authors developed items for the dimension ability to measure outcome. Outcome measurability, in literature used as a synonym for Ouchi's (1979) term of ability to measure output, is a construct of three items (Kirsch 1996). The first item is about whether the controller can determine if a project's goal was met. The second item as about whether to the controller it is possible for the controller to accurately and reliably assess to what extent a completed project meets the initially posed goal, while the third is based on how easily the extent of goal achievement is assessable (Snell 1992).

Again, we used these items to synthesize three criteria that can be determined by the available data. The first item is dedicated to whether a controller can state if the performance of a task sufficiently satisfies the companies need. This satisfaction does not have to be objectively assessable. For instance, this would apply to a control that requests to control the plausibility of data compared to previous months, or the plausibility of justifications given for deviations in performance. Second, higher ability to measure output is assumed, when objective indicators that suggest the objective-related successful performance of a task would exist. This is the case, for example, in the following control:

„Verify: if the Excel lists and all delivery notes were signed by the person in charge." (Archival Data)

Third, quantifiable measures, depicting the extent to which set targets were achieved, form a criterion for the construct. This criterion is fulfilled, if data is compared and deviations are quantifiable, as can be seen in the following control:

„Verify: if booked values equal with the values reported in the change-report." (Archival Data)

In order to test controls on their score for the dimensions of knowledge of the transformation and ability to measure output, measurement of output and behavior control is required. Measurement of the control mechanisms behavior and output control has been performed in the course of a plethora of studies in research (Cardinal et al. 2010, Kirsch 1996, Snell 1992).

First, the construct of output control is examined. Literature suggests items to measure output control as aiming at determining how strong the emphasis on output is regarding appraisal and rewards (Snell 1992). Similarly, other items stress the definition of antecedently specified goals and their linkage to reward as criteria for output control and how well they were communicated (Jaworski & MacInnis 1989, Kirsch 1996).

We summarize similar items in three criteria. The first criterion, goal specifity, refers to setting and communicating goals explicitly. The second criterion is the availability of quantifiable measures to determine the extent of goal completion. A third aspect in the context of the construct of output control is its link to rewards. Employees of Beta confirmed that no rewards for employees are linked to this control set. Rewards can only be linked to results, if these results are obtained at the end of a process. The third criterion used in the analysis is thus whether the control is directed to a final task at the end of a process.

Behavior control is the second control mechanism of interest regarding the analysis of the dataset. Jaworski and MacInnis (1989) evaluated behavior control with items based on the assessment of the controlee if immediate superiors can evaluate the extent to which the controlee follows established procedures, if procedures are evaluated, if procedures are adapted when results do not meet expectations and if the controlee expects feedback from his superior (Jaworski & MacInnis 1989). Snell (1992) refers to behavior control as process control and analyzes the strength of emphasis in evaluations on behavior, the accountability of subordinates for actions, the interest of the controller in procedures and methods and the imposition of top-down performance programs (Snell 1992). Furthermore, the scale is based on the frequency of feedback given by the controller as well as frequency of meetings, and the existence of predefined performance goals (Snell 1992).

In conclusion, three main characteristics of behavior control appear. First, research states that performance of behavior control is indicated by formulated guidelines, which contain clear steps that have to be followed. Second, centralization, thus no or little delegation of decision making to subordinates and centrally formulated policies and guidelines have been assumed to be characteristic for behavior or process control. The third characteristic is the frequency of performance control and appraisal, as well as of feedback given. In the considered data set, controls, which are performed at least daily, were considered to fulfill this criterion.

Rating of the control set was performed on every control as listed under test instructions of every of the 525 control under the label “verify”. Ratings on each item were conducted independently from each other. The score on the scale ranging from 0 to 3 resulted from the sum of appropriate criteria among the three defined. In the following, we report on the results of this rating. In order to fit within the framework, for each dimension, we assumed the scale of 0 and 1 as “low” and 2 and 3 as “high” regarding the dimension at hand.

4 Results

As outlined above, we classified the 525 controls, contained within the data set. Figure 2 presents an overview of the classification. In the following, we report on the classification in detail. First, results on the dimension of knowledge of the transformation process are listed. Measurement of knowledge of the transformation process consisted of three items, 1) formulization, 2) simplicity and 3) integration in process. 386 (73.52%) controls were directed to formulated tasks, while 139 (26.50%) were not. 212 (40.38%) underlying tasks were estimated to be so simple, control owners would have enough knowledge on their process. 313 (59.62%) of tasks controls are performed on are supposed to be not as easily comprehensible. 218 (41.52%) of controlled jobs could not be integrated into the context of their performance only by archival data information, while 301 (58.47%) were.

In sum, 53 (10.10%) underlying tasks of controls were rated with a 0 on the designed scale of knowledge of the transformation process; 168 (32.00%) were rated 1. In the matrix proposed by Ouchi (1979) both lower ratings result the label of “imperfect” for knowledge of the transformation process (Ouchi, 1979). Thus, 221 (42.10%) tasks controls belong to are rated “imperfect”. 176 (33.52%) tasks controls are based on scored 2, and 128 (24.38%) controls scored 3 on the scale of knowledge of the transformation process. These ratings signify labeling of “perfect” knowledge of the transformation process. Ability to measure output was rated considering 1) determinability of satisfaction with performance outcome, 2) objective determinability of goal accomplishment and 3) quantifiable extent of goal accomplishment. For 462 (88.00%) tasks control is performed on, accomplishment of an objective to the organizations satisfaction can be determined, for 63 (12.00%) it cannot precisely. In 333 (63.43%) of all tasks control refers to, it can be objectively determined whether a target is

achieved, while in 192 (36.57%) of all tasks it cannot. The extent of accomplishment of 112 (21.33%) controlled tasks can be quantified. Accomplishment of 413 (78.67%) tasks was shown to not be accurately measurable. In sum, 27 (5.14%) of controlled tasks were graded 0, and 180 (34.29%) were graded 1 on the scale of ability to measure output. In summary, 207 (39.43%) of controls are labeled "low" concerning their ability to measure output. 227 (43.24%) of all tasks controlled are rated 2 on the scale, and 91 (17.33%) are rated 3. According to the scale, ratings of 2 and 3 result in a "high" ability to measure output. 318 (60.57%) of all assessed task consequently have a measurable output.

159 (30.29%) controls have scored "low" on ability to measure output and "imperfect" on knowledge of the transformation process. Performance outcome of 47 (8.95%) tasks can be measured, while knowledge of their transformation process is imperfect. Knowledge on 62 (11.81%) jobs is "perfect" whereas their output can explicitly be measured. For 257 (48.95%) jobs both knowledge of the transformation process and ability to measure their outputs is given.

As stated above, we also classified output and behavior controls. For the latter, 15 (2.86%) tasks were not centrally prescribed, 510 (97.14%) were centrally prescribed according to the control description. 503 (95.81%) of tasks were formalized, in parts within the description of the control itself, while 22 (4.19%) were not. Frequency resulted from the given classification in the provided control set. According to it, 93 (17.71%) of all controls were performed at least daily, while 432 (82.28%) were performed less frequently. On the 4 item scale, in sum 10 (1.9%) controls were rated 0 and 9 (1.71%) controls were rated 1, resulting in 19 (3.62%) of controls considered behavior control. 421 (80.19%) were graded with 2 and 85 (16.19%) were graded with 3. In sum, 506 (96.38) are considered behavior controls.

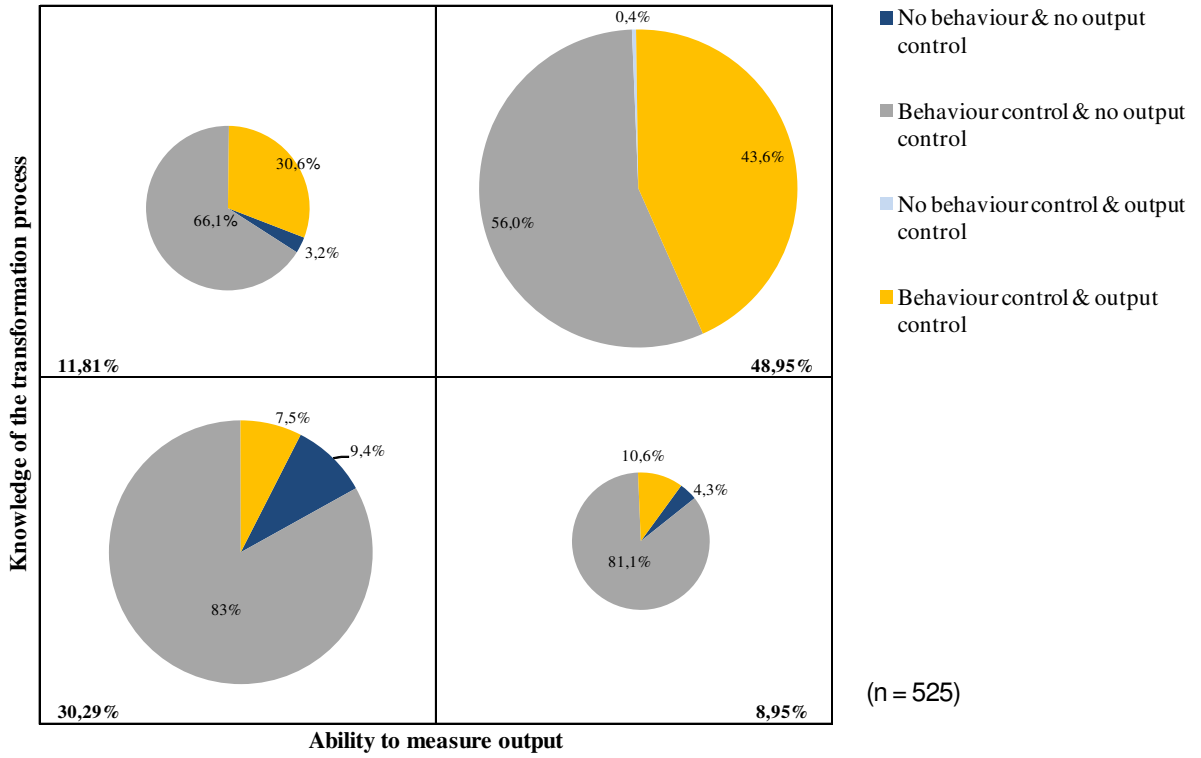

Figure 2: Classification of the data set within the organizational control framework

Considering output control, 381 (60.57%) of controls were found to be based on a specifiable outcome, while 207 (39.43%) were found not to be. 479 (91.23%) of controls are not dedicated to quantifiable extent of goal achievement, while 46 (8.76%) are. 164 (31.24%) of controls are directed to the end of a process and 361 (68.76%) are performed in a process's course. 176 (33.52%) of controls ended up with a grading of 0 and 199 (37.90%) with a grading of 1. 375 (71.42%) of controls are thus considered not to be output controls. 121 (23.05%) of controls scored 2 and 29 (5.52%) scored 3. 150 (28.57%) of controls are thus considered output controls. 17 control (3.24%) are low on both scales, knowledge of the transformation process and behavior control, while 301 (57.33%) are high on

both scales. 318 (60.57%) match Ouchi's (1979) assumptions. For 3 (0.57%) controls the transformation process is known, but they score low on behavior control; and for 204 (38.89%) controls knowledge of the transformation process was rated low, while characteristics of behavior control are fulfilled. 207 (39.43%) of controls do not show predicted relations between these two constructs.

As literature suggests, the ability to measure output ought to predict usage of output control, the correspondence has to be assessed. 189 (36.00%) of tasks have no measurable output, and no output control is performed on them. 132 (25.14%) of do have measurable output, and output control is performed on them. 312 (61.14%) of all controls have been predicted accurately by their antecedent according to theory (Ouchi 1979). For 204 (38.86%) this is not the case, because antecedent and the implemented control mechanism do not match.

Results show, that 349 (66.48%) of all controls have been predicted accurately by their antecedents. 176 (33.52%) of controls have not been accurately predicted. Focusing on the latter reveals some interesting insights. Of these, 172 (97.73%) controls are behavior controls, which are implemented in a situation, where knowledge of the transformation process is low. Considering the theoretical assumptions on the catalyzing character of IT on organizational controls as discussed above, we reviewed additional information on these controls carefully. We found that of these 172 controls, 111 (64.53%) were of preventive character. Only 61 (35.46 %) were of detective character. Typical examples include using information systems to aggregate information for benchmark and tracking purposes. One financial control for example assesses ensuring that internal cost allocations are conducted correctly. The risk of wrong internal transfer pricing is assessed by aggregating transfer price calculations from each subsidiary on a regularly basis. Though from management's perspective, there is no transparency of internal price negotiations, figures can be aggregated and compared with e. g. the opposing subsidiary. In this case, the implementation of information systems eases executing the control regarding time and efforts. ERP systems serve as disintermediating catalysts by eliminating laborious tasks, which would make such controls uneconomic. Within the purchasing department, operational controls for incoming goods aim at preventing fraud. Within Beta, a matching between order and incoming goods is conducted using information systems, providing first indicators for fraud and error, if the deviation is of noticeable size. Similarly, other preventive controls are of ex ante character to identify potential error and fraud, before the incident occurs.

5 Discussion

The purpose of this study was to investigate the fit of an existing theory on organizational control design with modern IT-based management control systems. Our results suggest that the dimensions of 'knowledge of the transformation process' and 'ability to measure output' as antecedents for control design as proposed by Ouchi do not seem to explain design rationales in modern management control systems any longer. We find 'synchronicity' and 'certainty of actions' as promising indicators for control design. Although such concepts have been theoretically considered in research before (Ansoff 1975, Mundy 2010, Wiesche et al. 2012), information systems enable organizations to explore these opportunities.

The data analysis disclosed four interesting observations, which we consider worthy of discussion. Two observations are related to the antecedents of organizational control design, two are related to the interpretation of control data and the usage within the management control system. Our observations and their discussion are summarized in table 1.

First, we found that behavior controls preponderate output controls. Many of these controls are designed, considering the design rationales as suggested by literature. However, some violate the theoretical suggestions (Ouchi 1979). Analyzing the controls, which violate the cost-efficient design rationales, our results suggest that the importance of control costs decrease when companies that face stiff compliance regulations (Eisenhardt 1985, Jensen 1993). We argue that the analysis of the insignificance of control cost, caused by both IS and regulatory requirements, is an interesting endeavor for further research.

Second, our data suggest that behavior controls are implemented at different points in time. Behavior controls are implemented at an early stage of the process to collect information, which is not sufficient enough for decision-making (Sia et al. 2002, Ansoff 1975). Based on our analysis, we assume that IS reduce the costs of collecting control data, which leads to a more transparent agency relationship. We argue that the analysis of the effect of IS on the antecedents of organizational control design could be a stimulus for further research.

Third, our data reveal interesting combinations of organizational controls. Within Beta's control set, behavior controls are combined with input controls quite often. The gathered information helps using control information for rather exploratory control purposes (Speklé 2001). Our analysis suggests that IS allow converging insights that accrue from the organization and use these insights for decision-making. We consider the impact of IT on the design and usage of exploratory controls an interesting endeavor for further research.

Fourth, our case suggests the dynamic development of organizational controls. On a regular basis, Beta's develops new controls and reviews existing controls for effectiveness. Different controls are combined for exploratory purposes. The current state of the data set comprises various combinations of control types (Mundy 2010). We argue that IS reduce barriers to an integrated use of management control systems. We consider research on the impact of IS on the balance of organizational control systems as an interesting stimulus for further research.

Observation	**Discussion**	**Stimulus for Research**	**Literature**
Designing controls, which violate theoretical cost-efficient design rationales	The importance of control costs decrease when companies that face stiff compliance regulations.	Insignificance of control costs	(Eisenhardt 1985, Jensen 1993)
Behavior controls differ regarding of control point in time	IS reduce the costs of collecting control data, which leads to a more transparent agency relationship.	Antecedents of control design	(Sia et al. 2002, Ansoff 1975)
Exploratory combination of input and behavior control	IS allow converging insights that accrue from the organization and use these insights for decision-making.	Exploratory controls	(Speklé 2001)
Try different control types within process, remove inefficient ones	IS reduce barriers to an integrated use of management control systems.	Balance of control systems	(Mundy 2010)

Table 1. Observations, suggestions, and stimuli for research in IT-enabled organizational control.

As implications for research, we provide empirical evidence that existing research explains today's organizational control systems only partly. We show that today's organizational requirements demand more controls than these, which are in line with existing theory. Although this exploitative usage of organizational controls is still prominent and hence relevant for organizational control research, our results reveal the need for further research on exploring organizational controls for ensuring organizational integrity (Wiesche et al. 2012).

As challenges increase for companies to comply with legal as well as other regulations, questions arise on how to control compliance in this complex context. This research aids practitioners on deciding, what the most efficient and effective control type is. We provide evidence that automated controls are promising additions to organizational control systems. For implementing IT-based organizational controls, we suggest criteria, which serve as antecedents of organizational control design.

However, there are several limitations that have to be taken into account. First, it should be conceded that this research is based on a single case study and therefore needs to be further evaluated in other contexts and broader samples. Especially the high degree of behavior control indicates an industry-specific phenomenon, which might limit the extent to which results can be generalized. In addition, although it is the most obvious, Ouchi's framework (1979) might not be the appropriate theoretical lens for researching this data set. Rather strategic theories for management control systems (Simons 1995) could provide further explanations and insights. From a methodological point of view, the

independent classification of both, the control situation and the control type made an objective analysis possible. Using the developed independent classification criteria, we classified controls as both output and behavior control. However, this does not affect our findings since we did not consider existing measures of control efficiency. Nevertheless, the double classification leaves some open issues, which need to be resolved in further research.

6 Conclusion

To answer the research question, we reviewed existing literature on organizational control design in order to understand the catalyzing impact of IT on organizational control systems. In control theory, various characteristics have been investigated to predict the implemented control mechanisms. Ouchi (1979) suggested two dimensions as antecedents that would predict the control type most adequate for application. We operationalized the framework using existing items from literature. We show that only around 66% of controls implemented could be adequately predicted by determining the dimensions of knowledge of the transformation process and ability to measure output. In one third of the cases, theory could not reliably explain the implemented control. For the latter, exploratory analysis revealed synchronicity and certainty of actions as promising antecedents. Analyzing Beta's data set further indicates that controls, which were formerly implemented for different purposes can now be integrated to provide a more consistent picture of the organization, which needs to be controlled.

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