EXPLORING INFORMATION SYSTEMS CONTROL ALIGNMENT IN ORGANIZATIONS

Research-in-Progress

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Abstract

This research-in-progress paper outlines a new concept called information systems (IS) control alignment, which refers to the consistency of controls that are employed within an IS process, such as systems development. Portfolios of mechanisms used to control employee behavior, including formal policies and training initiatives, are commonly utilized by management to encourage contributions to organizational objectives. However, due to the complexity of IS processes and the variety of controls put into place, it can be difficult for managers to determine if controls are working together cohesively or are at odds with one another. Using exploratory case studies and the development of a measurement instrument, this research seeks to contribute to practice by uncovering the implications and challenges of employing consistent controls within IS processes. From a research perspective, this study will introduce a new perspective that integrates the study of alignment and organizational control.

Keywords: IS control, human behavior, IT/IS management
Introduction

Today’s organizations require the effective utilization of information systems (IS) assets, capabilities, and projects in order to stay competitive and take advantage of technology innovations (Piccoli and Ives 2005). To accomplish this goal, companies continue to adopt new technology-related processes, such as recent trends towards cloud computing, agile development, and offshoring. Previous research has shown that fundamental process shifts can alter the IS subculture, decision-making structure, and employee interactions (Cao et al. 2009; Kirsch et al. 2002), as well as the underlying mechanisms used to control employee behavior (Choudhury and Sabherwal 2003; Kirsch 2004; McFarlan 1981). As IS processes increase in complexity and the mechanisms used to control employee activities become more diverse, managers are faced with the challenge of selecting effective controls to achieve organizational objectives.

Our research aims to understand the implications of employing consistent control mechanisms within IS processes, a phenomenon we refer to as IS control alignment. In this context, an IS process refers to a collection of procedures related to the planning, acquiring, delivering, and monitoring of information systems that take and manipulate inputs in order to produce outputs (IT Governance Institute 2007). Consistent with the Control Objectives for Information and related Technology (COBIT) framework, we consider IS processes to include activities such as managing projects, ensuring systems security, and acquiring application software.

This study seeks to address the practical problem of ineffective and insufficient IS controls utilized by organizations. As indicated by reports of the continued underperformance of systems development projects (Barclay 2008; Henry et al. 2007), ongoing security breaches (Chenoweth et al. 2010; Khansa and Liginlal 2009), and inconsistent service from third-party providers (Bayuk 2009; Durkee 2010), IS controls in many organizations are not operating as effectively as they could. We argue that this issue can be traced to the increasing complexity of information systems processes, as well as the choice of controls that are implemented to satisfy compliance requirements. Due to the rapid rate of technology change experienced in contemporary organizations, maintaining an up-to-date collection of controls that is effective in addressing risks can be challenging (Rai and Chukwuma 2010). As well, many organizations are under pressure to conform to recent changes in compliance regulations and rely on consultants to aid in the design and implementation of controls. These controls are commonly aimed at fulfilling standardized audit expectations, but do not necessarily consider the unique aspects of each organization’s situation in order to derive strategic and operational benefits (Sollis 2010).

One perspective on IS control alignment suggests that technology-related controls should be consistent and harmonious, as this enables employees to internalize the organization’s assumptions and beliefs as to how they should behave (Orlikowski 1991). Where controls are inconsistent with the socialized standards of the organization, it can lead to employee uncertainty, anxiety, and resistance (Fitzgerald et al. 2006; Orlikowski 1991). However, an alternative view suggests that consistent controls across IS processes could have negative implications by failing to recognize unique employee skills (Kirsch 1996; Rustagi et al. 2008), project subculture (Stewart and Gosain 2006), process characteristics (Baskerville and Stage 1996), and project structures (McFarlan 1981). From this perspective, a varied collection of controls can contribute to the achievement of organizational objectives and enhanced employee satisfaction (Santana and Robey 1995).

We approach the topic of control alignment from the perspective of evaluating the consistency of controls within an individual IS process. Although consistency between constructs can be defined in different ways, we have chosen to focus on two key attributes: similarity and complementarity. Similar controls share common characteristics, such as their tactics (e.g. aiming to prevent exceptions from occurring versus correcting existing issues), design (e.g. documented policy versus reward system), and desired outcomes (e.g. product quality versus cost reduction). In contrast, complementary controls work together to control a process more completely, such as with a systems development process that employs a unique collection of development techniques (e.g. technical documentation, requirement flexibility, stage gates) to address the specific risks of each project (e.g. high complexity, short timeline, limited experience).

The opportunity to better understand the organizational consequences of IS control choices is an issue that is of increasing importance to both practitioners and academics. Corporate and IS governance concerns are increasingly on the minds of executives, shareholders, and the public, in light of the rash of
business failures in recent years. Where IS controls are ineffective, organizations can be exposed to significant risks regarding the accuracy of their financial records and reliability of their technology systems (Mehta 2010). As well, this research will contribute to the advancement of research by answering past calls for the examination of IS alignment decisions at a micro level (Slaughter et al. 2006), interrelationships between controls (Kirsch et al. 2002), and complex settings that move beyond the traditional conceptualization of control (Kirsch 2004).

Two studies are underway within this program of research. First, a set of exploratory case studies that examine the IS control alignment phenomenon are being conducted to better understand the process leading to control alignment, as well as the implications of employing consistent IS controls. Based on these findings, a second study will develop an instrument to measure IS control alignment.

This paper is organized as follows. The next section will establish key definitions and outline the research questions. This will be followed by an overview of the literature related to IS control and alignment, as well as the study’s theoretical base. Next, details of the research methodology will be outlined. Finally, the paper will conclude by outlining the study’s limitations.

Definitions and Research Questions

**Control**

The term ‘control’ can be defined in a variety of ways, but in the context of this research it is applied in an organizational context as the attempt to influence the behavior of another person or group as a means to achieve organizational goals (Davis 1940; Flamholtz et al. 1985; Tannenbaum 1962). Within organizations, control over employee behavior can be utilized to achieve objectives related to activities ranging from accounting (e.g. the creation of accurate financial statements) to information systems (e.g. the development of a reliable computer application).

Past conceptualizations of control have relied on the concept of control modes, consisting of four categories displaying distinct characteristics: behavioral, outcome, clan, and self (Kirsch 1996; Ouchi 1978; Ouchi 1979). Under this view, particular control mechanisms (e.g. policies, supervisor monitoring, employee empowerment) are grouped into one or more higher level control modes. Groups of individual controls that are executed together in relation to a particular business process are often referred to as a ‘portfolio of controls’ (Choudhury and Sabherwal 2003; Kirsch 1997). Recently, alternative perspectives that challenge the exclusive use of control modes in information systems research have begun to emerge, including Cram and Brohman (2010) and Harris et al. (2009). These new approaches consider the unique aspects of emerging technology processes and their influence on control in today’s organizations.

The concept of control is sometimes confused with other related terms such as governance, power, authority, and influence (Flamholtz et al. 1985; Tannenbaum 1962). However, control is viewed within this research as being distinct on the basis that it: a) requires action (i.e. activities are undertaken by controllers to influence employee behavior); b) has uncertain effectiveness (i.e. control attempts do not necessarily result in changed conteree behavior); and c) can be employed in relation to any organizational process. Other terms related to control tend to be defined in terms of having the ability to change behavior but not necessarily taking the action to do so (e.g. power, authority), the certainty of the outcome of an attempted behavior change (e.g. influence), or the focus on a particular organizational level or process (e.g. governance) (Daily et al. 2003; Kabanoff 1985; Salancik and Pfeffer 1974; Simon 1947).

**Alignment**

The concept of alignment, which we consider to be synonymous with fit, is conceptualized within organizational research in a variety of ways. In its most basic form, alignment refers to the similarity or match between two constructs (Edwards 1994); however, more sophisticated views of alignment can extend to the consideration of complementary and supplementary relationships between constructs (Muchinsky and Monahan 1987).

A variety of approaches used to determine the extent of alignment have been proposed in the literature, including Venkatraman (1989) who outlines six conceptualizations of alignment: moderation, which is calculated using interaction terms; mediation, which is modeled using indirect or intermediate variables;
matching, which is measured using deviation scores; gestalts, which are arrived at via cluster analysis; profile deviation, which is examined using pattern analysis; and covariation, which is computed using factor analysis (2004).

Past research specific to alignment in an information systems context has included four important areas: strategic alignment (e.g. consistency of business and IS strategies/plans), structural alignment (e.g. consistency of business and IS decision-making rights/reporting relationships), cultural alignment (e.g. consistency of an organizational or national culture and an organization’s IS strategy/objectives) and project alignment (e.g. consistency of IS project deliverables and an organization’s strategy/objectives) (Chan 2002; Chan and Reich 2007; Jenkin and Chan 2010).

Two main categories of models have emerged in alignment research (Chan and Reich 2007). The first is a contingency model, which views alignment as a construct to be measured at a single point in time (e.g. in a cross-sectional study using a variance model). Research using this model tends to focus on the antecedents, measures, and outcomes of alignment, such as Sabherwal and Chan (2001), Preston and Karahanna (2009), and Tiwana (2009). The second category of alignment adopts a process model, viewing the phenomenon as a process to be understood over time rather than as an end state. Research using this model tends to consider the application of specific IS management capabilities, actions and reactions, and alignment-related patterns that occur over time. Examples of research using this model include Sabherwal et al. (2001) and Benbya and McKelvey (2006).

Regarding the outcomes of IS alignment, the literature generally indicates that alignment corresponds to an increase in business performance. Results that support this assertion have been confirmed by Chan et al. (1997), Croteau and Raymond (2004), and Sabherwal and Chan (2001). Research has also suggested that alignment can lead to increased IS performance in terms of quality, planning and implementation (Slaughter et al. 2006), focused and strategic use of technology (Chan and Reich 2007), and efficiency and effectiveness (Tiwana 2009).

**Information Systems Control Alignment**

A new concept that integrates the ideas of control and alignment is proposed in the research. IS control alignment is defined as the degree to which controls employed in IS processes are consistent. Although consistency between constructs can be defined in different ways, we have chosen to focus on two key attributes: similarity and complementarity. An IS process employing a collection of controls that shares many common characteristics is considered to have a high degree of similarity. In contrast, an IS process employing a collection of controls that addresses a complete range of risks pertaining to an IS process is considered to have a high degree of complementarity.

Although IS control alignment is perceived to exist at multiple organizational levels, the unit of analysis for this research is at the process level. That is, individual IS processes such as managing projects, ensuring systems security, and acquiring application software each utilize a series of individual control mechanisms that comprise an overall portfolio of control. Our focus is on determining the consistency of controls within each of these IS process-specific portfolios.

IS control alignment is positioned in this research as a phenomenon that is distinct from past conceptualizations of IS alignment. Specifically, we view IS control alignment as being unique in its core alignment constructs (i.e. the mechanisms used to influence employee behavior), level of analysis (i.e. a wide variety of IS processes, ranging from defining IS architecture to managing IS investments), and alignment consequences (i.e. uncertainty related to the positive or negative consequences of IS control alignment).

**Research Questions**

Three research questions are posed in this research program. First, what are the theoretical foundations of IS control alignment? The answer to this question is anticipated to provide a detailed analysis and description of the proposed theoretical underpinnings of the phenomenon, as well as a theoretically-derived explanation as to how and why it occurs. Second, how does IS control alignment function in organizations? The answer to this question is anticipated to provide a detailed, rich explanation of the
phenomenon as it exists in practice. Finally, how can IS control alignment be measured? The answer to this question is anticipated to provide a reliable and valid measurement tool.

**Literature Review and Theoretical Base**

**Information Systems Control**

A detailed review of IS control literature was conducted, consisting of 62 publications from a total of 21 journals, including MIS Quarterly, Information Systems Research, and Journal of Management Information Systems. Using an iterative coding approach, five dominant concepts emerged from the literature review, representing key themes examined within the IS control literature: control environment, controls features, control execution, socio-emotional experiences, and control outcomes. See Figure 1, below. Within each concept, a series of underlying themes are also identified, consisting of the particular issues that were examined within the research studies. Cram (2011) provides a more detailed discussion of the control concepts and themes. Each of the five concepts is briefly detailed in below.

![Figure 1. IS Control Literature Framework](image)

The control environment theme refers to the organizational factors that influence the type of control that is selected. Past research has suggested that characteristics of an organization’s strategy, structure, processes, culture, and people will influence the type of control that is chosen for implementation.

The control mechanisms theme refers to research focusing on the characteristics of specific IS controls. Research in this area focuses on the categorization of the controls based on shared characteristics (e.g. control mode, preventive/detective) or the nature of the control activity itself (e.g. policy, procedure, employee monitoring).

The control execution theme refers to the extent that implemented controls are viewed as operating effectively and evolving over time. Literature focusing on this theme examines the extent that controls are modified due to perceived performance issues or adaptation by employees.

The socio-emotional experiences theme refers to the social and emotional consequences that employees experience as a result of being controlled or controlling others. Past research has considered a range of control implications, including motivation, stress, satisfaction, and trust.

The control outcomes theme refers to the organizational objectives that the employment of control is intended to achieve. Literature in this theme focuses on the relationship between control and outcomes such as quality, cost, speed, and innovation.
Three key observations result from the literature review. First, the majority of IS control literature focuses on the project level, specifically on systems development projects. Very little research considers the IS control issues within other IS processes or at the different units of analysis (e.g. department). Second, the concepts of control environment, control features, and control outcomes have attracted extensive research focus, while limited attention has been paid to the control execution and socio-emotional experiences concepts. Particularly in relation to the negative aspects of control, which are more commonly addressed in research within the social sciences, there has been only limited focus within the IS control literature. Finally, there is no substantive research that examines the process or implications of aligning controls within organizations.

**Theoretical Base**

Past management control research has been criticized by commentators who view the field as lacking an integrated, broadly applicable theoretical framework and philosophy that considers the realities of organizations (Hofstede 1978, Jaworski 1988). However, three universal paradigms are recognized as being broadly applicable to control issues within a business environment (Macintosh 1994): agency theory, the manager as the nerve centre, and the labor process paradigm.

Agency theory is perhaps the most widely accepted view related to the theory of control and is concerned with the relationship between one party (the principal) who delegates work to be performed by another party (the agent). The theory uses the metaphor of a contract to describe the principal-agent relationship (Jensen and Meckling 1976) and seeks to resolve two problems: a) the interests of principals and agents are divergent; and b) it is difficult for the principal to verify what the agent is actually doing (Eisenhardt 1989). One application of the theory, termed *positivist agency theory*, focuses on situations where principals and agents have conflicting goals and examines the control mechanisms used to restrict the divergence of interests between the two parties (Eisenhardt 1989). Whereas this view of the theory typically considers an owner-manager relationship, a second application called *principal-agent research* takes a broader view of agency, including doctor-patient and employer-employee relationships (Harris and Raviv 1978; Kohli and Kettinger 2004). This perspective on agency theory seeks to identify the optimal principal-agent contract, while considering varying levels of outcome uncertainty, risk acceptance, and information (Eisenhardt 1989).

An alternative theoretical framework used to evaluate control phenomena considers managers as the ‘nerve centre’ of the organization in that their jobs require the effective collection, storing, and dissemination of information relating to day-to-day business activities. Taking an information processing theory approach, Macintosh (1994) argues that a manager’s ability to access and act on information related to organizational activities (i.e. control) enables the achievement of objectives and goals. Rather than focus on the mechanisms used to regulate the behavior of employees, this perspective instead considers how managers utilize with the operational information at their disposal and make decisions that affect the organization.

A third universal paradigm for viewing control in organizations is that of the labor process, which adopts a critical social theory perspective that seeks to free workers from the inequalities of power within capitalistic society (Macintosh 1994). This approach advocates on behalf of employees who are viewed as being taken advantage of through acts of workforce deskilling and the restriction of knowledge. In contrast to the other two paradigms that focus primarily on company owners and managers, the labor process perspective instead is concerned exclusively with the well-being of the employees who are the subject of oppressive actions by others.

Of these three universal theories, the principles of agency theory are considered most appropriate to apply within the context of this research due to the dual focus on both principals and agents, as well as on the choice of mechanisms used to control the agent behavior. In contrast, the nerve centre paradigm focuses primarily on the activities of management, while the labor process paradigm considers only employee consequences. By adopting an agency theory perspective in this research program, it will help to guide our analysis of the alignment of controls employed in IS processes as a means to minimize the divergence of interests between managers and employees.
Methodology

Two empirical approaches will be utilized in this research program. First, a set of exploratory case studies will be conducted in order to further develop a rich explanation of the IS control alignment phenomenon. This will be followed by the initial steps required to develop an instrument to measure IS control alignment in organizations.

Case Studies

As IS control alignment is a newly defined phenomenon, the case studies for this research will adopt an exploratory approach. The level of analysis will be at the process level. Each ‘case’ will focus on the control portfolio associated with a particular IS process. Two processes are selected for investigation: managing enterprise architecture and managing systems development projects. Organizations will be recruited through professional associations and will be selected on the basis of theoretical replication, whereby contrasting results are anticipated across the sites due to the variation in their underlying approaches to control. Organizations will continue to be recruited for participation until theoretical saturation is reached.

Data collection will consist of three techniques: semi-structured interviews, observation, and document collection. The interviews will be conducted on a retrospective basis, such that data can be collected at a single point in time, but relate to events that occurred in the past. Approximately ten interviews will be conducted at each organization (i.e. five interviews per IS process), each lasting approximately 60 minutes. Interviews will be conducted with employees in a range of positions, but will be specific to those involved with the target processes. Observations will be conducted at meetings and day-to-day operations as a means to verify the current controls in place. Finally, documents relating to current and past control activities (e.g. policies, procedures, meeting minutes, audit reports) will also be collected from the case sites.

Three key steps will be undertaken for data analysis. First, coding of the interviews will be conducted based on the five themes emerging from the literature review. The second data analysis step will seek to verify the consistency of coding by engaging an independent research assistant to re-code a sample of the data in order to evaluate the dependability of the process. The final data analysis step will consist of an in-depth examination of the coded data through explanation building, time-series analysis, logic models, and cross-case synthesis (Yin 2009).

Measurement Instrument Development

This study will complete the initial steps required for the development of an instrument that can be used to measure IS control alignment in organizations. The procedures proposed by Lewis et al. (2005), Straub (1989), and Templeton et al. (2002) will be followed for the development of this new instrument.

The first step will be defining the domain, which comprises three activities: specifying the premise (purpose and importance of the construct), the conceptual definition (description of the construct in general or theoretical terms), and a list of dimensions that represent elements of the construct. This information will be adapted from the current literature, from which multiple item stems will be created for each of the dimensions. The measurement instrument will utilize existing control and alignment measurement tools where possible (e.g. Tiwana (2010), Tiwana and Keil (2009), Kirsch (1996), and Gopal and Gosain (2009)), but will develop new measures when required.

In principle, the instrument will be based upon the premise that IS control alignment can be determined by examining the characteristics of the five control concepts (i.e. environment, mechanism, outcomes, socio-emotional experiences, execution) associated with each control in a process’ portfolio. By measuring each control using an ordinal scale for each of the five control concepts, both the similarity and complementarity of a control portfolio can be determined. For example, control environment characteristics for a set of controls within a particular IS process could be measured using a scale ranging from 0 (highly centralized, structured, formal controls) to 5 (highly decentralized, unstructured, and informal controls). Where controls used in a process exhibit matching environmental characteristics (e.g. all highly centralized), it can be concluded that the controls have a high degree of alignment, from the perspective of similarity. Where the configuration of controls used in a process differs from a set of pre-
established ‘ideal types’ (i.e. specific ordinal rankings across the five control concepts), performance degradation may be expected to occur. This implies that control portfolios employing complementary controls will correspond to higher performance.

The second step will be the construction of the instrument, consisting of three activities: pre-test, pilot test, and item screening. The pre-test will consist of the collection of empirical feedback from a controlled sample (e.g. experts in the topic area) to enable a preliminary assessment of the instrument. Respondents will be recruited from the academic and practitioner community to conduct the pre-test, which will consist of a card sort exercise and providing feedback on possible format and terminology improvements to the instrument questions. Based on the responses, the instrument will be revised as required. The pilot test will recruit respondents who are similar to those who will be completing the real survey. Similar to the pre-test, respondents will complete the instrument and provide suggestions. Again, revisions will be made to the instrument based on feedback using focus groups. Finally, an item screening exercise will be conducted with a set of experts who will rate the relevance of each item to its construct. Based on the responses, content validity will be evaluated for statistical significance using Lawshe (1975). Items not found to be significant will be dropped from the instrument. A full test of the instrument (e.g. factor analysis, nomological validity) will be conducted as part of a future study.

Limitations and Conclusion

As with any research program, this study has limitations. First, past commentators such as Golden (1992) have highlighted the potential risks of collecting retrospective data, as is planned for the case studies. However, suggestions provided by researchers for improving reliability and validity in retrospective studies have addressed many of these concerns (Golden 1997; Miller et al. 1997) and will be adopted in this study. Second, the scope of this research is limited to the theorizing and initial construct development of the IS control alignment phenomenon. Future studies will be required to fully refine the measurement instrument and employ it across large samples of respondents in order to obtain a broad view of the implications of the IS control alignment in practice.

This program of research is motivated by the increasing complexity and rate of change associated with information systems processes, which can lead to challenges for management in employing an appropriate and effective collection of controls. By considering the extent that controls associated with individual IS processes are consistent with one another, an opportunity exists to assist managers in designing control systems that are more effective and efficient in achieving organizational objectives. From a research perspective, this study will develop and refine a new theoretical model, conduct a series of case studies, and begin the development of a measurement instrument, which can contribute a novel and valuable extension of research related to the control and alignment of information systems in organizations.

References


