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ICTs as Challenges to Enacting IS Project Control: An Interpretive Case Study of an ERP Implementation

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Abstract

This study investigates challenges posed by Information and Communication Technologies (ICTs) in the enactment of Information Systems (IS) project control. Using the control perspective developed by the sociologist John Law, we conducted an interpretive study of an Enterprise Resource Planning System implementation at a large public university system. From our investigation, four salient insights emerge. These insights are accompanied by corresponding assertions that demonstrate how ICTs, through varied forms of involvement, may challenge IS project control enactment. We integrate these insights for deeper illumination and conclude with contributions and implications of this study.

1. Introduction and Motivation: ICTs and Enactment of IS Project Control

The issue of control in IS projects is an important one, because it is one of the key factors involved in the ultimate success of projects [11]. Control has been defined "as the set of mechanisms used to motivate individuals to act in a way that is consistent with organizational objectives" [14, p. 489]. Generally, research on IS project control understands ICTs as playing the role of "communication and control systems that are *standard, compatible, and reliable* [emphasis added]" [2, p. 64] that aid in the implementation of control by controllers.

In IS literature, technologies and their associated techniques and procedures thus provide for the set of mechanisms to ensure normativity with organizational objectives. Control research has seen substantial work within the IS discipline; however, a few blind spots in this literature can be discerned. For example, in a fairly recent review of control literature in IS, it has been observed that "existing research primarily studies the contextual antecedents and performance consequences of control modes and amounts, and thus focuses on control portfolio configurations" [28, p. 741]. As a response to this limitation, current research is engaging more with the notion of control enactment (beyond just control modes and their antecedents/outcomes). Control enactment captures how control issues are played out in an organizational setting, such as through dynamics between controllers and controlees [12].

Our study adds to this emerging stream of research on control enactment [e.g., 20], but with a rather unique perspective. We propose that apart from humans being controllers or controlees, ICTs could also be viewed in a similar fashion. Therefore, we extend the control enactment literature by showing how ICTs can serve as controllers and controlees or can interfere in how control enactment takes place between controllers and controlees. For example, we show how ICTs, when subjected to being controlees, can also "rebound" and try to become controllers – thus shaping the dynamics of control enactment. Treating ICTs as unexpected shapers of organizational dynamics has been studied in prior research [25] and our study follows the same approach by assigning agency to nonhumans like ICTs. For this purpose, we use the control perspective proposed by the British sociologist John Law [16, 17], and investigate the following research question: **How can ICTs shape enactment of IS project control, especially in unexpected ways?**

Specifically, we investigate how *roles of ICTs in the enactment of control emerge and change over time, especially in an unexpected (and often undesired) manner*. This change could be the result of actions by actors to be controlled [21], unintended technological failure [13], or complex interactions between human choices and/or operations of technology [7]. For

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example, ICTs which are regarded as tools for enforcing organizational form and control, may produce unintended disruptive effects and radically change pre-determined outcomes (i.e., control objectives) by enforcing novel/disruptive innovations [19]. Such unintended effects of ICTs often compromise control enactment in IS projects. Our study thus extends insights beyond the view that ICTs help in *systematically* enabling project control [22]. We show that ICTs can be "disobedient" and can try to warp control enactment in IS projects.

2. The Theoretical Lens of this Study: Law's Control Perspective

For key definitions and concepts in Law's control perspective [16, 17], please refer to Table 1 (all tables are included at the end). Law explains control as being exercised *by, through, and over interactions amongst actors forming parts of actor-networks*. An actor-network for exercising control contains the controlling actors or focal actors, the actors over whom control must be exercised, and the actors that exercise control on behalf of the controlling actor (called envoys). Envoys create inscriptions and envelopes to help them pursue the interest of the focal actors. The focal actors must exercise control over the other actors in the network to induce the latter to play roles in which they take actions to accomplish the objectives set for the actor-network. An important process in this regard is punctualization.

When–through the process of punctualization–groups of actors become highly aligned in terms of their interests and actions, they can be treated by the controlling actor as a single actor that serves as a resource in a larger network. However, punctualization requires successful translation of the actors in the actor-network by the focal actor. Notably, in Law's perspective of control, punctualization is a process marked by struggles [17], because actors may be resistant (or may later become resistant) to the objectives for which control is being exercised. Often translation requires the passage of an actor through the obligatory passage point, beyond which the actor subscribes to the interests of the focal actors. However, in some cases, the actors in the actor-network may reverse this passage; in such cases, the network may become de-punctualized.

Law's control perspective differs from that found in most IS project control studies in multiple ways. Control for Law is a process with potentially *uncertain objectives and outcomes* and disavows technological and social determinism. Notably, Law's perspective does not distinguish between human and non-human actors. Thus, ICTs, ***as non-human actors can play as important a role*** **in exercising (or compromising) control enactment**. This is a primary reason why we embrace Law's perceptive, as it allows us to ascribe a pivotal role to ICTs.

3. The Empirical Study

We conducted an interpretive case study [27] to investigate our research question using Law's control perspective. This case describes the process to implement three generations of the enterprise resource planning system (named ERP-Star) at the Varied University System (or VUS) (pseudonyms are used for anonymity). The four VUS universities include U1 University, U2 University, U3 University, and U4 University or U1, U2, U3, and U4, respectively.

VUS is overseen by a board of regents (BOR). The BOR guides VUS and makes high-level decisions. The chancellor is charged with implementing the BOR's decisions, while being U1's president. The chancellor and his/her high-ranking subordinates comprise the university system administration or UA. Each university has its own administration, led by a president who enjoys a high level of discretion in governing their universities and members of the faculty and staff (FS) who work there. However, each president is subordinate to the BOR and subject to VUS policies.

3.1. Conducting the Study: Using the Cole and Avison 2007 hermeneutical framework

This entire research study, including the initial formulation of inquiry, to the analysis of case data through which we developed the ultimate theoretical assertions was based upon completing the *hermeneutic circle*, a central idea in interpretive research, as advised by Klein and Myers [15]. This principle calls for researchers to engage in a process following the principle that human understanding occurs through the iterative act of moving between a whole and interdependent parts comprising that whole [15]. In particular, Cole and Avison [6] provide a framework to conduct hermeneutic research which our study uses (see Table 2). Data was mainly collected as semi-structured interviews (33 initial and 34 follow up) with key project

stakeholders. Additional sources (e.g., newspaper articles emails, etc.) were also collected. Analysis proceeded along the Cole and Avison guidelines, informed by Law's control perspective.

4. Empirical Analysis: The Case Insights

This section distills the key insights from our analysis of the ERP-Star case, beginning with challenges to IS project control from ICTs that hindered other actors' understanding of the project.

4.1. Insight 1. ICTs Hindering IS Project Control by Clouding Actors' Understandings of Projects' Status

Viewed through Law's perspective, the VUS case sheds new light on challenges to identifying problems and their root causes, in part due to the involvement or lack of involvement of multiple ICTs, as well as relations among them. In other words, ICTs used for such purposes *failed to live up to focal actors' expectations of the faithfulness of such envoys*.

This behavior of ICTs as unfaithful envoys appeared to occur through at least two channels. First, the controlling actor enrolled a copy of organizational data that was insufficiently comprehensive or outdated into a relationship as part of the *envelope of an envoy*, ERP-Star's testing version. However, this action was unsuccessful. A UA member provided an example:

"We tested that [a cancellation for nonpayment process in ERP-Star]…but because we didn't test it on the whole population, we missed some things that it was doing that we really didn't want it to do. It overlooked canceling some groups of students that we did want canceled"

Second, the controlling actor and members of the FS differed in their understanding of what components were needed to provide accurate results to support testing. The controlling actors, the UA and implementation team (IT), understood that a certain set of elements were those needed for effective testing (e.g., ERP-Star's testing version and testing plans). However, a U3 manager (part of FS) contended that he did not have access to a report needed for accurate results:

"…we can't actually see the effect it's [entering data] having on the system [ERP-Star] without having a report. So you kinda felt like you were testing with like half the tools that you needed."

In these instances of the enrollment of envoys to be used to understand project status, the result was unsatisfactory. This envoy, a testing version of ERP-Star, had the capacity to provide accurate accounts of project status. However, thanks to the enrollment of or failure to enroll other actors, it took on the role of 'deceiver.' In other words, this envoy posed a challenge to control by hindering actors' capacity to develop an accurate understanding of problems the projects faced and slowed the diagnosis of such problems' causes. Based upon these insights, we offer the first assertion:

Assertion1. ICTs enrolled to monitor and identify project problems can provide deceptively favorable views of projects; creating these deceptive views can delay problem resolution, which can interfere with efforts to punctualize a system such as ERP-Star, and possibly lead to additional project costs.

4.2. Insight 2. Data Stored/Processed by ICTs Compromising Actors' Supportive Roles in IS Projects

Data, as an actor, was influential in compromising control in project settings. Primarily, Data impeded actors' efforts to induce other actors to comply with the objectives of the former actors. First, the absence of complete data showed to FS as part of training created an impediment for the successful implementation process by compromising actors' support. For example, an U1 academic advisor noted:

"Because in the training they said, 'Okay, in order to view student data, this is where you go. But you can't view it yet. It's not – all the data is not converted yet. You can't do this.'"

Had this data been available in the training version of ERP-Star, this member of FS suggested that FS would have been more supportive of the implementation process. An associate dean at U2 recalled an instance of *distrusting* Data, which ultimately extended to *distrusting* ERP-Star itself.

"The error rate [of data] was in the neighborhood of 70% and that is NOT a good neighborhood. Were the data put into the system incorrectly? Did ERP-Star simply not identify the correct data? Both? Neither? I will likely never know. However, it was

*such **drastically poor data** [emphasis added] that set the perception that one could not trust ERP-Star data…We simply could not believe anything ERP-Star produced. It is this **complete mistrust of ERP-Star** [emphasis added] that has the greatest impact on our work."*

Data also presented challenges for the actor-network assembled by the UA and the IT due to lacking particular characteristics desired by other actors. The interactions that concern us are those of which data is a part (e.g., training FS members), entailing activities intended to contribute to control of the project.

Drawing upon Law's perspective, control can be understood as successful translation of actors in an actor network by the focal actor(s). Also, translation has four moments (please see Table 1)– problematization, interessement, enrollment, and mobilization. In this case, the translation of the other actors (e.g., FS) by the key actors (e.g., UA and IT) was achieved up to a certain point. In Law's language of control, *problematization, interessement, and enrollment* were successful. However, *mobilization* was hampered by Data as is evidenced above. Thus, Data created an impediment to the control envisioned by the focal actors. The major ramification of this was that other actors' buy-in of the implementation process suffered because of Data. So, while these actors were problematized, interessed, and enrolled by the focal actors to support the implementation process, they started to distrust Data and ERP-Star as a result. Hence, we propose our second assertion:

Assertion 2: Data stored/processed by ICTs may become an impediment to control objectives; specifically, it can lead to incomplete translation by hampering mobilization and so create distrust in the ICT itself by actors in the actor-network.

4.3. Insight 3. Project Control and ICTs: Negotiating with ICTs and Accepting Compromises

The IT tried to use different ICTs beyond ERP-Star as additional *envoys* to *interess* and *enroll* actors into the project and *mobilize* them in support of the projects. While one ICT (Microsoft Project) acted as an obedient enabler of project control, the involvement of another ICT was more problematic. Actors (e.g., the IT) had implemented a 'dashboard' in response to a delay in the U2 Student Administration application upgrade. This Microsoft Excel-based tool was planned to give its users a more-complete, high-level view of project status. The problem that this plan faced was that the dashboard had competition. An U1 manager described the competing list used by programmers:

"You can see…a number of items that are not on our list. This was the beginning of our effort to capture all those on the dashboard and to eliminate shadow tracking with secret information."

It was necessary to reconcile the two views of the project status to reduce the likelihood of misunderstanding that would hinder the effectiveness of efforts to punctualize ERP-Star. The punctualization of ERP-Star, as we shall see in later, was a primary control objective for the projects. In Law's terms, this negotiation process, as part of *translating* actors, made it possible for the dashboard to play its intended role after a time.

The negotiation with ICTs did not stop here. While ICTs could be turned into obedient members (i.e., obedient controlees) of the projects' actor-network, they could also be stubborn. It was also the case that controlling actors' negotiation with an ICT could result in the latter *dictating conditions* of its involvement in the project. In other words, this negotiation for the ICT's involvement carried costs for *controlling actors*. An example of this costly negotiation is the involvement of the technology known as QUANT in the process.

QUANT was a packaged software technology intended to move modifications to ERP-Star into the production environment and to track the status of work on such modifications. Originally, QUANT was intended by actors leading technical aspects of the projects effort to transfer large numbers of changed elements or patches into the ERP-Star production environment. The IT had already learned (from another client) that this might not be possible:

"The subject of large volumes of objects came up specifically with trying to use QUANT to migrate the ERP-Star vendor's updates and fixes patches into application environments. They the other client explained to us that they had attempted this several times and found that the product bogged down and would not handle the volume..."

Again, QUANT refused to function under the condition of high volumes identified by the other client. For VUS personnel to receive other benefits that QUANT could offer (e.g., allowing monitoring of modifications made to ERP-Star), a compromise

was required. We see that QUANT was a disobedient piece of software that could not be used in all the originally desired ways. Specifically, ICTs such as QUANT demanded negotiations from the focal actors for an altered and reduced role (i.e., the controlee turned into a controller). In other words, they contributed to the punctualization of ERP-Star only when their "demands" were met. Crucially, these ICTs demanded a price for their "obedience" in supporting the projects' objectives – one of which was to punctualize ERP-Star into a resource as we see later in the meta-theme.

Considered in light of Law's work and the related literature, the concept of disobedient, non-human actors is not a foreign one [17, 18]. The steps of translation to gain the compliance of an actor may entail force, persuasion, and negotiation. This negotiation may be problematic, including incurring additional costs. This concept of problematic negotiation with ICTs provides the basis for the following assertion:

Assertion 3: ICTs, intended for use in controlling a project, may be potentially used as envoys for punctualizing key actors; however, such ICTs may negotiate their "price" for their obedience; specifically, this may result in additional costs for the project either in the procurement of new resources or the imposition of dilatory procedures.

4.4. Insight 4. ERP-Star's Adversarial Relationships with other ICTs and ICT components

Through much of the case timeline, ERP-Star was engaged in adversarial relationships with other ICTs or ICT components. The common effect of these clashes appeared to be compromising ERP-Star's status as a punctualized actor that could serve as a resource for the controlling actors and others. We consider here three examples: ERP-Star's relationship with Emblem, the relationship between ERP-Star and e-Manage, and the relationship of ERP-Star with data to be entered into it.

The U3 administration group saw Emblem as superior to ERP-Star, as one manager explained:

"…from a satisfaction point of view, from a business needs point of view, our product [Emblem] is still superior to what ERP-Star can do…we can't see anything that would add value…for us to be transferring to ERP-Star."

Characteristics such as these contributed to U3's success in gaining the BOR's permission to use Emblem in place of ERP-Star. Emblem effectively challenged ERP-Star's place in the project's actor-network. Rather than being the one solution being implemented to solve the problems at VUS, ERP-Star entered into a relationship with Emblem in which *both* could serve as such effective solutions.

In the instance of E-Manage, ERP-Star again compared unfavorably to it. One student interviewed by the U1 newspaper offered this criticism of ERP-Star:

"It has caused me nothing but problems," a student said "It has been a huge inconvenience for me in preparing for this upcoming semester, and it has held me back from getting things done, which would have been much easier to do using the old system [E-Manage]."".

Lastly, ERP-Star's production versions contributed to conflict with ICT components. For example, at U2, a member of the FS working to recruit students recalled ERP-Star's refusal to accept data in Excel format:

"You have them [data on prospective students] in [an] Excel spreadsheet…40,000 names or 100,000 names…to send them direct mail…and then you don't have it in the prospect database [an ERP-Star component], because there's no way to upload the thing, you know, fairly easily, without having to manually enter all those names…"

To overcome this obstacle U2 FS had to undertake a workaround of manually entering the data. In addition, a U2 faculty member recalled another barrier imposed by ERP-Star:

"The big problem with ERP-Star…is [that it is] so rigid that it makes liars out of us all. We kind of had to figure out how to schedule our classes."

Members of U2's FS had to provide ERP-Star with fabricated enrollment information or else ERP-Star did not reserve classrooms (i.e., ERP-Star was "controlling" their actions). It is interesting to note that this step assisted *members of FS* to draw upon ERP-Star as a taken-for-granted resource though not as intended by the UA and IT, while simultaneously interfering with ERP-Star's ability to provide accurate reporting (a goal of the controlling actors).

Lastly, members of FS at U4 also experienced ERP-Star's 'refusal' to accept another format of data entry: which letter grades faculty could enter for students. A U4 manager explained the challenge that ERP-Star posed:

"…it's a mod [modification to ERP-Star's code] that was written for U2…U2 had a mod that would prevent the issuance of a W. Well, we want to have a W…for grades for faculty…but, because of that mod, it was preventing us from being able to do that."

These barriers to forming relationships with ICT components (e.g., forms of data to be entered) stemmed from *inscriptions* that ERP-Star carried, having been inscribed by its vendor or through the modification that project actors made to earlier production versions to meet a need of U2's FS. While these inscriptions could be overcome with manual workarounds, entering fabricated information, and additional coding, they initially contributed to difficulties in maintaining ERP-Star's status as a punctualized actor. Based upon these three variants of ERP-Star's conflict with other technologies, we offer our fourth assertion:

Assertion 4: An ICT, intended by controlling actors to serve as a punctualized resource, may be compromised by its adversarial relationships with other ICTs and ICT components; the development of these adversarial relationships may result from the ICTs excluded from an actor-network, or inscriptions written into the ICT to be punctualized.

5. Integration: The Challenge of Punctualization for Enacting IS Project Control

These four insights into challenges that ICTs can pose to IS project control enactment indicate the existence of an underlying meta-theme that can holistically capture how ICTs compromise control enactment. This common theme points to the role and ramifications of *punctualization* in actor-networks. As discussed in Table 1, punctualization entails the changing of an actor-network that makes up a part of a more extensive actor-network [18]. Through this changing, this actor-network becomes, in effect, a single actor. Thus, punctualization is a key technique for focal actors to exercise control, by reducing heterogeneity, and the punctualized actor often serves as a consolidated resource for control [26].

In our context, controlling the ERP-Star implementation and upgrade process was an important endeavor in the eyes of the key controlling actors. From a punctualization standpoint, this involved turning ERP-Star into a taken-for-granted resource, maintaining ERP-Star in this condition, and attempting to use this resource for furthering the control objectives established for the process. Throughout much of the process, achieving effective, sustained punctualization was a key focus of the work of the controlling actors. In effect, the controlling actors desired that ERP-Star would operate as an "obedient" controlee by being fully punctualized.

However, ERP-Star was punctualized to an extent; at the same time, other elements of ERP-Star were not, presenting challenges to the controllers' objectives. Thus, it would be more accurate to say that ERP-Star exhibited the quality of being *simultaneously punctualized and un-punctualized.* In other words, it faithfully played the role of a controlee at times, while at other times, it assumed a more controlling role.

Instances of the ICT (here components of ERP-Star's production versions) appeared to reach punctualization and the desired, taken-for-granted status while co-existing with others that did not attain a punctualized state. In response, controlling actors appeared to seek to make corrections to strengthen ERP-Star as a resource. This entailed bringing in new actors, such as additional technology or other artifacts (e.g., a help guide) as envoys of the controlling actors. Doing so was sometimes problematic. For example, this help guide did not perform as expected and required modifications to enhance its effectiveness. Examined from Law's perspective, the actors, not limited to the controlling actors, seeking to use ERP-Star, attempted to enroll additional sometimes problematic actors into the actor-network or to alter the enrollment of other actors (e.g., the testing version of ERP-Star). In some cases, these attempts led to the desired effects, while in others they did not.

Punctualization creates a black box that is assumed to be functional [3], i.e., fully compliant with control objectives. It is because of this that punctualization has always been a key issue in project management especially related to IS implementations [4, 25]. As punctualization is often synonymous with the reduction of a network's heterogeneity, it makes it simpler and easier for the focal actors to enforce control [25]. Therefore, the controller prefers

punctualization because of its inherent simplicity in enforcing control [4]. However, punctualization is subject to threats. Therefore, punctualization attempts may not always be successful. *In other words, punctualization may result in increased control for the controlling actors, which is why they prefer it, but the very attempt at punctualization may create negative outcomes and compromise control enactment simultaneously.* Thus, punctualization has a complex and interesting relationship with control, as evidenced by this study. In line with our discussion, we formally explicate our meta-theme as the following set of assertions:

a. **Efforts of focal actors in establishing control by punctualizing an ICT may not be wholly successful due to constraints/resistances established by other actors, including versions of the ICT itself; consequently, it can be difficult for an ICT to obtain the status of a punctualized resource to enable control.**
b. **Strategies to enforce punctualization might be successful, but they can often result in the misappropriation of the ICT and hinder accomplishing project objectives.**
c. **As a result, an ICT can exist simultaneously in a punctualized and un-punctualized state that both enables and challenges control of the project by the focal actors.**

6. Contributions and Implications

6.1. Contributions to research

We contribute to the IS project control literature by offering a richer view of the possible role of an ICT (an ERP, in this case) in the enactment of control. Prior literature has argued that ICTs help enable controls [2, 22] due to the fact that they can act as consolidated resources and can tighten controls [26]. However, in this study we see that ERP-Star never reached the consolidated status of "punctualization". It existed both in a punctualized and an un-punctualized state. In other words, the ICT was in a state of flux, quite distant from the reliable and systematic conceptualization of ICTs found in the extant project control literature [2, 22]. As a result, the ICT compromised the enactment of control objectives and did not subscribe to the dominant view that ICTs are mechanisms to enforce control [23]. In reality, our study shows that ICTs are emergent [9] and often switch to being a controller when humans try to enforce/use it as a controlee.

In addition, the insights and corresponding assertions themselves make important contributions to the literature on project control enactment. *Assertion 1* contributes to the IS project control literature by providing a richer view of ICTs' relationship with a key element of enacting control: monitoring project status. *Assertion 2*, related to the challenges posed by data stored/processed/generated by ICTs, may benefit multiple literatures, such as the information management literature [1]. This is because these assertions discuss the role of data which, in turn, gives rise to information when this "data is classified, summarized, transferred or corrected in order to add value" [8, p. 6]. *Assertion 3* suggests that one role that ICTs may play in the project control is that of a disobedient actor with whom other actors must negotiate. In this case, the ICT assumes the role of the controller. Also, we find that a consequence of this disobedience may be additional costs to the original controller stemming from negotiating with the disobedient ICT. Finally, *Assertion 4* calls for researchers to take an expanded view of ICTs involved in project control, a view that includes versions of the ICT being implemented. This assertion reminds researchers to not take for granted the influence of *different versions of the ICT being implemented* on the operation of project control. These versions of the ICT being implemented, in these adversarial relationships with other ICTs or their components, may compromise project control enactment in multiple ways such as by reducing employees' support for the implementations. Overall, these insights also contribute to the research stream on control enactment [5, 29]), which seeks to explain how project control operates. This study furthers the extant research on control enactment by showing how ICTs can interfere with the operation of enactment efforts.

6.2. Contributions to practice

This paper makes two contributions to practice. *First*, organizational resources (e.g., pre-existing organizational data) may themselves have disruptive influences when ICTs "refuse" to perform their assigned tasks. Thus, this study unearths challenges that practitioners may face in projects and accordingly alerts them to take appropriate actions. *Second*, this study suggests the possibility that using an actor as a proxy, standing in for another actor, may not have expected results. Practitioners may want to choose proxies wisely so that the desired objectives are not compromised.

7. Future Research Directions

First, it could be valuable to conduct a follow-up study in another setting that has implemented or is in the process of implementing a complex information system like ERP-Star. This follow-up study could test the assertions presented in this paper. A variant of this follow-up study alternative could be one conducted in a multinational corporation. Projects conducted by these corporations have been an increasingly common means for these organizations to develop and/or implement information systems [10]. For that reason, this follow-up study could provide a potentially useful complement to the existing studies of control enactment. Such studies could also enable researchers to contribute to understanding ICTs' interfering roles in control enactment.

To conclude, this work has highlighted how various ICTs challenge and shape IS project control enactment. We hope that this work will energize future research to further investigate the nuances of the roles played by ICTs in the enactment of control in new (as well as existing) IS projects.

8. References

1. Anand, K.S. and Goyal, M. Strategic information management under leakage in a supply chain. *Management Science*, 55, 3 (2009), 438-452.
2. Anantatmula, V. and Thomas, M. Managing global projects: A structured approach for better performance. *Project Management Journal*, 41, 2 (2010), 60-72.
3. Callon, M. Some elements of a sociology of translation: Domestication of the scallops and fishermen of st. Brieuc bay. In J. Law (ed.), *Power, action and belief: A new sociology of knowledge*: Routledge, London, England, 1986, pp. 196-233.
4. Cho, S.; Mathiassen, L.; and Nilsson, A. Contextual dynamics during health information systems implementation: An event-based actor-network approach. *European Journal of Information Systems*, 17, 6 (2008), 614-630.
5. Chua, C.H. and Myers, M.D. Social control in information systems development: A negotiated order perspective. *Journal of Information Technology*, 33, 3 (2018), 173-187.
6. Cole, M. and Avison, D. The potential of hermeneutics in information systems research. *European Journal of Information Systems*, 16, 6 (2007), 820-833.
7. Constantinides, P. and Barrett, M. Negotiating ict development and use: The case of a telemedicine system in the healthcare region of crete. *Information and Organization*, 16, 1 (2006), 27-55.
8. Grover, V. and Davenport, T. General perspectives on knowledge management: Fostering a research agenda. *Journal of Management Information Systems*, 18, 1 (2001), 5-21.
9. Harris, M.L.; Collins, R.W.; and Hevner, A.R. Control of flexible software development under uncertainty. *Information Systems Research*, 20, 3 (2009), 400-419.
10. Herbsleb, J.D. and Mockus, A. An empirical study of speed and communication in globally distributed software development. *Software Engineering, IEEE Transactions on*, 29, 6 (2003), 481-494.
11. Heumann, J.; Wiener, M.; Remus, U.; and Mähring, M. To coerce or to enable? Exercising formal control in a large information systems project. *Journal of Information Technology*, 30, 4 (2015), 337-351.
12. Huang Chua, C.E. and Myers, M.D. Social control in information systems development: A negotiated order perspective. *Journal of Information Technology*, 33, 3 (2018), 173-187.
13. Kallinikos, J. The order of technology: Complexity and control in a connected world. *Information and Organization*, 15, 3 (2005), 185-202.
14. Kirsch, L.J.; Ko, D.-G.; and Haney, M.H. Investigating the antecedents of team-based clan control: Adding social capital as a predictor. *Organization Science*, 21, 2 (2010), 469-489.
15. Klein, H.K. and Myers, M.D. A set of principles for conducting and evaluating interpretive field studies in information systems. *MIS Quarterly*, 23, 1 (1999), 67-93.
16. Law, J. On power and its tactics: A view from the sociology of science. *The Sociological Review*, 34, 1 (1986), 1-38.
17. Law, J. The structure of sociotechnical engineering – a review of the new sociology of technology. *The Sociological Review*, 35, 2 (1987), 404-425.
18. Law, J. Notes on the theory of the actor-network: Ordering, strategy, and heterogeneity. *Systemic Practice and Action Research*, 5, 4 (1992), 379-393.
19. Lyytinen, K. and Rose, G.M. The disruptive nature of information technology innovations: The case of internet computing in systems development organizations. *MIS Quarterly*, 27, 4 (2003), 557-596.
20. Mähring, M.; Wiener, M.; and Remus, U. Getting the control across: Control transmission in information systems offshoring projects. *Information Systems Journal*, 28, 4 (2018), 708-728.
21. Majchrzak, A.; Rice, R.E.; Malhotra, A.; King, N.; and Ba, S. Technology adaption: The case of a computer-supported inter-organizational virtual team. *MIS Quarterly*, 24, 4 (2000), 569-600.
22. Oshri, I.; Van Fenema, P.; and Kotlarsky, J. Knowledge transfer in globally distributed teams: The role of transactive memory. *Information Systems Journal*, 18, 6 (2008), 593-616.
23. Persson, J.S.; Mathiassen, L.; and Aaen, I. Agile distributed software development: Enacting control through media and context. *Information Systems Journal*, 22, 6 (2012), 411-433.
24. Pinsonneault, A. and Kraemer, K.L. Middle management downsizing: An empirical investigation

of the impact of information technology. *Management Science*, 43, 5 (1997), 659-679.
25. Sarker, S.; Sarker, S.; and Sidorova, A. Understanding business process change failure: An actor-network perspective. *Journal of Management Information Systems*, 23, 1 (2006), 51-86.
26. Silva, L. and Fulk, H.K. From disruptions to struggles: Theorizing power in erp implementation projects. *Information and Organization*, 22, 4 (2012), 227-251.
27. Walsham, G. Doing interpretive research. *European Journal of Information Systems*, 15, 3 (2006), 320-330.
28. Wiener, M.; Mähring, M.; Remus, U.; and Saunders, C. Control configuration and control enactment in information systems projects: Review and expanded theoretical framework. *Mis Quarterly*, 40, 3 (2016), 741-774.
29. Wiener, M.; Mähring, M.; Remus, U.; and Saunders, C.S. Control configuration and control enactment in information systems projects: Review and expanded theoretical framework. *MIS Quarterly*, 40, 3 (2016), 741-774.

Table 1. Concepts in Law's Perspective on Control as applied in IS literature, such as in Sarker et al. (2006)

Concept	Descriptions of the concept
Actor	An entity that takes actions influencing the operation of control.
Actor-Network	A collection of actors assembled into relationships to act in concert to accomplish the objectives of control.
Control	A process used by a controlling actor to accomplish objectives by employing the efforts of other actors assembled into an actor-network.
Envoy	An actor who exercises control on behalf of the controlling actor.
Envelope	A structure composed of an envoy's relationships with other actors, as well as the envoy himself. The envelope influences the envoy's capacity to exercise control.
Inscription	A piece of knowledge that has been converted into an easily reproducible and transportable form. Inscriptions may influence the actions that an envoy takes.
Punctualization	"Treating a heterogeneous network as an individual actor to reduce network complexity" (Sarker et al., 2006, p. 56)
Translation	"The process of alignment of the interests of a diverse set of actors with the interests of the focal actor" (Sarker et al., 2006, p. 56).
Problematization	"The first moment of translation, during which a focal actor defines identities and interests of other actors that are consistent with its own interests, and establishes itself as an obligatory passage point (OPP), thus rendering itself indispensable" (p. 56)
Interessement	"The second moment of translation, which involves negotiating with actors to accept definition of the focal actor" (Sarker et al., 2006, p. 56)
Enrollment	"The third moment of translation, wherein other actors in the network accept (or get aligned to) interests defined for them by the focal actor" (Sarker et al., 2006, p. 56)
Mobilization	The fourth moment of translation, in which the focal actor attempts to ensure that speakers properly represent the interests for which they are to speak and do not betray them. These speakers are to represent the one or more objectives that the focal actor wants to foster.

Table 2. Using the hermeneutic framework developed by Cole and Avison (2007) to guide our study

Stage	Key sub-stages	Key Activities/Considerations in each sub-stage	Application to this research study
Understanding	The explication of prejudices	Unearth the dominant motivations of the researchers to determine literature to be reviewed	The researchers' dominant motivation was to investigate the challenging roles of ICTs in enacting IS project control.
	Formulating lines of inquiry	Determine the 'parts' that are key to the 'whole' which will later guide the data collection	The "parts" here are Law's individual concepts of control discussed in Table 1, linked to the "whole" which is his overall perspective of control. As shown below, our data collection and analysis use those "parts."
Explanation	Conducting the active	"identify "normal" and "abnormal"	Interviews focused on

Stage	Key sub-stages	Key Activities/Considerations in each sub-stage	Application to this research study
	interview	behaviors" (p. 825) and statements used "as reality creating activities through which behaviors, circumstances and persons are cast in instances of cultural and technical significance" (p. 825)	understanding whether the various ICTs behaved as they were expected (consistent with the dominant perspective of control enactment) or did not. Interviews were also focused on bringing out the actual (real) reactions of key implementation stakeholders.
	Analyzing a priori codes	Categorization, identification of tools to analyze data, and further interviews	Data was categorized based on the concepts presented in Law's control perspective. (e.g., actors). The same participants were interviewed multiple times, when possible, to facilitate understanding how their interpretations changed over time.
Interpretation	Breakdown of prejudices	"researchers…re-assess their particular understanding of the nature of component phenomena" (p. 826).	The re-assessment occurred through follow up interviews with the subjects, where the researchers' initial interpretation of the events (in the previous stage) were presented to them, leading to further changes in interpretation.
	Fusion of horizons	"The aim is to create, through shared meanings, new concepts that transcend originally held meanings" (p. 826).	The researchers' understandings are distilled in the form of 4 insights, with corresponding abstractions (assertions). These insights were integrated into a meta-understanding for a more sophisticated insight.