Toward a Dynamic View on Client Dependence in IS Outsourcing Relationships: A Qualitative System Dynamics Approach

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When companies disregard to manage their dependence in exchange relationships, they leave themselves vulnerable to opportunistic behavior by their partner. However, organizational dependence is subject to various mechanisms that additionally turns it into a dynamic concept. The dynamic nature of dependence is an under-researched topic, though, especially when it comes to dependence in information systems outsourcing relationships. This paper draws on five client-supplier relationships in an outsourcing setting to explore the dynamic behavior of client dependence in detail. A causal loop diagram is developed to provide client companies insights into hazardous mechanisms at place when outsourcing the development and maintenance of their information systems to external parties.

1 Introduction

From a client perspective, a high dependence on an IT supplier is perceived as a main risk in any IS (information systems) outsourcing endeavor (e.g., Gonzalez, Gasco, and Llopis 2005). According to Frazier (1983), dependence between two exchange partners is essentially the "need to maintain the relationship to achieve desired goals". High dependence is thus often negatively associated with an inability to switch to an alternate, more preferable supplier.

Basically, a high client dependence puts the supplier in an advantageous position, given that its own dependence on this client is lower. A resulting dependence asymmetry in favor for the supplier gives him the opportunity to exercise a power potential over the client (Emerson 1962; Gulati and Sytch 2007). For example, the supplier might raise prices or lower its performance. Taken together, high client dependence on a supplier presents a risk that might threaten the client's business performance and its overall outsourcing success.

Despite this risk, today many client companies have outsourced their information systems to specialized IT suppliers by a large extent. In practice and research, the focus has largely shifted from finding an optimal outsourcing degree towards the successful management of client-supplier relationships (e.g., Hirschheim, Dibbern, and Heinzl 2008). However, relevance of organizational dependence has not diminished. Rather, research in the field sees dependence as a key attribute of a relationship between two or more organizations (Emerson 1962). Basically, as such, dependence always exists in exchange relationships, but it can significantly differ in magnitude.

Furthermore, several researchers have posed the assumption that dependence is not static, but rather changes over time (Caniëls and Roeleveld 2009; Lonsdale 2001; Gulati and Sytch 2007). A dynamic investigation of dependence is, however, considered as a gap in research (Caniëls and Roeleveld 2009; Gulati and Sytch 2007). Specifically, a thorough investigation of the dynamics present in IS outsourcing relationships has not yet been conducted to the best of our knowledge. Remaining questions are for example: How do clients blunder into a high dependence on their IT supplier? And also, what are mechanisms that lead to a diminishing dependence?

This paper takes a closer look on the influencing factors of client dependence and seeks to explore the concept from a dynamic perspective. In their extensive literature review, Dibbern,

Goles, and Hirschheim (2004) pointed to the scarcity of studies in IS outsourcing research that incorporate a temporal dimension and called for an investigation of dynamic aspects in outsourcing arrangements. However, it has been argued that researches need to clearly explain how and why changes came about, thus, to move beyond a descriptive illustration of phases or process steps (Dibbern, Goles, and Hirschheim 2004; Markus and Robey 1988, in referring to Mohr 1982). To reach this, the system dynamics methodology is used herein to identify and explain mechanisms that lead to changes in client dependence (e.g., Kanungo 2003; Sterman 2000).

Summarizing the objective of this paper, the following research question guided the research process and analysis: "How does client dependence on a supplier in an IS outsourcing relationship evolve over time?" To answer the research question the remainder of the paper is organized as follows: The next section introduces the research background. In the third section, we present the empirical study that motivated the dynamic theory-building work presented in this paper. Next, we discuss the identified reference modes of client dependence and illustrate the key feedback effects in a qualitative causal model. The article closes with a discussion of findings, limitations and possible directions for future research.

2 Research Background

2.1 IS Outsourcing Research and System Dynamics

IS outsourcing is herein understood as a "business practice in which a company contracts all or part of its information systems operations to one or more outside information service suppliers" (Hu, Saunders, and Gebelt 1997). This study will thereby concentrate on two main phases, in which the external supplier(s) are involved: 1) the (initial) development of the IS and 2) the maintenance of the IS. These present two distinct phases, in which the outputs of the development work (initial running software version) serve as an input of the maintenance phase (Dibbern, Goles, and Hirschheim 2004). After the initial development and the go-live of the system, maintenance includes activities such as enhancing existing functions, adding new functions as well as correcting bugs (Dekleva 1992).

Pointing to the opportunity of applying System Dynamics in IS research, Georgantzas and Katsamakas 2008 identified some sample articles in a literature review and evaluated SD modeling as a valuable approach. Inspired by the pioneer work of Abdel-Hamid and Madnick (1991) on software development processes, various articles of SD application have appeared especially in this IS domain (Georgantzas and Katsamakas 2008; Häberlein 2004). However, reviewing methods commonly applied in the field of IS outsourcing, a focus on empirical analyses, case studies and formal argumentative-deductive approaches can be stated (Martens and Teuteberg 2009). There are only a few articles that add a system dynamics perspective to IS outsourcing. However, it can be argued that software development projects are even more dynamically complex and unpredictable when an external supplier is involved (Häberlein 2004).

With their seminal work in 1999, McCray and Clark laid the foundation for subsequent work in the field of system dynamics and IS outsourcing. In their article they addressed the long-term impacts of outsourcing IS tasks to external suppliers. They developed causal models, addressing two different categories of outsourced services, namely software vs. hardware/networking. Different strategies on the cost of service provision, the remained knowledgebase in-house and the achieved service level were explored (McCray and Clark 1999).

Roehling et al. (2000) applied system dynamics modeling to explore inter-firm relationships in application outsourcing and to support outsourcing decision-making. Häberlein (2004)

developed a generic causal framework of IS outsourcing projects. More precisely, the work focused on acquisitions of custom-made projects that are deemed to undergo a higher complexity than pure in-house developments or acquisitions of standard software.

Mollona and Sposito (2007) built a system dynamics model to study the dynamics within an outsourcing endeavor. In the model, a software-house company and the option of outsourcing software development were considered. The model explored the long-term effects of outsourcing development: the speed of implementation of an outsourcing decision and the general willingness to outsource. By grounding their work mainly on transaction cost economics (Coase 1937; Williamson 1981), Mollona and Sposito (2007) adopted a cost-perspective and monitored the impact of these two factors predominantly on total sourcing costs (governance and production costs).

2.2 Client Dependence in IS Outsourcing Relationships

While dependence is seen as a central concept in relationship marketing as well as purchasing and supply management, there is still the need to transfer the concepts to an IS outsourcing setting and to study it especially from a dynamic perspective. Research in this field is scarce, although prior research has acknowledged the role of dependence in IS outsourcing relationships (Kern and Willcocks 2000; Currie and Willcocks 1998). One exception is the work of Straub et al. (2008), who show that firms need to control strategic important IT resources in-house to improve their performance, thus limiting their dependence on external organizations. Lonsdale (2001) observes that if transaction-specific investments are not equally shared between the partners, the weaker actor will face significant sunk costs and is in an undesirable position compared to the more powerful actor. Lonsdale (2001) views especially client organizations which decided to outsource activities with high specifity shifting to a weaker position in the post-contractual phase.

Dependence research in general pointed out that dependence is a dyadic concept (e.g., Emerson 1962). Thus, to identify which party holds a power potential over the other (positive net dependence), both dependencies, the client dependence on the supplier and in turn, the supplier dependence on the client, need to be taken into account.

In this paper, we adopt the perspective of a client in an outsourcing arrangement and are interested in understanding the leverage points in influencing its dependence. The challenge is here to understand which factors influence client dependence and how they interact and produce a dynamic behavior during the phases of IS development and maintenance. The model developed in this paper presents a move in this direction and builds on the system dynamics tradition in software development and outsourcing dynamics.

3 Research Approach

The system dynamics (SD) methodology allows for studying systems where “dynamic complexity“ arises (Sterman 2000, 21). Although, a system under study need not be complex itself; the complexity usually arises from the interaction, i.e., feedback processes, among the system’s components over time (Sterman 2000, 12, 21). At its core, two different feedback loops can be differentiated, self-reinforcing (positive) or self-correcting (negative) loops which lead to observable dynamics in the system.

To build a dynamic causal model of client dependence in IS outsourcing relationships, the system dynamics and case study methodology were combined in a multi-method approach (Mingers 2001). Furthermore, we draw upon data collection and analysis methods well-known in social sciences to enhance the rigor of our modeling efforts (Luna-Reyes and Andersen 2003).

The dynamic modeling presented herein follows an inductive approach (Schwaninger and Grösser 2008). A case study at an IT Organization of a large German enterprise from the transportation sector was conducted. At this research site, five outsourcing relationships, i.e., cases, to differing suppliers were selected (see Figure 1). The respective suppliers are commissioned for the development and/or maintenance of five information systems for the IT organization. Table 1 gives a detailed overview of the cases' characteristics.

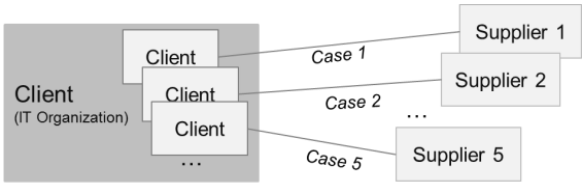

Figure 1: Study Design

The model is built upon a large number of interviews and literature in the field of IS and dependence research. A total of 10 face-to-face interviews with 12 interviewees across the five cases were conducted in a first wave. Altogether, the interviews lasted over 13 hours and produced 257 pages of text after transcription. On average, one interview took approximately 80 minutes. The experts had several years of experience of IS outsourcing and held different positions (i.e., contract manager, project manager, team member and head of sub-department) in the IT organization. The interviews were based on a pre-tested interview guideline encompassing semi-structured, open-ended questions. Different aspects were addressed herein: First, general information about the contractual relationship and the background of the interviewees. Second, an estimation of the perceived client dependence. This was followed by a discussion of (1) influencing factors of our key variable, dependence, and their interplay as well as (2) the consequences of low and high dependencies (Vennix 1996). During the interview, the emerging variables and causal relationships were drawn on a sheet of paper to increase the common understanding and to elicit the mental models from the interviewees (Doyle and Ford 1998; Ford and Sterman 1998). In a second wave, five interviewees agreed to draw their perception of dependence over time, giving insights into the dynamic behavior and allowing for a retrospective analysis.

	Case 1	***Case 2***	***Case 3***	***Case 4***	***Case 5***
Description	*"Sales Platform"*	*"Self-Service Platform"*	*"Client Core Service System"*	*"CRM Platform"*	*"GUI for Customer Service"*
Contract period	2009 - 2015	2009 - 2011	2005-2020	2008-2020	2011-2015
Likelihood of contract extension/ expected period	high (80%), 2020	n. a.	high (90 %), 2030	medium (60%), 2025	low (5 %), 2016
Current phase in IS lifecycle	maintenance	end of development (transition)	development/ maintenance	development	maintenance, supplier transition
Interviewees	team member, project manager, team leader	team member, project manager	team member, contract manager	head of sub-department, project manager	team member, project manager, contract manager
Perceived dependence (end of 2011)	medium	high	high	high	medium/high

Table 1: Overview of Cases

Based on the interview transcripts, two researchers identified text paragraphs that included relevant information about the influencing factors of dependence and their interplay. Each one of the two reviewers stated whether a text passage was relevant or not. The resulting reliability was very high with an average value of app. 90%. The text was then encoded and structured using a QDA (qualitative data analysis) software. The coding procedure was undertaken as follows (Miles and Huberman 1994; Corbin and Strauss 2008): A coding list was initially developed by the two researchers. During the coding process still omitted codes were added to the list after agreement. The transcribed interview data revealed a large set of factors or codes influencing client dependence. The factors were then iteratively regrouped, aggregated and redefined in order to avoid an overlapping. Different streams of literature and theories were used to facilitate the causal mapping and raising the conceptual level of our work (Eisenhardt 1989). The first author and a research assistant then transferred the relevant text passages into a collection of hypotheses, linking the prior derived codes. Based on these extractions a qualitative system dynamics model (see e.g., Coyle 2000) was developed.

4 Qualitative System Dynamics Model

The presentation of our model is oriented on the two phases common to a qualitative system dynamics approach 1) articulating the problem to be addressed, i.e., description of dynamic behavior and key variables observed, and 2) formulating a dynamic hypothesis about the causes of the problem (Sterman 2000).

4.1 Problem Articulation

4.1.1 Dynamic Behavior

Motivated by the research gap towards the dynamic nature of dependence (Gulati and Sytch 2007; Caniëls and Roeleveld 2009), the five cases were intensively investigated to identify significant feedback loops at work.

With perceived client dependence our main variable of interest has already been introduced. In each case, interviewees agreed to draw their perception of dependence across the lifecycle of their IS, thus, including a pre-contractual phase, the core development phase and the phase of maintenance after the go-live of the system. In the preceding wave of data collection, interviewees explained that dependence does not grow infinitely and is limited by an upper limit (see also section 4.2.3). Thus, dependence was set to a range of zero to one in our provided template. Even though, the reported data about perceived client dependence might suffer from e.g., a recall bias, it gave valuable and rare insights. Especially, since historical and numerical data was not available, it was the only way to elicit the knowledge about past values from the interviewees (Sterman 2000; Vennix 1996).

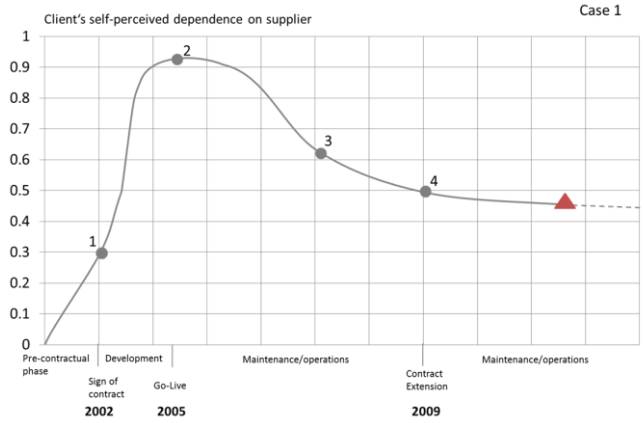

Figure 2: Dynamic Behavior of Client Dependence (Case 1)

Having a closer look at case 1 (see Figure 2), the dependence was here perceived as relatively low (1) in the pre-contractual phase, but grew rapidly with the implementation of the system. In the first phase of development, the client got increasingly more dependent on its supplier, since he lacked the functional and technical know-how of the system in the initial stages. A supplier switching would have been accompanied with high efforts to prepare a new bid and to explain the needed functionality (*evaluation and selection efforts*). The client realized this disadvantage and took countermeasures to decrease its substitutability difficulties. With time, the client's own IS knowledge increased, leading finally to a flattening of the dependence curve (2). The diminishing switching barriers were then used to transfer one central system component to a former subcontractor of the supplier, thus, reducing equally the focal supplier's delivered IS *importance*, in terms of relative financial magnitude and functional criticality (3). Thus, the client dependence continued to decline and has now (see red triangle) reached a medium level, also favored by an increasing *number of supplier alternatives* on the market over time.

Figure 3 shows the behavior over time graphs for the remaining four cases. They all show an increasing perception of dependence until the end of the initial development. In the maintenance phase, interviewees observe different outcomes in the cases. While in case 2 and 3 a further increase is expected, the dependence is assumed to decline in the remaining two cases. While the interviewee in case 4 hypothesized that a supplier switching would become more easily in the maintenance phase, the client organization has already started to build up an alternative supplier in case 5, diminishing its remaining dependence on the incumbent supplier.

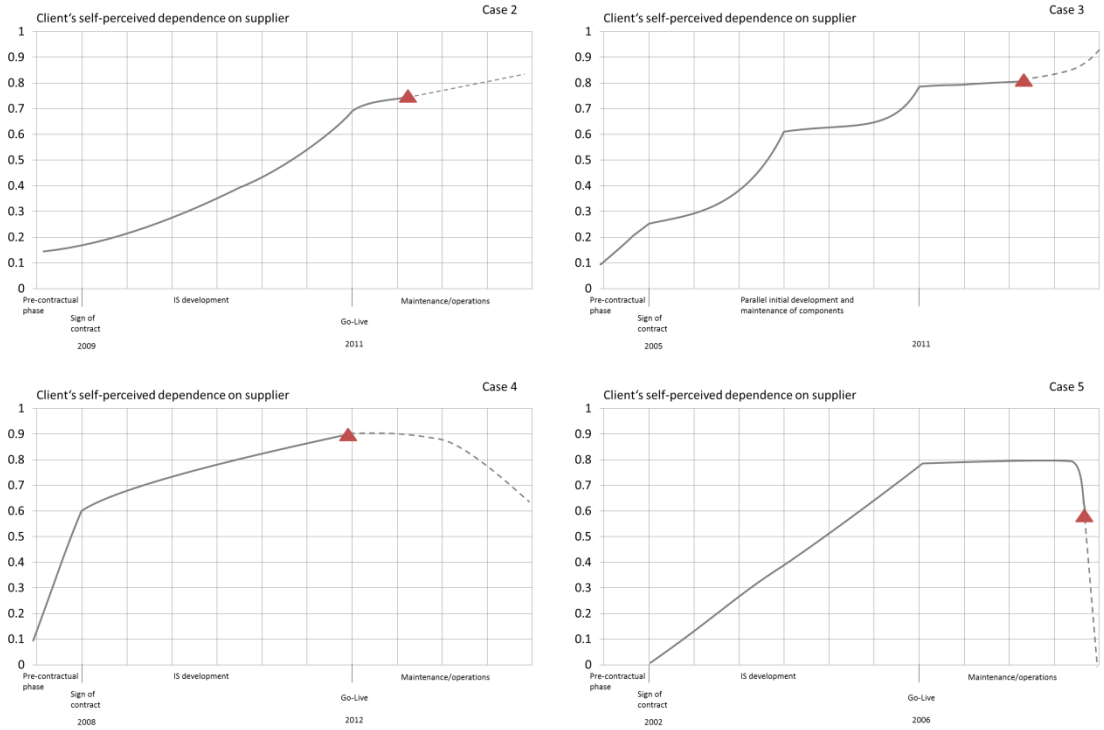

Figure 3: Dynamic Behavior of Client Dependence (Cases 2-5)

The reported dynamic behavior suggests that there are mechanisms at work that increase dependence over time. To reveal these, the following section disaggregates dependence into its underlying components.

4.1.2 Key Variables

An output of this study was the identification of ten factors in three categories as important determinants of client dependence that have been discussed in detail in another publication (Kaiser, Widjaja, and Buxmann 2012).

The revealed factors span different theories and perspectives, namely (resource) dependence theory (RDT) (Emerson 1962; Pfeffer and Salancik 1978), transaction cost economics (TCE) (Coase 1937; e.g., Williamson 1981, 1991), social exchange theory (SET) (e.g., Thibaut and Kelley 1959) and the switching cost perspective (SC) (Whitten and Wakefield 2006; Jones, Mothersbaugh, and Beatty 2002).

Beginning with the main categories, organizational dependence can be divided into the *importance* of the covered functionality by the IS and the *substitutability* of the current supplier based on Emerson's dependence view and RDT (Emerson 1962; Pfeffer and Salancik 1978). *Spillover effects* emerged as an unanticipated third category of dependence. Dissatisfaction with a party's decision to terminate an exchange relationship can spill over to other exchange relationships and lead to a transfer of an untapped power potential to the focal relationship (Kaiser, Widjaja, and Buxmann 2012). For example, the supplier might increase prices in other systems provided to the client to compensate for his turnover loss in the discontinued exchange relationship. The following model will, however, concentrate on the two "traditional" categories of dependence and exclude spillover effects, since they result from other exchange relationships between client and supplier (see Figure 4).

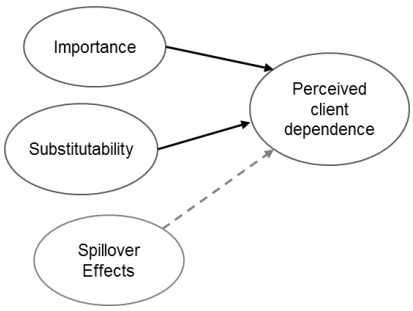

Figure 4: Determinants of Perceived Client Dependence

Anchored in RDT, the importance facet is further influenced by the relative financial magnitude and (functional or strategic) criticality of the IS (Pfeffer and Salancik 1978; Bourantas 1989). The substitutability facet is positively influenced by the number of supplier alternatives (Pfeffer and Salancik 1978; Emerson 1962). However, there are other factors that make a replacement of a supplier difficult (Heide and John 1988). Time and efforts necessary for evaluating and selecting a new supplier as well as remaining uncertainty with regard to the performance of a potential alternative supplier represent barriers to switching (Whitten and Wakefield 2006). Also, the perception of sunk costs, i. e., non-recoverable time, money and efforts invested in the incumbent relationship might negatively influence the perceived substitutability of the current supplier (Jones, Mothersbaugh, and Beatty 2002; Whitten and Wakefield 2006). Grounded in SET, benefits received from the current relationship (e. g., high service quality or special support services) that an alternative supplier cannot deliver are supposed to additionally limit the substitutability and thus increase dependence (Anderson and Narus 1984; Thibaut and Kelley 1959). Anchored in the switching cost perspective, high costs associated with switching on client side as well as the set-up costs incurred by the supplier (which the client usually has to bear) were further found as significant determinants of client dependence. Table 2 summarizes the nine factors (except spillover effects) the dynamic model is based on.

Determinant	Influencing Factor	Description
Importance	1 Relative financial magnitude (+)	Supplier's share of total purchasing volume related to the IS.
	2 Relative value contribution (+)	Degree of value contribution of the covered functionality (by the IS) in relation to relative magnitude.
Substitutability	3 Supplier alternatives (+)	Number of supplier alternatives for the IS or a similar IS.
	4 Evaluation and selection efforts (-)	Time and effort needed for evaluating and selecting a new supplier.
	5 Performance uncertainty of alternative suppliers (-)	Uncertainty or risk surrounding the performance of alternative suppliers.
	6 Sunk costs (-)	Non-recoverable time, money and effort invested in the outsourcing relationship.
	7 Lost benefits (-)	Benefits resulting from the current relationship and which are lost upon contract termination.
	8 Post-selection client side costs (-)	Time, effort and financial outlays needed to conduct the switching process on client side.
	9 Set-up costs of alternate supplier (-)	Upcoming investments in the alternate supplier necessary to reach the previous work state (related to the IS).

Table 2: Influencing Factors of Client Dependence (Kaiser, Widjaja, and Buxmann 2012)

4.2 Dynamic Model of Client Dependence

Based on these findings, a dynamic model that reflects the mechanisms resulting in a growing client dependence was developed. As mentioned before, the model include the development and maintenance phases of an IS. The variables relevant to our model span the client organization and the market for the IS, that is, the supplier organization is to a large extent ignored.

Figure 5 shows perceived client dependence embedded in a high-level model of two positive feedback loops. The model assumes that a change in client dependence is mainly driven by a change in the perceived substitutability and/or in the perceived importance of the IS.

The feedback effects can be explained as follows. In an IS outsourcing setting, perceived client dependence inherently induces the *need to extend the IS* (e.g., fixing bugs or enhancing functionality) in the future *with the current supplier*. If a functional gap (between the desired and actual system) then actually arises, the order to extend the IS is more likely to be given to the current supplier the higher its need to do so. In consequence, investments in the IS and in the current supplier are made which strengthen the bond to the company. Hence, potential efforts and costs for switching this supplier are increased, leading to a reduced perceived substitutability of the current supplier and boosting the perceived client dependence in turn. Furthermore, significant functional extensions increase the importance of the IS, since the likelihood that the system will become obsolete is lowered. This effect will add to an increased dependence. The two cycles reflect that dependence might be low in the beginning, but is naturally increased each time around the cycle.

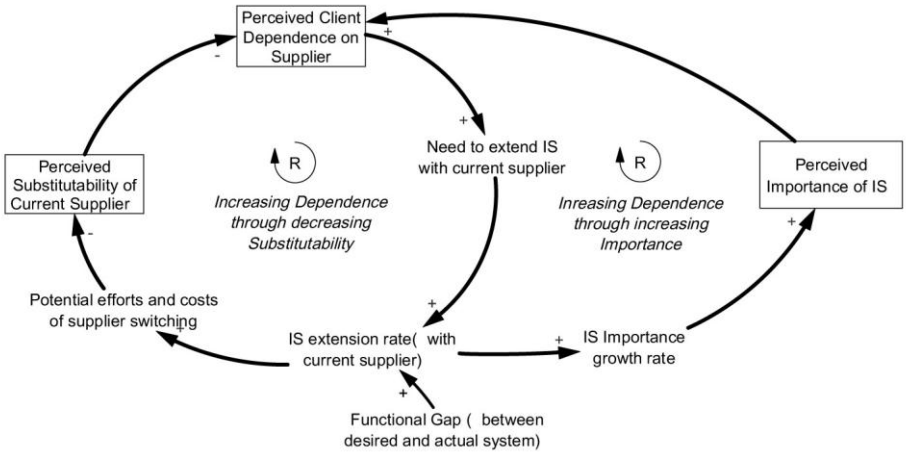

Figure 5: High-level Diagram of Perceived Client Dependence

These reinforcing mechanisms depicted here are similar to those described in other contexts. For example, a similar issue is addressed by the Lock-In Cycle developed by Shapiro and Varian (1999). Their model describes how customers in high-tech industries might face increasing switching costs over time, by moving along four sequential phases 1) brand selection, 2) sampling, 3) entrenchment, and 4) lock-in and potentially back to brand selection. The critical phase is the entrenchment phase, in which the customer develops a preference to the product brand and does complementary investments. In each round of new purchases of equipment and brand-specific training and so on, entrenchment grows and so do the costs to switch to an alternate brand.

So far, our high-level diagram showed an aggregation between IS extension and the two main determinants of dependence, substitutability and IS importance. In the following, these are disaggregated into a more advanced causal loop diagram. In this way, the interplay between the underlying variables that lead to growing and shrinking dependence becomes apparent.

4.2.1 Substitutability Segment

Before the client initially commissions the supplier, its dependence in this relationship is usually still close or equal to zero. Upon conclusion of the contract for the development/maintenance of an IS, however, a client's perceived dependence on the partner usually increases. One central reason is that client and supplier often contractually agree on penalty clauses at this stage. Since the client would have to pay the penalty when ending the contract prematurely, such an agreement positively influences the potential *client-side costs* for switching. This may already lead to the perception of a lower substitutability of the incumbent supplier and thus to an increased perceived dependence at a very early point in time. Contract penalties are, however, often negligible in comparison to other imminent costs that are rising over time (see Figure 6).

With the commissioning of the supplier two main mechanisms are set in motion that enfold vicious feedback effects over time. First, the client invests in the supplier, e.g., by paying him for the completion of IS extensions and spending efforts for monitoring and controlling his activities. The *degree of specifity* expresses that a certain degree of these investments is specific to the current outsourcing relationship and thus non-redeployable in other relationships with alternate suppliers (Heide and John 1988). The result are sunk costs that are expected to limit the perceived substitutability of the supplier and thus to increase dependence for the investing party (*R1_Increasing Sunk Costs*). Our case study findings suggest that the extent to which prior IS developments are legally owned by the client are one central way to

limit sunk costs (c*lient IP percentage*). As such, the client is at least potentially able to reuse and transfer the prior developed system components to another relationship. On the contrary, high sunk costs (and thus increased dependence) can lead to continuance of a given course of action, investing more and more in the current relationship, even if a cancellation would be more advantageous (e.g., Keil et al. 1995).

The second vicious mechanism is initialized with the required business domain knowledge transfer to the supplier. As the domain knowledge needed to implement the IS usually resides at the client side (Tiwana 2003), a certain amount of this knowledge needs to be transferred to the supplier in form of functional requirements to enable him to adequately implement the IS. With the necessary amount of business domain knowledge transferred (*B1_Knowledge Transfer*), the supplier is gradually able to deliver IS extensions (*B2_Closing Functional Gap*), of course, depending further, inter alia, on its technical capability (Tiwana 2003). However, the acquisition of new business knowledge helps the supplier either to close a gap to concurrent alternatives or to move ahead in terms of IS attractiveness for the client company (*R2_Outpacing or reaching the market level*). A reason is that systems get often more and more 'individualized' or 'tailored' over time to meet the company's specific needs, even if originally bought as a standard solution 'off the shelf'. Furthermore, as the IS scope increases over time, another side effect arises. Other systems begin to use the existing functionalities of the IS which lead to an increased intertwining of the IS and a higher number of interfaces. A highly interconnected IS increases the efforts to understand and maintain these connections. The rising complexity leads to higher set-up efforts for an alternate IT supplier, diminishing further the perceived substitutability of the current exchange partner.

Besides the efforts for a new supplier to reach a previous work state or a specific level of covered functionality (*IS scope*), the *client-side costs* needed to conduct a switching process also grow with an increasing gap between the current supplier and alternatives. For example, the client usually needs to make personnel available to explain the today's IS scope and to develop the new supplier. Thus, an outpacing of the market level negatively influences the *substitutability* in two ways, on the one hand by increasing the expected costs for a supplier set-up and on the other hand the costs directly incurred on client side to manage, support and control the new supplier during the switching process.

With regard to the substitutability facet, there are three more factors not explained yet that precede the mechanisms explained so far: number of supplier alternatives, evaluation and selection efforts and supplier alternatives performance uncertainty.

The number of alternatives on a market that offer a similar IS or are able to maintain the today's IS are supposed to directly influence the substitutability of the current supplier. Naturally, the relationship between *number of supplier alternatives* and *substitutability* is assumed to be a degressive one: The effect on substitutability is higher at a small amount of supplier alternatives, thus, marginal substitutability declines as the number of alternatives increases. The number of alternatives is mainly influenced by existing market alternatives. In addition, if the client possesses the capability to perform the IS tasks in-house, the client itself may present a valid supply alternative.

In the context of IS outsourcing, even if there are known market alternatives and the client is willing to switch its supplier, there are evaluation and selection efforts necessary that precede the actual switching process. These include the provision of resources, know-how and time to conduct the phases from preselecting and evaluating alternatives to finally selecting an appropriate new supplier (Kaiser, Widjaja, and Buxmann 2012). Remaining efforts to fulfill these tasks are mainly influenced by the client's actual acquired knowledge about its own systems and alternate systems and suppliers (*client IS knowledge*).

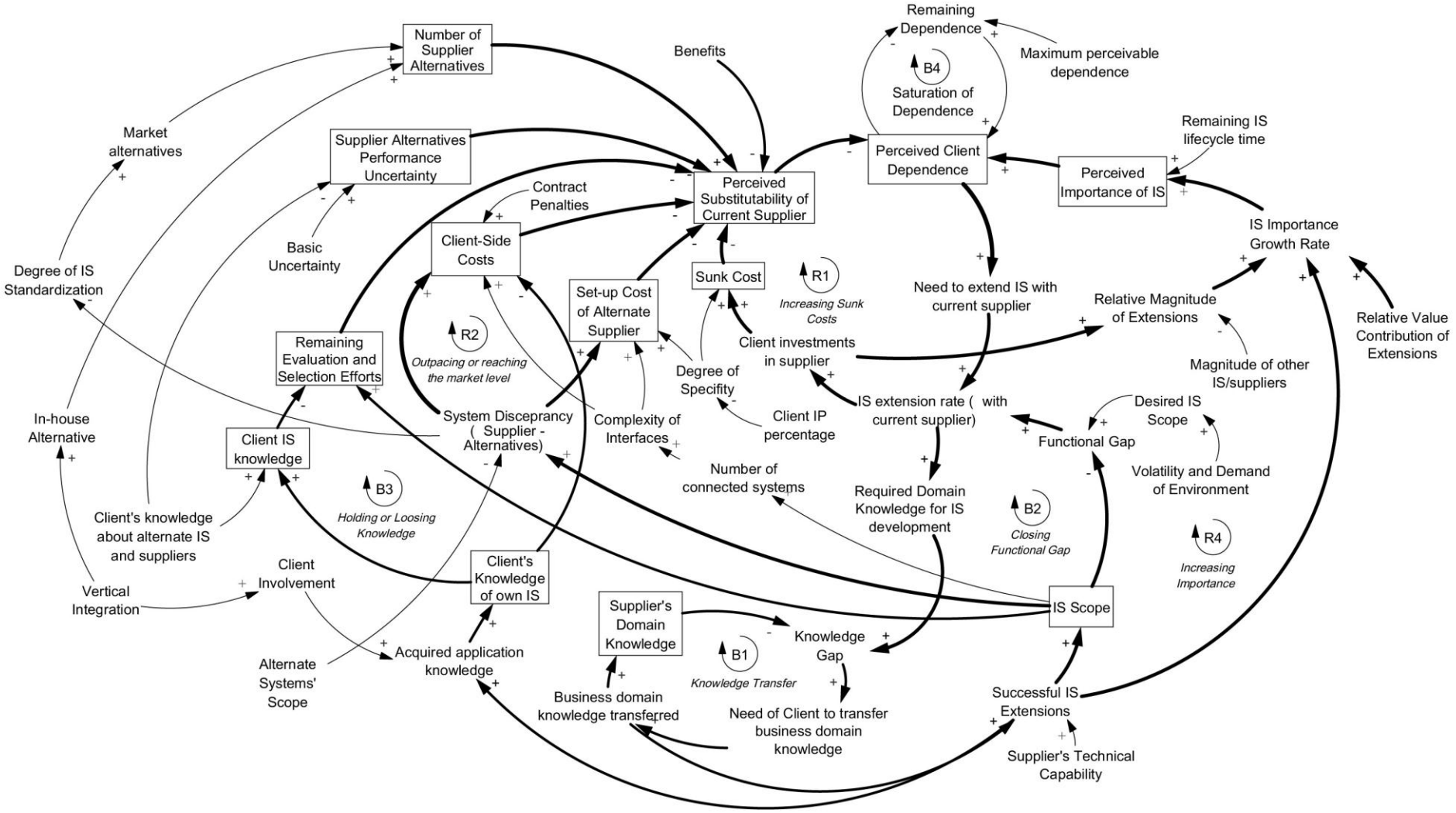

Figure 6: Dynamic Model of Client Dependence in IS Outsourcing Relationships

During the development of the IS, the client might be highly involved in the activities and thus gains a good understanding and knowledge about the own system. This brings an advantage and lowers the *remaining evaluation and selection efforts*. However, even if the client is highly involved, *client's own IS knowledge* might decrease over time, e.g., due to employee fluctuation or eroding knowledge. High remaining evaluation and selection efforts might discourage a client from switching. A countermeasure is a thorough documentation of any system change, but interviewees admitted that while the documentation efforts are ideal in the beginning, it becomes usually more and more neglected the longer the exchange relationship is enduring.

Another substitutability barrier arises from the uncertainty associated with the performance level of alternative suppliers (Whitten and Wakefield 2006). While in IS outsourcing, the supplier's capability and performance level is an important success factor (Grover, Cheon, and Teng 1996), it is often uncertain and hard to predict in advance. Even if a client organization can lower the gap between expectation and knowledge with high evaluation efforts (which increase the client's knowledge about alternative systems and suppliers), interviewees perceived the remaining uncertainty (lower bound: basic uncertainty) as an additional element that limits the substitutability of the current supplier.

A further variable of our model are benefits that are lost upon contract dissolution and switching to an alternate supplier. While benefits were not observed to undergo important feedback effects within our system, they are modelled as exogenous. However, offered benefits, such as premium support and high quality, might be linked to the supplier's interest in the relationship, or in other words, its own dependence on the client. Given our focus on client dependence, however, this connection is not discussed here in more detail.

4.2.2 Importance Segment

Turning to the importance determinant of dependence, we modeled *IS importance* as a function of *relative financial magnitude* and *relative value contribution* (Kaiser, Widjaja, and Buxmann 2012; El-Ansary and Stern 1972). The higher the (financial) client investments in the supplier the higher is the relative magnitude of exchange, assuming that the financial magnitude of the remaining client information systems remains the same. Next to its financial magnitude, each extension has a certain value contribution to the supported business processes (Kaiser, Widjaja, and Buxmann 2012). That is, an IS' relative value contribution can differ from its relative magnitude. For example, maintenance services of a sales system might be more crucial to the company's success than similar services to a back-office system, even if the financial magnitude of exchange is equal. Thus, successful IS extensions lead to a specific importance growth rate which in turns contributes to perceived IS importance. As described above, a higher perceived IS importance leads to a higher dependence and thus closes the reinforcing loop (*R4_Increasing Importance*).

4.2.3 Limits to Growth in Perceived Client Dependence

The presented model distinguishes between actual (e.g., client-side costs, relative magnitude) and perceived values (e.g., perceived client dependence, perceived importance of IS). The reason is that there might sometimes be a significant difference between the actual state of affairs and perceived system values (Sterman 2000). Furthermore, the perceived values are of great concern here since they ultimately govern a decision maker's behavior towards its supplier.

In addition, the distinction between actual and perceived values lead us to a peculiarity of the model. Whereas sub-determinants of dependence, such as client-side costs, can grow

infinitely, especially, the perceived dependence is limited to an upper bound, i.e., the *maximum perceivable dependence*[1]. More precisely, interviewees explained that the higher the dependence, the smaller is the gap towards the maximum value and the progress to reach the maximum value declines. This behavior is well-known in system dynamics as the "limits to growth" or "s-shaped growth" archetype (Sterman 2000). To illustrate this, Figure 7 shows a simple causal model of perceived client dependence and the expected behavior over time.

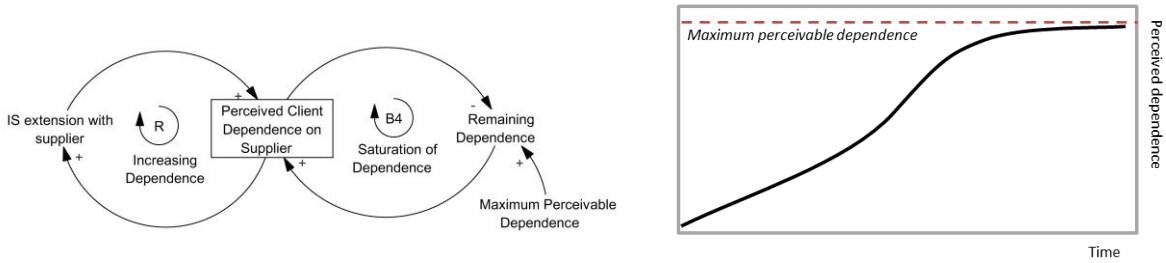

Figure 7: Limits to Perceived Client Dependence Growth

The reinforcing loop is simplified in the causal loop diagram in Figure 7. However, it incorporates the so far explained reinforcing mechanisms in the system, through increasing substitutability and importance. A balancing loop (*B4_Saturation of Dependence*) is interlinked to reflect a growing weakening effect on the client's perception.

5 Conclusion and Outlook on Future Research

In this paper, we drew on five cases to investigate the temporal dimension of client dependence in IS outsourcing relationships. Given that a high dependence on an IT supplier might present a performance risk for client companies (e.g., Gulati and Sytch 2007), it is of primary interest to understand how dependence behaves over relationship duration and how it can be influenced. A qualitative system dynamics model based on interview data and literature was derived, showing that perceived dependence is strongly intertwined with a number of further factors.

5.1 Discussion

Since high dependence is often negatively associated, the findings presented in this paper paint rather a bleak picture for clients in IS outsourcing relationships: their dependence naturally increases over time due to reinforcing feedback effects, shifting them in a difficult position. However, the cases and the model offer some valuable leverage points on how to decrease client dependence.

Before discussing these, it has to be recalled that high dependence offers a *potential* for the other party to exploit its power advantage, which is not equivalent to that the supplier actually uses it. However, by not managing their dependence, clients leave themselves vulnerable to opportunistic behavior by the supplier (e.g., Shapiro and Varian 1999). One exception might be a situation of high joint dependence, that is, client and supplier dependence are equally large, which can also result in high performance for the client due to a mutual interest of both parties in the exchange relationship (Gulati and Sytch 2007).

However, for clients that seek to decrease their dependence on an IT supplier, there are at least two main anchor points: 1) decreasing the importance of the IS and 2) increasing the substitutability of the supplier.

[1] It is also reasonable that perceived substitutability and perceived importance are limited to an upper bound. However, we chose to explain this phenomenon by means of one specific variable, perceived dependence, to avoid unnecessary confusion.

Beginning with the latter, the presented framework herein reveals that dependence decreases, when one or more influencing factors of substitutability decrease and this effect is not overcompensated by changes in the remaining variables. It has to be noted, though, that in many cases a lowering of dependence is equal to high efforts and financial outlays. For example, in order to reduce evaluation and selection efforts, a client company could increase their documentation efforts or hiring personnel with a deeper technical knowledge. These outlays have to be weighed against the expected lower dependence and thus the improved power position towards the supplier. Overall, it seems to be reasonable to manage dependencies proactively and with foresight from the beginning of a relationship to be in a better position later off. To mature a client's supplier relationship management (e.g., Kaiser and Buxmann 2012), actual and expected future dependence combinations should be a strategic criterion in the supplier selection and monitored throughout the relationship.

With regard to the importance facet, relying on *multi-sourcing* and thus involving further suppliers in the development/maintenance of the IS can also reduce the client dependence on the focal supplier (see case 1). It has to be noted, though, that such a strategy does not really diminish the total dependence of a client on external parties, rather, a 'portion' of dependence is here transferred to another client-supplier relationship.

The model also called attention to a number of strategic variables that have an influence on the underlying facets of dependence. The analyzed cases suggest that a client's level of IS knowledge, its degree of vertical integration, the degree of IS standardization as well as obtained intellectual property rights represent promising leverage points to break or weaken reinforcing loops.

Even if a client's dependence has become prohibitively high, there are ways to decline it. External changes in the environment, especially in the markets, can work in favor for the client. For example, in case 1, new market entrants significantly altered the dependence combination between client and supplier, since the number of alternatives increased. Moreover, in general, information systems reach sooner or later the end of their *lifecycle*, e.g., when new technologies emerge or when the supported business processes by the IS become obsolete. As such, the functional and strategic importance of the IS might diminish, decreasing the need for the client to further invest in it.

5.2 Limitations and Outlook on Future Research

Despite its 'qualitative' nature, we believe that the model offers interesting insights into the dynamics of client dependence which is a barely examined issue in research. Future research could take the next step by transferring the qualitative model into a quantitative simulation model. A well-designed quantitative model could help companies to monitor their dependence on IT suppliers and derive strategies to avoid e.g., a high dependence. A challenge will, however, be the quantification of variables and the inclusion of "soft variables", such as perceived client dependence.

While we investigated not only one case, but relied on five cases, there is still a need for other studies to discuss, extend and argue our findings. Although there is a high likelihood that the identified mechanisms are transferable to other client companies, we cannot exclude that additional feedback effects influencing client dependence exist.

Moreover, the integration of the supplier side would be a worthwhile expansion of the model. Since equally a high dependence can arise here (Kaiser, Widjaja, and Buxmann 2012), providing insights into its dynamics would be valuable for both, researchers and practitioners, in the field of IS outsourcing.

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