

**Firm boundary decisions in solution business:
Examining internal vs. external resource integration**

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Research highlights:

- Transition to solution business requires resource expansion rather than conversion from product to service-based resources.
- The solution provider's resource integration approach can be analyzed as a firm boundary decision utilizing four lenses: identity, competence, efficiency and power.
- We explicate the choice of external vs. internal resource integration approach through eight research propositions.
- The chosen resource integration approach should be consistent with the provider's intended service growth trajectory

Abstract

This paper examines the drivers that lead manufacturers to choose between an internal versus external resource integration approach as they transition to solution-based business. We emphasize product-based resources and examine drivers for the choice of resource integration approach through four distinct firm boundary conceptions – identity, competence, efficiency, and power. These boundary conceptions are applied to an empirical investigation of two global manufacturers, Wärtsilä and Kone, which have chosen opposite strategies to integrate product-based resources in transitioning to solution business: one opted to internalize the required resources, while the other works with a network of external partners. We develop research propositions to explicate how internal vs. external resource integration approaches in solution business represent distinct paths for manufacturers to grow their underlying product businesses; derive value from integrated resources; manage interdependence between solution components; and position themselves as central integrators of complex solutions. This paper contributes to the existing research by providing a systematic and theoretically inclusive analysis of alternative approaches to organizing solution provision. Previous contributions on these issues are very few and predominantly focus on examining manufacturers' organization of service provision. This paper provides a complementary view focusing on product-based resources and incorporates a wider range of explanatory theories.

Keywords: Solution business, Service transition, Resource integration, Boundary decision, Case study

1. Introduction

Commoditization pressures and heightened competition have increasingly prompted manufacturers to transition to solution-based business (Nordin & Kowalkowski 2010; Ulaga & Reinartz 2011; Tuli *et al.* 2007). Providing solutions involves integrating a broad set of product- and service-based components into a seamless whole that meets customer-specific needs (Hakanen & Jaakkola 2012; Biggemann *et al.* 2013), requiring considerable changes in the organization and its resources (Ferreira *et al.* 2013). Understanding how manufacturers manage different aspects of this necessary yet challenging transformation has been emphasized as a key area of research (Evanschitzky *et al.* 2011).

To effectively transition to solution-based business, manufacturers need to secure access to an expanded set of resources (Raddats & Easingwood 2010). In doing so, they can choose between two distinct approaches: internalizing the required resources or seeking access to them through an external partner network (Davies *et al.* 2007). However, we currently lack a clear understanding on how firms choose between internalization and externalization approaches as they transition to solution business. While there are rich research traditions addressing firm boundary decisions, very few studies have addressed this issue in solution or servitization contexts where the need for resource expansion is critical. Some initial attempts have been made to explore manufacturers' externalization vs. internationalization decisions with regard to service-based resources (Kowalkowski *et al.* 2011; Paiola *et al.* 2013). The expansion of product-based resources has garnered comparatively less attention, although we know that some

solution transition paths place relatively high importance on product-based resources, for instance in the form of tailored systems (Matthyssens & Vandembemt 2008).

To address these gaps in the existing research, *the purpose of this paper is to analyze the drivers that lead manufacturers to choose between internal vs. external resource integration approaches as they transition to solution-based business.* In doing so, we emphasize product-based resources to complement prior contributions' emphasis on service-based resources (Kowalkowski *et al.* 2011; Paiola *et al.* 2013). We analyze the drivers behind these resource integration approaches by applying four distinct, but interrelated, firm boundary conceptions initially introduced by Santos and Eisenhardt (2005, 2009): identity, competence, efficiency, and power. These boundary conceptions draw upon a rich set of established theories and enable us to develop a more theoretically inclusive analysis of the internal vs. external resource integration approaches in solution business. Thereby, we also respond to the critique that much of solution business research lacks grounding in more generic theoretical frameworks (Nordin & Kowalkowski 2010).

The four boundary conceptions provide the analytical framework to examine the resource integration approaches of two global manufacturers, Wärtsilä and Kone, which operate in the metal engineering sector. The studied firms have chosen opposite strategies to integrate product-based resources in transitioning to solution business: one chose to internalize the required resources, the other works with a network of external partners. By examining these polar types of

cases through multiple theoretical lenses, we provide a holistic understanding of the ideal conditions that favor internal vs. external resource integration approaches.

This study extends the current knowledge on the organization of solution business (Davies *et al.* 2007; Gebauer *et al.* 2013) by identifying drivers for alternative resource integration approaches, specified in a set of research propositions. We also problematize the tendency of the existing research to focus on service-related resources, while neglecting consideration of how access is gained to product-based resources.

The paper is organized as follows: we first establish the conceptual basis by explaining how resource integration approaches in solution business can be analyzed as firm boundary decisions. Subsequent sections present methods and data, findings of the empirical study, discussion, and conclusions.

2. Conceptual basis

2.1. Approaches to resource integration in solution business

Solutions have been defined as “individualized offers for complex customer problems that are interactively designed and whose components offer an integrative added value by combining products and/or services so that the value is more than the sum of the components”

(Evanschitzky *et al.* 2011, p. 657). Thus, at the very center of solution business initiatives lies the provider’s ability to integrate a wide range of resources, both product- and serviced-based, either

within or between organizations, into value-creating responses to customer problems (Evanschitzky *et al.* 2011; Jaakkola & Hakanen 2013).

From prior studies we know that different transition paths exist with implications for resource configuration. For instance, Matthyssens and Vandenbempt (2008) note that manufacturers can transition to solution business via two dimensions: technical application integration or business process integration. The former implies developing tailored systems whereby the supplier adds value by modifying the technical solution to fit the customer's needs. This solution transition path is consistent with the early contributions in systems selling (Mattson 1973; Hannaford 1976) and places relatively higher importance on the role of product-based resources. The latter transition path is in line with the servitization stream of solution marketing research: it involves developing service concepts and process management that integrate with the customer's value chain, thus emphasizing service-based resources (Matthyssens & Vandenbempt 2008). As noted by Kowalkowski *et al.* (2015), much of the recent research has emphasized the servitization perspective. This has led to a lack of insight on product-based resources in solution business.

In transitioning to solution business, providers can choose between two distinct approaches: the "systems seller" where the firm primarily uses resources based within the organization, and the "systems integrator" where the firm integrates resources residing outside its boundaries (Davies, *et al.* 2007). A firm operating as a systems seller is responsible for developing and delivering the entire solution, comprising activities such as designing the system, interface, and component specifications; developing products; producing and integrating components into a system; and

providing services to operate and maintain a system over its life cycle (Davies *et al.* 2007). We term this the *internal resource integration approach*. A systems integrator is a prime contractor for the customer, coordinating and integrating the components and resources provided by external suppliers and partners (Ibid.). Instead of mastering all the activities and resources internally, the systems integrator identifies, selects and manages suppliers across different supply chains, integrating the components into a customer-specific solution (Gebauer *et al.* 2013). We term this the *external resource integration approach*. In practice, firms may also adopt a hybrid solution in which they combine both approaches (Kowalkowski *et al.* 2011).

2.2. Firm boundary conceptions in solution business

Choosing between opposing approaches to resource integration requires choices regarding firm boundaries. While multiple theories can be utilized to analyze this crucial aspect of organizational design (Jacobides & Billinger 2006), the overwhelming majority of prior studies have adopted the transaction cost economics perspective conceptualizing firm boundary decisions as comprising discrete make-or-buy choices with the minimization of governance costs as the guiding principle (Santos & Eisenhardt 2005, 2009). While resulting in powerful insights, such an atomistic view neglects to consider other boundary-setting mechanisms that, when analyzed together, form patterns of strategic action (Ibid).

In making boundary decisions, firms need to address a set of basic organizational issues that can be captured through corresponding boundary conceptions: identity (coherence), competence (growth), efficiency (cost), and power (autonomy). These boundary conceptions are based on

Santos' and Eisenhardt's (2005) interpretations of different but at times interrelated theories of the firm. Each is grounded on well-established theories of the organization but none is a direct application of an individual theory. The boundary conceptions form the analytical lenses through which we investigate choice of resource integration approach in solution business, as illustrated in Figure 1.

Please insert Figure 1 here.

Next, we briefly explain how each boundary conception approaches the firm boundary decision, outline the theoretical basis of each view, and identify a key question driving firm boundary decisions in the context of solution business.

2.2.1. The identity view

The identity view, as defined by Santos and Eisenhardt (2005), focuses on how members of an organization define the organization with boundary decisions being guided by a sense of what constitutes an appropriate sphere of activities for the organization as a whole. This view draws on the literature concerning managerial cognition that strives to understand how managers act and interpret the world (e.g., Weick 1995), and from the organizational identity literature that examines the origins and roles of shared values and norms (e.g., Albert & Whetten 1985; Dutton & Dukerich 1991) (see Santos & Eisenhardt 2005).

Kowalkowski *et al.* (2015) note that since Oliva and Kallenberg's (2003) seminal article on the service transition process of manufactures, scholars have tended to conceptualize service-led growth strategies, including transition to solution business, as shifts on the product-service continuum, implying a unidirectional movement from product business to service business. While the aspect of organizational identity is seldom explicitly addressed in the extant solution business research, a servitization perspective implies a shift in organizational identity from product manufacturer to service provider. At the same time, particular solution transition paths (e.g. provision of tailored systems as noted by Matthyssens & Vandenbempt 2008) place relatively high importance on product-based resources. Furthermore, few if any studies address organization identity as a boundary-setting mechanism as opposed to an outcome of a transition. Thus, the question of identity and how it guides resource integration decisions in solution business is a highly ambiguous one. To examine the drivers for resource integration approaches from the identity perspective, we pose the following question: Which resource integration approach maintains coherence between the identity of the organization and its solution business activities?

2.2.2. The competence view

The competence view considers how firms acquire, exploit, and renew firm-specific resources to enhance their sources of competitive advantage. As described by Santos and Eisenhardt (2005), this view considers what resources the organization should possess, with organizational boundaries being set to maximize the value of the firm's resource portfolio. The competence

view draws on contingency theory (Chandler 1962) and the resource-based view (Wernerfelt 1984; Barney 1991).

The solution business literature indicates that from a competence perspective, internal and external resource integration approaches both have associated benefits. External resource integration enables flexible access to an expanded range of resources that can be integrated to create solutions to unique customer needs (Ferreira *et al.* 2013; Windahl & Lakemond 2006; Jaakkola & Hakanen 2013), and may also enable access to better resources (Prencipe 1997). Others meanwhile have questioned the ability of solution providers to truly derive value from integrated resources through external resource integration approaches, as they, for instance, lack the ability to drive required changes to existing product-system architectures to support overall system performance (Davies *et al.* 2007). Thus, from a competence perspective, we do not sufficiently understand the conditions that drive choice of resource integration approach, and pose the following question: Which resource integration approach maximizes the value of the resources needed for solution provision?

2.2.3. The efficiency view

The efficiency view analyzes firm boundary decisions as an exercise in minimizing governance costs (Santos & Eisenhardt 2005). According to this view, firms transact through markets or hierarchies depending on the most efficient governance mechanism (Williamson 1975). Santos and Eisenhardt (2005) discuss three types of governance costs: firstly, *transaction costs* are the most well-known type of governance cost that arise from asset specificity, small numbers

bargaining, and frequent transactions that may expose the firm to hold-up by opportunistic agents (Williamson 1991). Secondly, the related agency stream examines *measurement costs* arising from information problems (Williamson 1985; Holmstrom 1999), that prompt firms to organize activities, align incentives, and collect information within the organization's internal boundaries (Hart & Moore 1990; Holmstrom 1999). Thirdly, the knowledge based view rejects opportunistic behavior as a necessary source of governance costs in market based exchanges, and suggests that idiosyncratic knowledge can create *coordination costs* even when firms behave honestly (Conner & Prahalad 1996).

In the solution context, the efficiency of managing interdependence between the integrated elements is critical (Galbraith 2002), as the provider's task is to ensure "superior 'fit' of its components... [resulting] in competitive advantage over systems constructed out of separate components" (Page & Siemplenski 1983, p. 95). Conventional understanding presupposes that integrating resources internally is a more efficient mechanism, due to the better flow of information and knowledge by which the solution integrator can develop a superior system (Davies *et al.* 2007). At the same time, increased reliance on modularity and open standards has decreased the coordination costs needed to deliver sufficient levels of interface efficiency (Ibid.). To study these issues in more detail, we pose from the efficiency view the following question: Which resource integration approach minimizes governance costs related to managing interdependence between the solution elements?

2.2.4. The power view

According to the power view, as defined by Santos and Eisenhardt (2005), firms set boundaries to maximize strategic control over key external forces. The power view incorporates aspects of resource dependence theory (Thompson 1967; Pfeffer & Salancik 1978) and industrial organization (Porter 1980). Thus, power in exchange relationships can be analyzed in terms of the actors' relative dependence on resources introduced into the relationship. Firms can reduce dependence on suppliers and gain more favorable terms by integrating new activities along the industry value chain. The power conception can also be applied to networks of relationships, whereby the focal actor can increase its power by occupying a central network position (see Santos & Eisenhardt 2005).

A solution provider is typically conceptualized as a single organization that acts as the prime contractor in charge of managing the customer interface while integrating products and/or services into a seamless whole (e.g., Galbraith 2002; Hakanen & Jaakkola 2012). At the same time, the existing research does not provide guidance on the conditions that enable or hinder the ability of solution providers to gain the position of central integrator. To enhance our understanding of these dynamics, we thus from the power view pose the following question: Which resource integration approach maximizes strategic control by enabling the solution provider to assume the position of central integrator?

Table 1 summarizes the analytical framework that is utilized to analyze our empirical findings.

Please insert Table 1 here.

3. Methods and data

3.1. Research approach and process

Our research asks why firms choose the internal vs. external resource integration approach as they transition to solution business. Since this aspect of solution business has rarely been studied empirically, we rely on the case study methodology that is widely recognized as suitable for theory-building research in unexplored research areas (Eisenhardt & Graebner 2007). We employ an abductive approach in which the researcher typically enters the field with some preliminary theoretical frameworks, which are then adjusted as directed by empirical findings (Locke 2010; Dubois & Gadde 2002). Such continuous movement between the empirical and the model world is critical to the process of theorizing from case study research (Locke 2010). In this study, the continuous confrontation of theories with the empirical world led to redirecting our analytical framework from solution literature to theories addressing firm boundaries.

In line with Gioia and Pitre (1990), our theory building approach is not guided by the search for a single “truth.” Instead, we seek to use multiple paradigms to develop a comprehensive understanding of a complex, real-life phenomenon. This approach has led to fresh insights since

different lenses capture different facets of organizational phenomena (Gioia & Pitre 1990; Okhuysen & Bonardi 2011). To do so, we adopt as the main analytical frame Santos and Eisenhardt's (2005, 2009) conceptualization of firm boundary decisions comprising four distinct but complementary viewpoints.

Our research draws on two in-depth case studies of global manufacturers that operate in the metal engineering sector, Wärtsilä and Kone. Both firms provide equipment with a serviceable lifecycle and, due to increasing competitive intensity, have transitioned to solution business. As is typical of the abductive approach, the specific research question of this paper was not originally included in the research agenda when collaboration with the case firms began in 2006. Instead, the initial empirical observations resulted in the identification of new issues that were further explored with new data collection (Dubois & Gadde 2002). Therefore, our research was conducted in multiple stages. The research process is illustrated in Figure 2.

Please insert Figure 2 here.

The first round of data collection was conducted in 2006–2010 (Study 1). Initially, the aim was to explore the service transition of Wärtsilä and Kone, leading industrial manufacturers of power engines and elevators. The case selection was purposeful, derived from the goal of learning something based on studied cases rather than aiming at representativeness in terms of population.

We focused on the opportunity to develop an in-depth understanding of a complex phenomenon through direct interaction and cooperation with a limited number of firms for theorizing purposes (Gummesson 2000; Yin 2009; Patton 1989). Kone and Wärtsilä represented leading global players in their industry and provided an opportunity to study the process of transitioning from product- to solution-based business.

Analysis of the first study focused on the solution transformation process of Kone and Wärtsilä, and these results were previously published in Salonen (2011). Beyond the initial research aims, the findings from this first study led to the observation that although the case firms are in many respects very similar, in terms of the utilized resource integration approach, they act as polar opposites. More specifically, both firms are manufacturers of investment goods with considerable service business (40-50% of turnover). This service business ranges from basic product maintenance to more advanced services entailing availability and/or performance guarantees, as well as user oriented services such as training and consulting. Both firms have systematically internalized the required resources as they have built service-based capabilities. Both have also transitioned on the technical application integration dimension by developing the ability to integrate tailored systems requiring access to an enlarged pool of product-based resources. It is here that the firms have adopted completely different approaches in terms of resource integration: Wärtsilä, as a result of its transition, integrated more products into its portfolio, essentially increasing its level of internal integration, whereas Kone has transitioned through collaborating with partners.

To explore this issue further, a second round of data was collected in the case companies in 2013 (Study 2). The aim was to compare Wäertsilä's and Kone's solution business strategies, and to gain insight into why certain strategies were adopted. In terms of approaches to integrating product-based resources required in a solution business transition, Wäertsilä and Kone thus represented polar cases with "maximum variation" (Patton, 1989; Yin, 2009). The cases provided an opportunity to compare and contrast these polar types (Eisenhardt & Graebner 2007), greatly enhancing our understanding of the drivers that lead firms to choose between these approaches to resource integration, and enabling an analysis of the consequences of such decisions. Analyzing the data collected in the second study led to identifying the characteristics of the principal drivers that favor an internal vs. external resource integration approach. Subsequently, we conducted a final, targeted interview round to complete our emerging understanding of these approaches to resource integration.

3.2. Data collection methods and data analysis

The main data collection method in this research was in-depth interviews. Between 2006 and 2013, 34 interviews were conducted with representatives of the case firms. We included informants from multiple hierarchical levels, ranging from manager to division head, and multiple functional backgrounds, such as sales, systems engineering, finance and control, design, and marketing (see Table 2). This allowed us to develop rich insights into the studied phenomenon, since the variety of respondent backgrounds led to complementary viewpoints being adopted in analyzing aspects of key decisions. Using multiple respondents also provided the opportunity to confirm information from several sources, increasing the validity of the results

(Golden 1992). To select the most suitable informants for the topics, we identified new interviewees based on information provided by the interviewed managers. The interviews, lasting mostly between one and two hours, were recorded and transcribed verbatim, and are listed in Table 2. In addition to the recorded interviews, the lead author has a long-standing collaboration with key informants responsible for solution business at both case firms, which has resulted in numerous discussions not reported in the official interview count. Consistent with the abductive approach (Dubois & Gadde 2002), the interview themes evolved during the course of the research process, as the focus shifted from general understanding of the solution transition strategies to more explicitly addressing alternative approaches to resource integration (see Figure 2).

Please insert Table 2 here.

In terms of data analysis, we followed the thematic analysis method whereby data is analyzed and reported according to predetermined themes (Lee 1999). We combined the data analysis with a further review of existing theory to formulate an understanding of the empirical phenomenon. We adopted the distinction between “systems seller,” that is, internal resource integration, and “systems integrator,” that is, external resource integration, as the starting point for our analysis (Davies *et al.* 2007). First, we compared the cases, searching for contrasting characteristics that described the case firms’ approaches to resource integration. Next, we analyzed the cases through the four boundary conceptions: identity, competence, efficiency, and power. We applied

one boundary conception at a time to the analysis of the cases, focusing on questions that were deemed important in the solution context. Iterating back and forth between data and the literature identified the drivers that guide firms to choose between the internal and external resource integration approaches. The four boundary conceptions provided the necessary theoretical grounding for the drivers, and we generated a richer, more holistic understanding than would have been possible with a single theoretical approach (Okhuysen & Bondardi 2011; Santos & Eisenhardt 2009).

The validity of our findings is increased through triangulation, a clear chain of evidence, and strong links to established theory. In terms of triangulation, the occurrence of subjective biases was reduced by using multiple key informants from various levels and functions of the studied companies. Also, the use of multiple perspectives in the interpretation of our data enabled theory triangulation (Jick 1979). To support our interpretations, we established a clear chain of evidence from the empirical data, illustrated by a rich set of quotations (Yin 2009). Moreover, we employed theory (the four lenses) as the overarching frame for the study, and also closely examined the emerging findings with existing literature (enfolding) (Eisenhardt 1989). To facilitate reliability, we present detailed information on the research process and data collection (Figure 2 and Table 2). Moreover, the fact that case companies have not been anonymized contributes to the transparency of our statements regarding them, and enables a more accurate contextual portrayal of the studied cases (Jick 1979, p. 603).

4. Findings

We first present the case firms and explain how they have transitioned to solution business using opposing approaches to integrating product-based resources. We then compare these approaches in more detail by analyzing them through the previously identified boundary conceptions.

4.1. Internal integration: case Wärtsilä

Wärtsilä, headquartered in Finland, provides power solutions for marine and energy markets worldwide. In 2012, the firm had net sales of €4.7 billion and comprised three divisions: ship power (28% of net sales), power plants (32%), and service (40%). The findings reported here concern the firm's ship power division and related service operations.

The ship power division's key product group has traditionally been its medium-speed diesel engines; the firm is a global market leader. Since the late 1990s, Wärtsilä has sought to enhance its technology-based differentiation by redefining itself as a provider of power solutions for marine and energy markets. Consequently, the firm offers integrated product systems that improve energy efficiency on board ships, and provides various life cycle service concepts. These range from basic product maintenance to operating the product systems on the customer's behalf, with accompanying performance guarantees, or training customers to help them improve the performance of the installed systems.

Wärtsilä has consistently internalized the service-based resources required to offer life cycle services. Additionally, to develop capabilities to offer tailored product systems, the firm has

acquired various product businesses outside its core in diesel engines. The first major acquisition was in 2002, when Wärtsilä bought John Crane-Lips, a global supplier of marine propulsion systems based in the UK. Subsequently, Wärtsilä acquired a number of firms in the fields of automation, naval architecture, and maritime engineering. The most recent and largest acquisition was in 2012 when the firm acquired Hamworthy, a UK-based manufacturer that specializes in environmental solutions and gas systems for the marine, oil, and gas sectors. Wärtsilä currently holds the most comprehensive offering portfolio in the industry, which includes ship design, engines, generating sets, reduction gears, propulsion equipment, automation and power distribution systems, sealing solutions, emission control, gas containment and handling systems, and control systems. Through seamless integration of these subsystems and offering various life cycle services, the firm strives to enhance energy efficiency on board ships.

4.2. External integration: case Kone

Kone is a Finland-based global provider of elevators, escalators, automatic doors, and related services. In 2012, the company's annual net sales amounted to €6.3 billion. Service and new equipment sales accounted for roughly equal amounts of the company's turnover. Kone is among the top four elevator manufacturers in the industry. Since 2006, the company has worked to redefine itself as a provider of "people flow" solutions, referring to tailored product systems that integrate various subsystems in buildings that link to its existing offering in elevators, escalators, and doors, to ensure a smoother and more comfortable movement of people in buildings. The

company also offers full life cycle services to the installed base ranging from basic product maintenance to availability guarantees.

Similarly to Wärtsilä, Kone has consistently internalized service-based resources. However, in contrast to Wärtsilä, Kone has not grown its product scope in the course of transitioning to offering tailored product systems. Instead, Kone's strategy is to "connect and develop," that is, the company seeks out appropriate partners to co-develop solutions which are then sold under Kone's brand. These external partners operate in access control, destination, information, and monitoring. By seamlessly integrating its existing products with subsystems provided by external partners, and offering various life cycle service concepts, Kone is able to provide solutions that improve people flow in buildings.

4.3. Comparison of resource integration approaches

In this section, we report findings concerning resource integration approaches utilized by the case firms as they have transitioned to solution-based business. We emphasize product-based resources that facilitate the provision of tailored systems. These resource integration approaches are investigated through the boundary conceptions identity, competence, efficiency, and power.

4.3.1. Identity view: maintaining coherence between organizational identity and solution business activities

Analysis of the data from the identity viewpoint revealed that both case firms have strong and established core identities as manufacturers of products with related service activities, and we observed no desire to diminish the role of product business. In fact, an important part of a transition to solution business in the form of tailored product systems has been to strengthen the product-based businesses of the firms, as illustrated by a respondent at Kone:

This is very strongly a product business and services built on top of that...contrary to what many people think the proportion of revenue coming from products has actually grown recently. (Senior Vice President, Kone).

At the same time, there were significant differences in the degree to which the case firms were willing to enact changes within their core identity, with implications for the choice of resource integration approach. Wärtsilä decided to expand beyond its base in engine manufacturing, while Kone made a strategic decision to remain an elevator manufacturer.

To explain this rationale in more detail, when Wärtsilä began its solution transition, the firm had a roughly 50% global market share in medium-speed main engines, making it the undisputed market leader. Wärtsilä therefore saw that further growth in this product segment would be very difficult. Thus, as part of the transition, the firm felt that expanding beyond the core product through a series of horizontal acquisitions into industries that are logically related to the main business was strategically sensible:

If you go back as far as 1997, we were a small company dealing with some parts of the ship. We did engines basically....In 2002, we went into propulsion through our biggest acquisition, and that was, you could say, the start of a journey where we acquired technology companies to consolidate the industry....We went into strategic growth by acquiring products.... we were huge, the Walmart of our industry. (Vice President, Wärtsilä)

Kone's approach to a solution business strategy was very different. In contrast to Wärtsilä, Kone felt strongly that transitioning to solution business should not fundamentally change what the company is: an elevator manufacturer. This perspective is perhaps partly explained by the firm's history. Kone has consistently grown and internationalized by buying up smaller companies in its core business domain, thereby gradually becoming one of the top four manufacturers in its industry, with further market consolidation likely. Thus, expanding beyond the core would not make strategic sense:

Our core business is elevators....we buy more elevator companies because that results in the beauty of being big...we are the integration point that brings together the whole system. (Assistant Vice President, Kone)

Furthermore, many of the horizontal industries that complement Kone's core offering in the solution dimension are highly fragmented. Thus, Kone would find it difficult to develop stand-alone product businesses:

Even if we owned one of them (solution partner), we would not be able to get more than 5% market share...If you want ownership, you really need to have 50% market share, so that it really makes sense...Why not instead develop the ability to be the best in integration. (Executive Vice President, Kone)

In sum, in the studied cases the externalization vs. internalization decision was influenced by the firm's willingness to adapt its identity: Wärtsilä sought growth by expanding from an engine manufacturer to an all-inclusive power supplier, while Kone wanted to preserve its existing identity as an elevator manufacturer.

4.3.2. Competence view: maximizing the value of resources needed for solution provision

In terms of the competence view, Wärtsilä and Kone seemed to have a very different logic towards maximizing the value of the resources required to provide tailored product systems, and consequently adopted different resource integration approaches. In Wärtsilä's case, the firm purposefully searched for resources that were closely related to its existing portfolio, for example in automation, naval architecture, and maritime engineering, and then sought to internalize these resources to derive superior value from them:

Initially, our goal was to do more [with] these technical systems, and we tried all the time to see what would be the next product that connects to our existing system...and it can in fact yield a number of interesting synergies. Through a wide product

portfolio, you also develop a wide knowledge basis on a deep level....That's when we can make a more sound total solution. (Vice President, Wärtsilä)

Ownership of product-based solution components gave Wärtsilä an in-depth understanding of the inner workings of different subsystems that make up the solution, enabling it to begin optimizing customer solutions that improve energy management on board ships. Internal control also formed the basis for offering performance guarantees regarding complex solutions:

We can tie up the whole link, the whole system, and by that, we can guarantee on the whole package certain reliability in percentage 99.8% or something...we design it, and we know when we should do certain things from experience... we measure, we monitor...The competition can't do that. They don't know what to look at...they have not designed the product... when you have a missing link—it's difficult to guarantee. (Director, Wärtsilä)

Kone, on the other hand, sought to integrate resources that bring together fundamentally different types of technology and fields of knowledge, many of which are not part of Kone's core expertise. Therefore, it sought to access them through external resource integration mechanisms:

These are so new areas for us that even if we could somehow develop the technological solution in-house, it just wouldn't fly without capabilities from the other industry. (Manager, Kone)

The firm felt that if the resources remain independently owned in specialized companies, that would lead to enhanced innovation capabilities and cross-learning opportunities resulting in better overall solutions: one firm would not be able to stay at the forefront of development in a number of highly dispersed knowledge fields. This dynamic is explained with a reference to access control solution elements provided by an external partner:

When we are integrating these solutions together, an elevator company can continue innovation in the elevator dimension. The access control company can continue innovation in the access control dimension, and the integration part is maintained together. So that the innovation does not stop...That is a learning experience for both companies. (Senior Vice President, Kone)

Therefore, it seems that for Kone and Wärtsilä the externalization vs. internalization decision was influenced by the type of resources being integrated as well as the underlying value proposition of the solution offering: Wärtsilä chose to internalize the resources underlying the solution because they are closely related technology wise, and having full control over the resources enabled Wärtsilä to offer performance guarantees. Kone, in turn, sought to act as the integration axis for a solution offering that draws on heterogeneous resources which must be continuously developed by specialized companies to maintain their value in the long term.

4.3.3. Efficiency view: minimizing the cost of managing interdependencies between solution elements

From the efficiency viewpoint, the studied cases seemed to differ significantly in terms of the degree of coordination and information exchange needed to manage the interdependence between the integrated solution components, leading to different choices of resource integration approach.

The solutions provided by Wärtsilä are typically complex and tailor made for the particular specifications of a ship and its user. As specified by the informants, all the elements must function separately and in interaction with the other solution elements exactly according to specifications. Otherwise, the solution does not perform optimally, which has severe implications, for instance, in the form of the total life cycle costs for the ship owner. Ensuring optimal solution performance thus requires high levels of coordination and information exchange to manage interdependence between the solution components. If many legally independent parties are involved in the exchange, the actors typically try to mitigate risk by delivering more than is specified by the customer to avoid culpability should the overall solution fall short of specifications. However, this approach leads to expensive solutions that may not ultimately even be optimal for the designed purpose. Thus, Wärtsilä believes that internal coordination mechanisms are more efficient:

The more detailed information you have within the same boundaries of responsibility... you don't need to have these contracting safety margins. Neither in the commercial transaction. Neither in the engineering process. Then you can actually end up with a more efficient and hopefully cheaper system. (Vice President, Wärtsilä)

In addition, since the different solution elements are interdependent, system-level optimization sometimes requires sub-optimization at the individual product level to improve the performance of the total solution. Due to incentive problems, this kind of optimization is difficult unless hierarchical coordination mechanisms can be used.

What might be good for one product may not be good for the other....If we make a new four stroke-engine or power upgrade, we need to do something to the propulsion system, or the other way around. (Vice President, Wärtsilä)

In the case of Kone, the nature of the underlying solution architecture is characterized by less interdependence between the elements. This means there is a more limited need for information and knowledge flows to manage interdependence between the integrated solution components. However, from an efficiency perspective, a challenge in integrating systems in this particular case is the lack of standardized interfaces in the industry. Thus, Kone needs to develop interfaces in collaboration with selected partners. At the same time, the interviewees pointed out that once the interfaces have been set, the solution can be efficiently replicated using mass customization principles without in-depth coordination between partners:

There are very little interfaces in this building industry. I meant standardized interfaces so you cannot really plug and play.... You must agree exactly what are the interfaces. And typically you need to do a lot of R&D implementation on both sides to make the integration happen... Once you have done it, you can multiply it

easily so that is the thing. So you need to build the integration part and then you can multiply that. (Senior Vice President, Kone)

Since joint R&D projects to develop standard interfaces lock Kone and its partners in through asset specific investments, detailed negotiations and a thorough screening process are needed to identify the right partners, which requires time and resources:

Legal issues, for instance, take a lot of time...Just to find the right partner that is truly interested in this kind of partnership. It's surprisingly slow...Legal issues, for instance, take a lot of time...After the technical development is done, we still need to implement it into the delivery process...it's a big challenge. (Manager, Kone)

These findings indicate that the externalization vs. internalization decision is influenced by the degree of interdependence between the integrated resources. Wärtsilä chose internal resource integration because of high interdependence between the solution elements, while Kone was able to utilize external resource integration because the solution elements are characterized by less interdependence and standardized interfaces can be developed via collaboration with partners.

4.3.4. Power view: Maximizing strategic control to assume the position of central integrator

In terms of the power view, occupying a position as the central integrator of resources that acts as an interface for the customer was a key concern for both firms. However, the firms differed in

their ability to introduce key dependencies into relationships with external providers of complimentary solution components, affecting their choice of resource integration approach.

In Wärtsilä's case, the firm felt that it is the logical integration point for a larger solution, since the engine is by far the most expensive piece of equipment in a ship's engine room and is one of the first purchased when a new ship is being built:

The company that is a global leader in manufacturing the most critical component in the engine room...should be well positioned to be the focal point in the systems delivery. (Director 2, Wärtsilä)

At the same time, Wärtsilä felt that persuading potential partners to collaborate in providing resources to a solution integrated by Wärtsilä would have been difficult. The market is more consolidated; potential partners were large actors and had the same contact point with the customer as Wärtsilä. Thus, they would not significantly benefit from Wärtsilä acting as a channel to the market. Instead, potential partners saw solutions integrated by Wärtsilä as a competitive threat to their own initiatives:

The providers of these different elements already had a contact point for the customer....everyone wants to move downstream in the value chain. The only way for us to move forward in this environment...was to take over these horizontal firms and technology areas. (Vice President, Wärtsilä)

The situation was very different in Kone's case. Many of the horizontal industries that Kone draws on to deliver solutions are more fragmented. Often, firms in those industries have a different contact point with the customer organization and, compared with elevators, decisions on the products concerned are made later in the customer's purchasing process. Thus, Kone provides an additional and logical channel to market for these partners:

In most cases, we offer one customer channel. So we can sell their products. We can provide them with more volumes. Then of course we may help them to access new markets they haven't been before. And the market can be not only this kind of construction market segment, but it can also be a new regional area... We are early on in the construction site selling elevators. That's an excellent time to also think about the people flow dimension. (Senior Vice President, Kone)

In sum, for Wärtsilä and Kone, the externalization vs. internalization decision was influenced by whether the external resource providers saw them as an attractive channel to market. Kone was able to find partners willing to collaborate in a Kone integrated solution, while this was not the case for Wärtsilä.

We summarize the empirical findings in Table 3.

Please insert Table 3 here

5. Discussion

Our findings demonstrate that external and internal resource integration represent viable but distinct approaches for manufacturers to gain access to the required product-based resources as they transition to solution business. Furthermore, through the application of the four boundary conceptions, we revealed a rich set of drivers for the firms' internalization vs. externalization decisions (Table 3). Next, we formulate a set of research propositions that explicate these resource integration approaches and reflect our findings against the previous research.

Applying the *identity view*, we found that the externalization vs. internalization decision is linked to the firm's willingness to change its core identity, closely tied with its core product. In the studied cases, Wärtsilä wanted to expand beyond engine manufacturing, where it already had a dominant position in a highly consolidated market. Through internalizing the resources required to provide tailored systems, it would turn itself from being an engine manufacturer into a "Walmart" of its industry. Kone, on the other hand, felt that further growth potential exists within the current core product business, and the horizontal product industries were deemed unattractive as stand-alone businesses. It thus made a strategic decision to remain an elevator manufacturer.

The findings from our cases resonate with the identity view, as formulated by Santos and Eisenhardt (2005), that sees organizations executing collective sensemaking concerning "who we

are” (Weick 1995). This sensemaking leads to the emergence of cognitive frames (Prahalad & Bettis 1986; Bettis & Prahalad 1995) that influence choices over activities to incorporate (Kogut 2000). In the studied cases, cognitive framing consistent with the identity of a product manufacturer fostered an understanding of solution business as a way to ensure continued growth and competitiveness in the underlying product business. The internal and external resource integration approaches were then distinct pathways to reach the same goal, reflecting an analysis by the case firms of the relevant underlying product market conditions. We thus propose the following:

Proposition 1a: Internal resource integration is chosen when the manufacturer seeks to grow beyond the current core product-based business.

Proposition 1b: External resource integration is chosen when the manufacturer seeks to strengthen its current core product-based business.

The role of organizational identity, as such, has rarely been explicitly considered in the extant solution business research (see e.g. Windahl & Lakemond 2010 for an exception), and we add to existing understanding in the field by introducing organizational identity as a boundary setting mechanism that shapes manufacturers’ solution business initiatives. Our findings suggest that the product-based identity of a manufacturer drives resource integration decisions in solution business, prompting the choice of integration approach that best ensures continued growth and competitiveness in the underlying product business. In doing so, manufacturers may even be willing to internalize product-based resources that fall outside of the established core. These findings complement previous research that has mainly considered the service orientation of the

manufacturing firm as a driver for the internalization of service-based resources, overlooking the role of other resources in augmenting the existing product offering (Kowalkowski *et al.* 2011; Paiola *et al.* 2012). Our findings challenge the implicit assumption in much of the existing solution business research that manufacturers realize a shift in identity from product manufacturer to service provider with a subsequent shift of focus from product- to service-based resources, thereby lending support to observations by Kowalkowski *et al.* (2015).

Analyzing our data with the *competence view* revealed that the nature of the resources to be integrated affects firms' choice between internal vs. external research integration approaches. In the case of Wärtsilä, the proximity of the integrated resources to the firm's existing knowledge base was an important consideration whereby it was able to develop an in-depth system level understanding of closely related solution components. This understanding formed the basis for providing tailor-made systems that optimize energy management on board ships. In the case of Kone, externalization was chosen since the integrated resources were more distant from the existing knowledge base. Thus, access to specialized suppliers was considered more effective in fostering the long-term development of resources that underlie the solution, deemed important to ensure a sufficiently high level of quality in the individual solution components. These findings are consistent with the competence view, particularly with the underlying resource based view, in suggesting that firms internalize activities that are proximate to the existing resource base in terms of underlying technological knowledge, and outsource those that are not (see e.g. Argyres 1996). We thus propose the following:

Proposition 2a: Internal resource integration is chosen when the fields of knowledge to be integrated are closely related.

Proposition 2b: External resource integration is chosen when the fields of knowledge to be integrated are distant.

Our findings contribute to the existing understanding in the field by helping to clarify the mechanisms through which solution providers derive value from integrated resources. As noted by prior research, external resource integration mechanisms are increasingly regarded as superior, given their potential to flexibly draw upon a wider range of resources (e.g., Davies *et al.* 2007; Windahl & Lakemond 2006) that are potentially also of higher quality benefiting from the advantages of specialization (Prencipe 1997). At the same time, excessive reliance on external resources has been found to limit the provider's ability to derive value from them, as it lacks the ability to drive changes to existing product-system architectures to support overall system performance (Davies *et al.* 2007). Our findings deepen understanding on this issue, by demonstrating that solution providers are in fact integrating previously fragmented fields of knowledge, which, when brought together seamlessly, result in value creating responses to customer problems. The degree to which this newly integrated knowledge is proximate to the existing base influences the provider's choice of integration approach.

The *efficiency view* prompted the finding that solution providers' internalization vs. externalization decision is driven by the nature of interdependence between the product-based components to be integrated. The systems provided by Wärtsilä require a high degree of

coordination and information exchange to manage interdependence between the product-based components, which is more efficiently managed within the hierarchy of the firm. The solutions provided by Kone are characterized by a fairly low degree of interdependence between the solution components. Thus, product-based components can be developed independently without the need for coordination and information exchange, beyond one-off R&D projects with partners to develop functional interfaces that enable efficient forms of external resource integration.

These findings reflect the basic concepts of modularity, a systems concept that assesses the extent to which components can be separated and recombined (Ulrich 1995; Schilling & Steensma 2001). Modular product conditions enable loose coupling between components and have been shown to favor loosely coupled organizational forms. At the same time, some product systems resist modularity due to the presence of synergistic specificity, whereby optimizing components for a particular configuration results in better functionality than combinations of more independent components favoring internal resource integration mechanisms (Schilling & Steensma 2001). We thus propose the following:

Proposition 3a: Internal resource integration is chosen when the integrated system is integral and resists modularity due to synergistic specificity.

Proposition 3b: External resource integration is chosen when the integrated system is modular or can be modularized.

These findings contribute to existing understanding in the field by explicating how solution providers manage interdependence through different resource integration mechanisms. Internal integration is thought to facilitate the management of interfacing efficiency. At the same time, increased reliance on modularity has enabled firms to specialize in systems integration, contributing to a growing preference for external forms of resource integration (Davies *et al.* 2007). However, given that machine manufacturing industries are typically not characterized by the same degree of modularity and open standards as for instance ICT-based industries, where much of the research advocating a modular approach originates from (Vervest *et al.* 2004), there appear to be limits on how external forms of resource integration can be applied.

Based on our results, we argue that the ability of an industrial manufacturer to effectively utilize external resource integration approaches depends on its ability to manage the network of actors involved in delivering complex solutions, so that common interfaces can be developed. This complicates the use of network-based value creation, an aspect that is not addressed through the existing research in the solution business field. More specifically, developing joint interfaces requires that the solution provider identifies partners willing to make relationship-specific investments, effectively locking the partners into the chosen network configuration. Thus, the solution provider sacrifices its ability to freely select and tailor multivendor systems based on unique customer needs—the supposed advantage of external resource integration approaches (Davies *et al.* 2007). At the same time, and as demonstrated by case Kone, this sacrifice is sometimes necessary to gain the other associated benefits of this mode of solution provision.

In applying the *power view*, we found that the manufacturer's ability to portray itself as an attractive channel to market drives the choice of resource integration approach. In Wärtsilä's case, persuading external resource owners to consolidate behind a Wärtsilä integrated solution presented a difficult task, since the external resource owners are large and powerful, compete for the same customer contact point, and/or are attempting similar service transitions, leading Wärtsilä to acquire the necessary resources. However, for Kone, external integration was a viable option, as the external resource owners are relatively small, and benefit from an additional channel to market and learning opportunities.

These findings resonate with the power conception whereby organizations are seen to be concerned with wielding influence over external forces, so as enhance their ability to pursue important organizational goals (Porter 1980). Organizations can influence others through their ability to introduce key dependencies into exchange relationships (Pfeffer & Salancik 1978), or when lacking that ability, revert to ownership mechanisms to preserve sufficient autonomy (Santos & Eisenhardt 2005). We thus propose the following:

Proposition 4a: Internal resource integration is chosen when the manufacturer lacks the ability to portray itself as an attractive channel to market

Proposition 4b: External resource integration is chosen when the manufacturer is able to portray itself as an attractive channel to market.

These findings add to the existing research in the field, which recognizes the importance of solution providers gaining a central network position (e.g., Galbraith 2002; Davies *et al.* 2006; Jaakkola & Hakanen 2013), but is silent on the mechanisms that enable it. We identify key dependencies that enable solution providers to exert influence over external actors, but also note that these dependencies are often not unidirectional. For instance, in cases of external resource integration where the provider may incur substantial transaction costs in establishing functional interfaces, it becomes to a certain extent dependent on its partners through relationship-specific investments necessitating the management of network relationships.

Finally, while we focused on product-based resources required in solution business, our findings generated emergent insights concerning linkages between the service-led growth trajectory (Kowalkowski *et al.* 2015) being pursued by the focal firm, and their choice of resource integration approach. In our study, it became evident that Wärtsilä is pursuing the service growth trajectory of a *performance provider* (Hypko *et al.* 2010; Kowalkowski *et al.* 2015). Wärtsilä thus seeks to provide solutions that optimize fuel efficiency onboard ships via the provision of tailored systems through the installation's life cycle with accompanying performance guarantees. Here, internal control of key product-based components facilitates the required understanding on and control over the product system to mitigate the risks inherent in providing performance guarantees to customers, thus enabling the intended service growth trajectory.

Kone, on the other hand, is following the service-growth trajectory of an *industrializer* (Kowalkowski *et al.* 2015). It aims to provide cost effective, productized solutions (Storbacka &

Pennanen 2014) that seamlessly integrate various building systems, so as to support enhanced people flow. The external resource integration approach enables access to high quality solution components that Kone then efficiently integrates, thereby supporting the chosen service growth trajectory.

While the prior studies examining resource integration approaches in solution business (Kowalkowski *et al.* 2011; Paiola *et al.* 2012) do not explicitly consider the link between the chosen service-growth trajectory and resource integration approach, their findings are consistent with this link. For instance, Kowalkowski *et al.* (2011) note that internalization of service-based resources facilitates a deep knowledge of the product's role in the customer's process, which arguably, when combined with the internalization of product-based resources, helps build a sound technological basis on which to create advanced performance-based offerings. Furthermore, Paiola *et al.* (2012) note that the external resource integration approach is suited to situations where the solution components are commoditized and the provider seeks to effectively exploit them through collaborating with external partners, thereby creating conditions that are favorable to pursuing the service-growth trajectory of an industrializer.

6. Conclusions

6.1. Main contribution

To our knowledge, this paper constitutes one of the first attempts to conduct a systematic and theoretically inclusive analysis of why manufacturers prefer the internal versus external resource

integration approach as they transition to solution-based business. We have analyzed the drivers behind this choice by applying four boundary conceptions initially introduced by Santos and Eisenhardt (2005, 2009). Our findings demonstrate that internal vs. external resource integration approaches represent distinct paths along which manufacturers can grow their product-based business; derive value from the integrated resources; control the costs of managing interdependence between the integrated solution elements; and position themselves as the central integrator of complex solutions.

The main contribution of this study is to bring forth new insights into alternative approaches to organizing solution provision and the identification of the drivers behind these choices (Davies *et al.* 2007; Gebauer *et al.* 2013). Previous contributions on these issues are very few and have predominantly focused on examining manufacturers' organization of service provision, tending to conceptualize service-led growth strategies, including transition to solution business, as shifts on the product-service continuum (see also Kowalkowski *et al.* 2015). This has resulted, for instance, in identifying drivers associated with the degree of service orientation of the firm, emphasizing the special characteristics of service provision, such as proximity to customers (Kowalkowski *et al.* 2011; Paiola *et al.* 2013), while leaving product-based resources and associated drivers aside. These prior studies have been instrumental in highlighting the need for a more explicit understanding of internal vs. external resource integration approaches in solution business. However, as does much of the solution business research (Nordin & Kowalkowski 2010), these earlier contributions lack sufficient grounding in fundamental theories of the organization and tend towards developing rich descriptions. This makes it difficult to compare

findings across studies to develop a precise understanding of the resource integration approaches in solution business.

This paper has sought to advance understanding in the field through a systematic and theoretically inclusive analysis of the alternative approaches to organizing solution provision, and the drivers behind these choices, which has led us to conclude that creating competitive advantage and enhanced customer value through solutions is a question of resource expansion rather than conversion from product- to service-based resources.

6.2. Limitations

As is typical to case study research, this study did not look to generate findings that are statistically generalizable to a population. Rather, we studied the research phenomenon in context and sought analytical generalization, that is, generalizing our findings to theoretical propositions (Yin 2009). This was achieved by explicitly linking our findings to prior theories (Miles & Huberman 1994). To facilitate the transferability of the findings, we have provided background data on the studied firms to establish context, clearly explicating the setting where these findings were generated to allow readers to make their own comparison (cf. Hirschman 1986). Finally, the case companies are polar opposites with maximum variation in terms of resource integration approaches concerning major product-based solution components. While the studied cases help us understand the ideal conditions that favor internal vs. external resource integration approaches, the lack of hybrid cases that fall in between the extremes is noted as a limitation.

6.3. Suggestions for further research

We consider the notion that the product-based identity and resources of manufacturers continue to play a central role in solution business to be a key issue meriting further exploration. It seems that manufacturing organizations with a strong product-based identity, while recognizing the importance of transitioning to solution-based business, resist transformations that fully challenge the existing basis. Given that there is a link between an organization's self-reflected identity and its capabilities (Santos & Eisenhardt 2005), such resistance may be an appropriate managerial response. We thus suggest that future studies pay more attention to the concept of organizational identity, particularly in challenging the assumed linearity of servitization logic as implying a shift in identity from a product manufacturer to a service provider.

We also recommend that future research adopts a broader view of the resources and capabilities required for solution transition. Our study highlighted that aside from service skills and components, firms need access to a broad range of product-based resources in developing a solution offering, such as technologies, product components, and IT systems, but these have attracted relatively little attention. Researchers should also examine how solution firms could, in terms of innovation and development, optimize their portfolio of internalized resources and those provided by external partners. Finally, we suggest more research be conducted on how solution providers not only gain but also maintain their central network position in the long term. This becomes a particularly important aspect of solution business when drawing upon the external resource integration approach, since the solution provider incurs transaction costs in establishing

a partnership to ensure the resources provided by the partner are integrated seamlessly into the solution offering.

6.4. Managerial implications

Through our study of polar cases, we have explored the ideal conditions that favor internal vs. external resource integration approaches. In practice, the drivers may conflict: for instance, when the fields of knowledge to be integrated are distant, but the solution is integral in nature. Here, it becomes a key managerial concern to determine which drivers are most critical to choosing an appropriate strategy, and if misaligned, how the drivers can be managed satisfactorily.

It is also critical to understand the contextual factors favorable to particular service growth trajectories, and the underlying resource integration approaches. Based on our findings, we argue that transforming into a performance provider while relying on an internal integration approach is most appropriate in instances where the provided solution is performance critical for the customer, highly integral in nature, and draws on closely related fields of knowledge. Becoming an industrializer that relies on an external resource integration approach is most appropriate in cases where the provided solution is modular and draws on relatively distant fields of knowledge. Here, from a value creation perspective, it is more important to efficiently integrate high quality components provided by specialized partners, than to draw upon an internal resource integration approach in an attempt to optimize the system for the customer's process.

Finally, the internalization of product-based resources implies a significant organizational commitment to entirely new product businesses – a decision that is potentially disruptive and costly to reverse. That decision should not be taken without in-depth consideration of the associated advantages, again highlighting the importance of understanding the various interdependent drivers that guide the choice of the optimal resource integration approach in solution business.

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Table 1: Analytical framework of the study

Boundary conception	Organizational issue addressed	Key determinant in firm boundary decisions	Theoretical basis	Boundary decisions in solution business
Identity	Coherence	Maintaining coherence between the identity of the organization and its activities	Managerial cognition (Weick, 1995) Organizational identity (Albert & Whetten, 1985; Dutton & Dukerich, 1991)	Which resource integration approach maintains coherence between the identity of the organization and its solution business activities?
Competence	Growth	Maximizing the value of the firm's resource portfolio	Contingency theory (Chandler, 1962) Resource based view (Wernerfelt, 1984; Barney, 1991)	Which resource integration approach maximizes the value of the resources needed for solution provision?
Efficiency	Cost	Minimizing the cost of governing activities	Transaction cost economics (Williamson, 1991) Agency theory (Williamson, 1985; Holmstrom, 1999) Knowledge-based view (Conner & Prahalad, 1996)	Which resource integration approach minimizes governance costs related to managing interdependence between the solution elements?
Power	Autonomy	Maximizing strategic control over crucial external forces	Resource dependence (Thompson, 1967; Pfeffer & Salancik, 1978) Industrial organization (Porter, 1980)	Which resource integration approach maximizes strategic control to enable the solution provider to assume the position of central integrator?

Table 2: List of interviews

Study 1 (2006-2010)		
<i>Company</i>	<i>Position of informant</i>	<i>Duration (min)</i>
Wärtsilä	Group Vice President	158
Wärtsilä	Sales Director	101
Wärtsilä	Vice President, Offshore	105
Wärtsilä	Vice President, Finance and Control	91
Wärtsilä	General Manager, Supply Management	86
Wärtsilä	Vice President, Propulsion Business	91
Wärtsilä	Sales Director, China	38
Wärtsilä	General Manager, China	113
Wärtsilä	Senior Technical Manager	96
Wärtsilä	Sales Manager	86
Wärtsilä	Vice President, Offshore	61
Wärtsilä	Business Development Manager	60
Kone	Vice President, Design	109
Kone	Vice President, Sales and Product Marketing	91
Kone	Managing Director, R&D	107
Kone	Vice President, Global Customer Management	38
Kone	Executive Vice President, Elevators	131
Kone	Senior Vice President, Technology and R&D	155
Kone	Senior Vice President, Marketing & Quality	42
Kone	Assistant Vice President, Portfolio Management & Business Analysis	30
Kone	Assistant Vice President, Market Strategy and Development	90
Kone	Director, Research and Development	105
Kone	Managing Director, China	51
Kone	Vice President, China	49
Kone	Assistant Vice President, Elevators	52
Kone	Assistant Vice President, Elevators	52
Kone	Executive Vice President, Major Projects	21
Study 2 (2013)		
<i>Phase 1</i>		
Group interview	Vice President, Offshore, Wärtsilä Director, Business Control, Wärtsilä Senior Vice President, Integrated solutions, Kone	90
Group interview	General Manager, Service Agreements, Wärtsilä Director, Concept development and innovation, Wärtsilä	120
Wärtsilä	Vice President, Offshore	60
Kone	Senior Vice President, Integrated Solutions	60
<i>Phase 2</i>		
Wärtsilä	Vice President, Offshore	57
Kone	Senior Vice President, Integrated Solutions	84
Kone	Platform Portfolio Manager	74

Table 3: Summary of the empirical findings

Key question driving boundary decision	Wärtsilä: Internal resource integration	Kone: External resource integration
Identity: maintaining coherence between the identity of the organization and its solution business activities	<ul style="list-style-type: none"> • Established identity: manufacturer of products (engines) and related services • Solution business initiatives enhance growth and competitiveness of the product business • Difficult to seek growth through current core product business due to dominant position in a highly consolidated market • Decision to change from being an engine manufacturer to the “Walmart” of its industry via internalizing resources required to provide solutions 	<ul style="list-style-type: none"> • Established identity: manufacturer of products (elevators) and related services • Solution business initiatives enhance growth and competitiveness of the product business • Further growth potential exists within current core product business; horizontal product industries are fragmented and firms therein not attractive as stand-alone businesses • Decision to remain the elevator manufacturer that seeks access to externally provided solution components
Competence: maximizing the value of the resources required for solution provision	<ul style="list-style-type: none"> • Solution brings together closely related fields of knowledge • Internalizing resources enables Wärtsilä to develop a superior knowledge base for the overall system. This knowledge can be applied to develop solutions that perform better in the customer’s process 	<ul style="list-style-type: none"> • Solution brings together disparate fields of knowledge • Relying on external resource integration enables Kone to focus on developing its own specialized resources, while acting as an efficient integrator of high quality resources provided by partners
Efficiency: minimizing governance costs related to managing interdependence between the solution elements	<ul style="list-style-type: none"> • Solution characterized by a high degree of interdependence between solution components; highly customized to individual customer needs • More efficient to internally manage the relatively high degree of coordination and information exchange required to provide solutions 	<ul style="list-style-type: none"> • Solution characterized by a low degree of interdependence between solution components; customization possible through configuration of basic solution elements • Once interfaces have been developed in collaboration with partners, external resource integration mechanisms become efficient since a relatively low degree of coordination and information exchange is required to provide solutions
Power: maximizing strategic control to enable the solution provider to assume the position of central integrator	<ul style="list-style-type: none"> • Wärtsilä wants to control the customer interface, but is not able to convince external resource providers to collaborate: External resource providers are large, significant actors attempting similar transitions; share same customer contact points 	<ul style="list-style-type: none"> • Kone wants to control the customer interface, and is able to convince external resource providers to collaborate: external providers are smaller actors that benefit from an additional channel to market; elevators are purchased earlier than other solution components in customer’s development process

Figure 1: Framing of the study

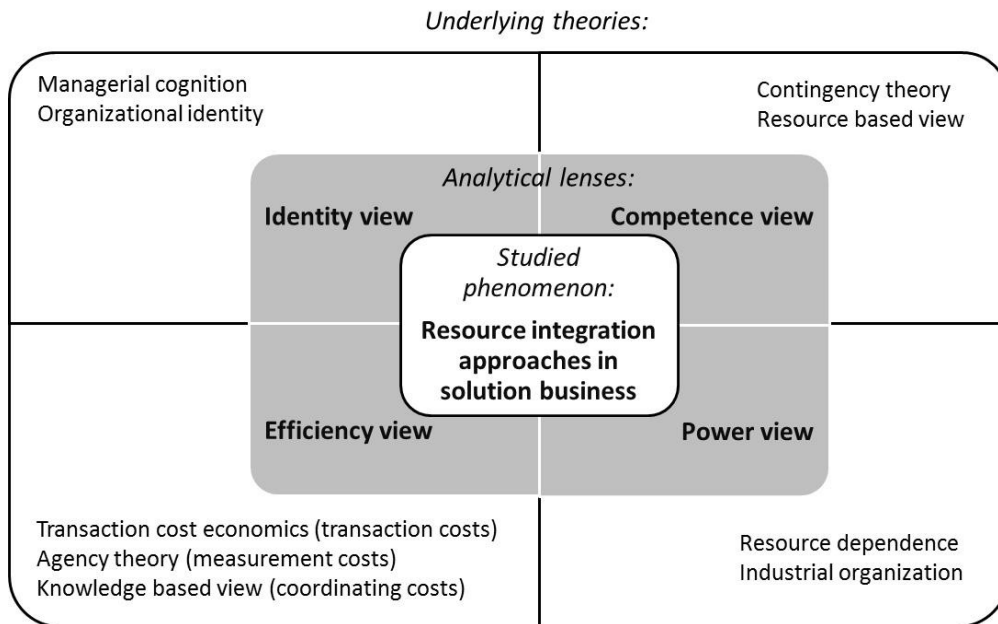


Figure 2: The research process

