

Organizing for solutions: systems seller vs systems integrator

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Accepted for publication May 2006

INDUSTRIAL MARKETING MANAGEMENT

Special Issue: 'Project Marketing and the Marketing of Solutions' forthcoming 2007

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Abstract

This paper aims to examine how firms are organizing to provide integrated solutions: a business model for the supply of capital goods based on the provision of products and services as integrated solutions to an individual customer's needs. The industrial marketing literature suggests that the origins of this business model can be traced back to early 1960s when firms adopted strategies and organizations for 'systems selling'. The marketing literature helps us to identify two contrasting types of organizations: (1) the vertically-integrated systems seller that produces all the product and service components in a system; and (2) the systems integrator that coordinates integration of components supplied by external firms. The paper uses these two ideal types to analyse the strategies and organisations of five case study firms that have recently attempted to move into the provision of integrated solutions. It argues that there is no evidence to support the continuing dominance of the systems seller or a simple transition from systems selling to systems integration. A more complex pattern of organizational forms is emerging, combining elements of both systems selling (i.e. vertical integration into services) and systems integration.

Key words:

Organization, integrated solutions, systems seller, systems integrator

1. Introduction

The importance of providing solutions rather than selling products has been seen by some as heralding the emergence of new service-based and customer-centric business models (Slywotzky 1996; Slywotzky and Morrison 1998; Sharma and Molloy 1999; Shepherd and Ahmed 2000; Cornet, *et. al.* 2000; Bennett, *et. al.* 2001; Galbraith 2002a and 2002b; Sandberg and Werr 2003). In capital goods, such as IT, telecoms and trains, this involves the provision of tailored combinations of products and services as high-value ‘integrated solutions’ that address the specific needs of large business and government customers (Wise and Baumgartner 1999; Davies, *et. al.*, 2001; Davies, *et. al.* 2003). For example, Alstom Transport, the train manufacturer, now offers solutions for ‘train availability’ and Thales Training and Simulation, the flight simulator manufacturer, provides military customers with ‘flight training solutions’. Providers of integrated solutions offer to design and integrate components into a system and provide services to operate, maintain and finance the system during its life cycle.

The aim of this paper is to examine how firms are organizing their internal and external activities to provide integrated solutions. Different strands of the business strategy literature help to show how firms are repositioning for integrated solutions by integrating forwards into the provision of services (Wise and Baumgartner 1999; Oliva and Kallenberg 2003), developing close relationships with their customers (Slywotzky 1996; Slywotzky and Morrison 1998; Hax and Wilde 1999), and creating customer-focused organizations (Foote, *et. al.*, 1999; Galbraith 2002). While the

strategy literature helps to identify key elements of integrated solutions provision, it over emphasizes the novelty and recent disruptive nature of this business model.

Pioneering research on industrial marketing (which is ignored by the mainstream management literature) suggests that the origins of integrated solutions provision can be traced back to the early 1960s when firms began to adopt ‘systems selling’ strategies and organizations (Mattson 1973; Hannaford 1976; Page and Siemplenski 1983; Dunn and Thomas 1986). Systems selling is defined as the provision of products and services as integrated systems that provide solutions to a customer’s operational needs. According to Azimont *et. al.* (1998), systems selling is now evolving beyond solving customers’ operational problems to a more strategic form of marketing based on ‘solutions selling’. This involves providing strategic and consultative advice to help customers achieve strategic objectives such as the transformation of core business processes.

Drawing upon various bodies of literature, the paper identifies two contrasting types of organization for the provision of integrated solutions. First, the industrial marketing literature emphasizes the advantages of the ‘systems seller’, a vertically-integrated firm that produces all or most of the product and service components required for integrated solutions provision. A pure systems seller’s offering is based on a single-vendor design incorporating internally developed technology, products and proprietary interfaces. Second, the provision of integrated solutions can be undertaken by ‘systems integrator’: a prime contractor organisation responsible for the overall

system design and integrating product and service components supplied by a variety of external suppliers into a functioning system. This form of organization emphasizes the advantages of specialization and modularity in component supply, standardization of interfaces, and the ability to specify and integrate multi-vendor sources of technology and product supply.

The paper argues that the traditional advantages of the pure systems seller approach are becoming less attractive as customers require more complex integrated solutions, often incorporating multi-vendor technologies, products and services. Since the mid-1990s, a growing number of systems providers have responded to this demand by developing the capabilities and organizational structures required to design and integrate systems out of physical components and services provided by a variety of internal and external suppliers. However, firms are not simply abandoning pure systems seller and adopting pure systems integrator organizations. Drawing upon case study research of large capital goods suppliers, the paper shows that these firms are adopting a variety of hybrid organizational structures that lie between the two ideal types of systems selling and systems integration.

The paper begins in Section 2 with a discussion of the key characteristics of integrated solutions provision. A review of the industrial marketing literature suggests that this business model should be understood as a recent transition in the longer-term evolution of systems selling. Section 3 discusses two ideal types of organizations that can help us to analyse and understand the structures firms are adopting for the

provision of integrated solutions. Section 4 draws upon case study research to analyse the hybrid organizational structures which combine elements of systems selling and systems integration. Finally, Section 5 provides a cross-case analysis of the different hybrid organizational forms being adopted by firms moving into integrated solutions provision.

2. Integrated solutions: an evolving business model

2.1. The essential elements of integrated solutions

Over the past decade, a growing body of strategy and consultancy literature has identified a business model for capital goods based on the provision of tailored combinations of products and services as high-value integrated solutions to a customer needs (Wise and Baumgartner 1999; Davies, *et. al.*, 2001; Davies, *et. al.*, 2003; Davies 2004; Davies and Hobday 2005). Pioneers of integrated solutions – such as IBM, General Electric and Nokia – have developed the scale and broad base of capabilities necessary to design, produce and integrate all the product and service components into a solution to an individual customer’s business challenges.

2.1.1. Vertically-integrating from products to services

Rather than specialize in the supply of individual components, several authors claim that integrated solutions provision can be understood as a strategy of vertical integration, conceived as a movement forwards from products to services (Wise and Baumgartner 1999; Oliva and Kallenberg 2003). According to Wise and Baumgartner

(1999), integrated solutions providers such as Nokia, the mobile communications supplier, are building on their manufacturing capabilities and moving downstream into the provision of integrated packages of products and services to design, build, operate and maintain a product during its life cycle. Manufacturing firms are achieving this by integrating forwards into service-based activities previously undertaken by their customers – large business or government-owned agencies.

IBM's experience in the computer industry illustrates the emergence of this business model in the early 1990s (Gerstner 2002: 57-61). Traditionally, IBM had the capabilities in-house to supply all the components (hardware, software and services) of a computer as an integrated system. By the mid-1980s, a new organizational approach emerged which challenged the traditional advantages of vertical integration. Many smaller specialized firms supplying modular components began to challenge IBM's dominant position. Large business customers – such as American Express – had to take responsibility for integrating externally supplied components into a system that solved their unique business requirements. Rather than mirroring this trend towards vertical disintegration by turning IBM into a group of individual component suppliers, Louis Gerstner, IBM's CEO, executed a strategy in 1993 to build on the firm's broad base of vertically-integrated capabilities by focusing on the provision of complete integrated solutions for a customers' computing and service requirements. At this time, IBM also moved away from its traditional offering based entirely on in-house technology when it decided to offer to design, install and support a competing vendor's products (e.g. Microsoft, HP and Sun) if this was required to provide a solution to a customer's needs (Gerstner 2002: 130).

2.1.2. *Customer-centric*

The adoption of this business model changes a firm's offering from one based on selling products to solutions. This customer-centric approach involves working backwards from a customer's needs and identifying options for mobilizing the capabilities necessary to provide solutions to those needs (Slywotzky 1996; Slywotzky and Morrison 1998; Wise and Baumgartner 1999; Hax and Wilde 1999). Several authors have identified a new type of customer-centric organization for solutions provision (Foote, *et. al.*, 2001; Galbraith 2002). These authors describe how large vertically-integrated manufacturers including IBM and Sun Microsystems have reorganized for solutions provision. In a shift away from traditional structures, product units are being reorganized to become back-end providers of standardised and replicable components that are combined into solutions provided by newly-formed customer-facing units. These front-end units are based on temporary projects which are continuously formed, combined, and disbanded around each customer's need for a solution.

2.2. Systems selling: industrial marketing literature

A review of some key contributions from the industrial marketing literature shows that the essential elements of an integrated solutions business model originated in the early 1960s, when capital goods suppliers first began to adopt systems selling strategies. Based on the following literature review, we suggest that integrated solutions should be seen as the most recent development in the long-term evolution of systems selling.

2.2.1. Systems selling concept

Systems selling is based on the provision of complete systems rather than individual components. Systems sellers combine components into a integrated system that provides a solution to a customer's business problem (Mattson 1973) or performs a set of functions for the customer (Hanniford 1976). The customer does not just buy a system, but the 'expectations of benefits' a system provides for a customer over time, such as an operating chemical plant or telecommunication system (Levitt 1983: 89; Drucker 1985: 231).

Systems sellers take over responsibility for systems previously used by customer organizations as part of their total operational activities, such as inventory control, production control systems, machine tools, IT and telecom networks. Each system sold is comprised of product and service components. Hardware or 'product components' are the physical or tangible products that perform a specific function within the system. Software or 'service components' are the knowledge or intangible human efforts to solve a customer's problems and perform activities required to design, build, operate and maintain a system.

The early marketing literature recognized and understood that systems sellers must be customer-centric. Mattson (1973) explains that rather than define its business model in terms of product attributes, the systems sellers organizes its activities around the needs of specific customers. Systems sellers identify ways of creating value for

customers by reducing purchasing costs, improving operational performance and facilitating system growth by incorporating new products and improving operational routines (Hanniford 1976: 145).

Since the early 1960s many firms have adopted strategies and organizational structures to sell complete systems rather than individual components. However, strategies based on vertically-integrated supply of complete systems of electrical and transportation equipment can be traced back even earlier to early 1900s (Passer 1952; Chandler 1990; 68-69). Systems selling was initially popular in the aerospace and data processing industries, but by the 1970s had widely adopted in the marketing of capital goods, such as bank teller equipment, scientific instrumentation, process control equipment, machine tools, office equipment and electronic control gear (Page and Siemplenski 1983: 89).

2.2.2. From system to solution

The early industrial marketing literature distinguishes between component selling (products or services) and systems selling. Whereas component sellers supply an individual component of a system, systems sellers provide all components in an integrated system. A more recent contribution to the literature makes a distinction between systems selling and 'solutions selling' (Azimont, *et. al.*, 1998). Whereas systems sellers are organized to solve a customer's operational problems, solutions sellers offer strategic advice to help a customer develop its business in existing or new markets.

It should be understood, however, that the idea of providing a solution to a customer's need has always been central to systems selling. Paliwoda and Bonaccorsi (1993) emphasize that systems sellers create value-added by providing physical products and services as 'integrated solutions' to complex customer problems. The systems sellers must define the customer's problem and identify the task of integrating components into unique or customized solution. However, the concept of solution selling places stronger emphasis on the role of the supplier in offering strategic consultancy advice to:

- provide an in-depth analysis of a customer's business
- identify and diagnose problems in a customer's organization (often before the customer is aware of it)
- offer solutions based on its experience of working with a number of customers facing similar situations
- coordinate the integration of components into a solution.

2.2.3. Standardization vs customization

The systems selling literature claims that firms can only achieve profitable and successful growth if components of a system are standardized (Mattson 1973: 109; Hannaford 1976: Page and Siemplenski 1983: 91). The general design interfaces between components in the systems are designed to be compatible so that components can be adjusted to the unique needs of each customer. Standardized product components can be specified and integrated in various predetermined ways to meet

the specific requirements of individual customers and markets. Service components can also be developed into standardized and simplified methods of operations (Hanniford 1976: 141). Rather than being offered at no charge on an ad hoc basis upon request of the customer, services are 'packaged' into routines and methods of operations.

By developing a basic modular system of components that can be easily configured and reconfigured for a variety of customer needs, suppliers can combine the cost advantages of producing standardized product components with high flexibility in system design (Mattson 1973: 115). If systems sellers develop a comprehensive options list of standardized components, each configuration can be unique, customized solution. The solution to a customer's needs is a customized adaptation of the basic modular system and its standardized components. Component standardizations allow the vendor to benefit from economies of scale in production, while providing each customer with a system configuration 'as though it were produced on a job-shop basis' (Page and Siemplenski 1983: 91).

Efficiency gains can be achieved by spreading the costs of providing solutions over many projects with customers. Customers that design and implement one-off solutions for their own internal needs cannot match the efficiency gains achieved by systems sellers. Systems selling involves long-term relationships with customers leading to long-lived, growing and profitable systems programmes, incorporating a range of standardized and replicable components. Rather than accept each customer's order for

a unique one-off system design, a seller-designed programme is led by the seller's predetermined system design rather than the customer's individual requirements. The vendor acts as the single source supplier during the life of the contract and provides a programme of projects for many customer purchasing problems.

The recent literature on integrated solutions also emphasizes the importance of developing standardized 'solutions-ready' components, that can be combined and recombined at much lower cost than solutions comprised of entirely customized components (Davies and Brady 2000; Foote, *et. al.*, 2001; Galbraith 2002; Grabher 2002; Davies, *et. al.*, 2006). Each solution can be tailored to a customer's needs by using standardized, reusable and easy-to-deploy modules based on product platforms and service portfolios. However, in contrast to traditional systems selling strategies, the literature on integrated solutions emphasises the need for some degree of customization to solve each customer's individual needs (Hax and Wilde 1999: 13).

The proportion of standardized and customized components in a solution varies according to the needs, capabilities and sophistication of the customer (Davies, *et. al.*, 2006). Less experienced customers often require solutions comprised entirely of standardised offerings. More experienced or sophisticated customers can find their needs are not fully satisfied by standardized solutions. For example, Ericsson has worked closely with lead customers such as Vodafone to create highly customized solutions for commercializing the new generation of 3G mobile system technology.

3. Organizing for integrated solutions

This section begins with a discussion of how the systems selling literature analyses different organizational structures. It then presents two ideal types of organizations: the systems seller and the systems integrator (see Figure 1). These are presented as ‘pure forms’ to highlight the distinctiveness of each approach (see Table 1) and to help analyse and compare emerging organizational structures being adopted by firms moving into integrated solutions provision in Section 4.

[Figure 1: Ideal types: systems seller and systems integrator]

[Table 1: Types of systems provision]

3.1. Analysis of organizational forms

The systems selling literature enables us to analyse different organizational approaches by distinguishing between two dimensions of systems buying and selling: the customer ‘make or buy’ decision, and the extent to which the systems seller is a vertically-integrated firm or a group of firms.

3.1.1. Make or buy

The nature of systems provision depends on a customer’s ‘make or buy’ decision (Page and Siemplenski 1983; Paliwoda and Thomson 1985). The customer can purchase a system from an external vendor or develop it internally. The advantage of

procuring a complete system from a vendor is that it enables the customer to focus on developing its core business. For a customer that chooses internal system development, there are two possible arrangements. First, a customer can develop the broad base of capabilities in-house required to produce many or all components of the system and combine them into a tailored solution to their needs. For example, in the 1980s state-owned European train operators such as British Rail, Deutsche Bahn and SNCF (the French train company) had the capabilities in-house to design trains and signalling systems, manufacture many key components, integrate components into a system, and operate rolling stock, track, signalling and railway systems.

Second, a customer may procure the system components from a variety of external suppliers, while concentrating on integrating components into a system and providing services to operate and maintain it. This requires the development of specialized skills and resources to search for and order components and to ensure that the components conform to the overall system design (Page and Siemplenski 1983: 97). For example, in the 1980s and 1990s multinational corporations such as General Motors and American Express had large in-house telecom departments responsible for operating international corporate voice and data networks. These departments integrated components – transmission circuits, switches and terminals – sourced from a variety of external suppliers.

3.1.2. Vertical integration or 'group of firms'

The industrial marketing literature also distinguishes between two forms of systems supply: the vertically-integrated system seller or components supplied by a 'group of firms' that collectively perform the same task as the systems seller (Mattson 1973). These groupings of firms are linked together by partnerships and alliances, often working in temporary consortiums for the duration of a project (Azimont, *et. al.*, 1998; 10). In most cases, however, a single organization (an internal customer department or external supplier) has to assume responsibility for combining the components into a system. The group of component sellers is often led by an prime contractor organization called a 'systems integrator', which is responsible for the overall design, specification of components and their integration into a system.

3.2. Systems seller

In the 'pure form' of systems selling as Mattson (1973) calls it, the customer procures a complete system of product and service components from a single vertically-integrated firm (see Figure 1). The system seller is responsible for the whole system design, interface and component specifications, product development and production of individual components, the integration of components into a system and the provision of services to operate and maintain a system during its life cycle. It performs many functions previously performed in-house by the customer organization. For the supplier, the systems selling approach offers increased revenues, reduced unit costs and brand loyalty. For the customer, it offers rapid system installation and reduced costs of development and procurement.

The systems selling literature recognizes that systems sellers can integrate systems out of components externally supplied by multiple vendors, but emphasizes the advantages of a single-vendor approach to system design and component development. According to Hannaford (1976: 141), a 'seller-designed system' is a set of standardized components that should be designed in advance by the vendor. A systems programme is based on upon a basic system design that can be adapted for many customers. Page and Siemplenski (1983: 93) claim that general system design developed by single vendor creates a high degree of complementarity among components: 'If the system is well conceived, the superior 'fit' of its components, which we will call interfacing efficiency, results in competitive advantage over systems constructed out of separate components' (Page and Siemplenski 1983: 95).

IBM's strategy for selling computers in the 1960s and 1970s is held up as a classic example of systems selling (Dunn and Thomas 1986: 1). IBM's System/360 introduced in 1964 was the first computer based on a modular design. Under this approach, physical components of a computer – or modules – could be designed by separate specialized groups working independently. The modules could then be integrated as long as they conformed to a pre-determined design (Baldwin and Clark 2000: 6). Although IBM's System/360 computer was based on modular hardware components which could be configured to meet each customer's needs, the software components and interfaces in the system were proprietary. Once a customer had purchased an IBM computer, the complex operating system made it difficult to switch to another vendor's system. Under IBM's bundling strategy, the customer purchased a complete system of IBM hardware, software and service support, and had it installed

for a single price. Bundling is a strategy for selling potentially separable components to customers only as an integrated system or ‘bundle’ (Porter 1985: 425).

3.3. Systems integrator

In its pure form, a systems integrator is the single prime contractor organization responsible for designing and integrating externally supplied product and service components into a system for an individual customer (see Figure 1). Page and Siemplenski (1983: 90) identify the systems integrator as an important early form of system procurement. They point out that the systems integrator approach was first used by the US military during the 1940s and 1950s to procure weapons systems from a prime contractor. A similar approach called general management was used in the construction of dams, oil refineries and nuclear power plants.

Although systems integration is recognized as one of the key activities performed internally by systems sellers (Page and Siemplenski 1983; Paliwoda and Bonaccorsi 1993; Gunter and Bonaccorsi 1996; Bonaccorsi, *et. al.*, 1996) or customer organizations (Millman 1996: 637), the industrial marketing literature neglects to systematically analyse the strengths of this form of organization as an alternative to the systems seller approach.

A different body of literature from innovation studies has emphasized the advantages of systems integration compared with traditional vertically-integrated structures

(Brusoni, *et. al.*, 2001; Prencipe, *et. al.*, 2003; Hobday, *et. al.*, 2005). These authors emphasize the advantages of specialization at the systems integration and component levels. A pure systems integrator focuses on the component integration task, while coordinating the activities of many external suppliers. This external network expands the capabilities and range of components that can be combined to create value for its customers (Galbraith 2002b: 139). For example, Boeing has positioned itself as systems integrator for airframe assembly, while subcontracting about 80 per cent of component production to specialists around the world. A component supplier specialises in a few activities and attempts to become the best in the world at providing a few products and services to many customers. A systems integrator is more than an assembler of product components, because it is responsible for the general system design, selection and coordination of a network of external component suppliers, integration of components into a functioning system, and the development of technological knowledge needed for future systems upgrades.

The trend towards modularity and open standards in industries has increased the possibilities for firms to specialize in component supply and/or systems integration. For example, as modularity became adopted widely in the industry during the 1970s and 1980s, hundreds of new specialists suppliers of modular components, which could be added to IBM computers, entered the industry and successfully challenged IBM's dominant position as a systems seller (Baldwin and Clark 2000).

In recent years, an increasing number of large capital goods manufacturers have been transitioning from 'being vertically-integrated (doing everything in-house) to being an integrator of somebody else's activities' (Hobday, *et. al.*, 2003: 1). However, the

literature tends to assume that systems integrators are manufacturing firms that have been outsourcing standardized and low-cost production activities and focusing on higher value added systems integration activities already performed in-house (e.g. Brusoni et al., 2001). This under emphasizes the variety of systems integrator organizations, and their changing roles in projects. There are many examples of firms traditionally based in services with no in-house manufacturing capability (e.g. BT, EDS, LogicaCMG and Atkins) that have also begun focus on being systems integrators of components sourced from a variety of suppliers (Davies 2004). Firms also perform different roles in projects: a firm may be a systems integrator on one project, while performing the role of a component supplier to a systems integrator on another project.

Customer demand for more complex solutions based on components supplied by a variety of firms is an important driver behind the emergence of systems integrators offering multi-vendor solutions. This involves a willingness to specify, integrate and service a competitor's technology, products and installed base, should the customer demand it or should it provide a superior solution to a customer's needs (Foote, *et. al.*, 2001).

4. Case studies: reorganizing for integrated solutions provision

This section presents five short case studies which use the two contrasting types of systems providers to examine how different firms have been reorganizing to provide integrated solutions. The empirical evidence is based on the findings of a

collaborative research project conducted during 2000-2003 (the findings are available in Davies, *et. al.*, 2001 & 2003), which studied the recent changes in the strategies of five international suppliers of capital goods:

- Alstom Transport – rolling stock and signalling systems
- Ericsson Mobile Systems – mobile phone networks
- Thales Training and Simulation – flight simulation
- Atkins – infrastructure and the built environment
- Cable and Wireless (C&W) Global Markets – corporate telecom networks

The cross-sectoral sample of firms was selected to examine how firms in different manufacturing and service industries have been changing their strategies and organization to move into integrated solutions provision. The case studies describe the changes implemented by the firms between 1995, when several of the firms started their first integrated solutions projects, and 2003.

4.1. Manufacturing firms

4.1.1. Alstom Transport

In the mid-1990s, Alstom Transport – a division within the Alstom group – was a product seller, which was integrated backwards into component supply. Alstom's product components were produced by two manufacturing divisions: the Passenger business unit was responsible the design and manufacturing of rolling stock, and the Equipment business unit produced primary components including bogies, electrical,

electronic and traction systems. These product components were designed and produced to meet detailed technical specifications set by Alstom's customers, the large state-owned railway companies that integrated the components and operated the railway system. At the time, Alstom's services were limited to maintenance services offered for free to clinch the product sale.

Since 1995, Alstom Transport has been implementing a strategy to move from 'being a seller of goods to a system and service provider' (Owen 1997). This has involved moving out of low-value and standardized component manufacturing. By 2001 Alstom Transport was outsourcing around 90 per cent of the components in its rolling stock products, while continuing to design and produce critical subsystems such as traction systems.

From this foothold in product component selling, Alstom has been expanding into systems integration and the provision of services to operate and maintain trains. Alstom Systems business is a pure systems integrator organization, responsible for combining components sourced from both its in-house manufacturing divisions and external suppliers. The division provides fixed infrastructure, rolling stock and signalling systems as a single integrated package. By developing its capabilities in project management, engineering and financial services combined with traditional design and build capabilities, the Systems business is able to provide customers with complete systems solutions.

In 1998, a Service Business was created as a result of a strategic review of Alstom's global activities, which recognized the huge growth in the market for rolling stock maintenance services. Alstom offers comprehensive services to maintain rolling stock – functions previously conducted by national railway monopolies. The division provides its customers – the training operating companies – with complete transport solutions for 'train availability' during the life cycle of the product.

4.1.2. Ericsson

During the 1980s and 1990s, Ericsson evolved from a broad-based manufacturer of telecoms equipment to focus on the supply of complete mobile communications systems. In 1996, Ericsson formed two main product divisions for mobile communications: a terminal division responsible for producing mobile handsets and a systems division responsible for all the components (e.g. radio base stations, data bases, operating systems and switches) integrated into mobile communication systems. At this time, services were provided by the product divisions.

In 1996, Ericsson's Corporate Executive Committee completed a strategic plan, called '2005 – Ericsson entering the twenty-first century', which initiated its strategy to provide mobile operators with 'solutions and services' (Ericsson 1996: 7). The report recognized the trend for mobile operators to outsource many network design, systems integration and operational activities previously performed in-house. In 1999, Ericsson combined its resources in service offerings and business consulting activities

to create Ericsson Services, ‘thus strengthening Ericsson’s position as complete supplier, system integrator and partner’ (Ericsson 1999: 7). In June 2000 Ericsson’s systems integration and service activities were brought together to form a new division called Ericsson Global Services to provide systems integration and service activities for mobile phone operators throughout the world. In 2001, Global Services became one of Ericsson’s five business units, responsible for developing a global service portfolio and supplying staff and resources to help the front-end units design and sell solutions. The division is responsible for providing a portfolio of simplified and standardized services called ‘Advise, Integrate, Manage’ which are configured to meet each mobile operator’s needs for customized solutions.

Since the late 1990s, Ericsson has outsourced an increasing proportion of its manufacturing activities. By 2001, many of Ericsson’s products (including exchange equipment, radio base stations and handsets) were outsourced and manufactured under contract by Flextronics, the specialized product seller. In 2003 Ericsson made another reorganization to support its move into integrated solutions. It formed 28 market units and created customer-facing units to deal with its largest global customer accounts.

Under this organization, all activities with mobile operators from strategic engagement to solutions delivery are undertaken by the customer facing units.

Ericsson’s in-house product and service divisions are providers of components delivered through a global network of customer-facing units.

4.1.3. Thales Training and Simulation

Thales Training and Simulation (TT&S) is part of the aerospace business of the Thales group, a large defence and electronics manufacturer. Until the mid-1990s, TT&S was one of the world's largest manufacturers of flight simulators. It supplied its defence (military air forces and departments of defence) and civil airline customers with stand-alone flight simulators and computer-based training devices. TT&S designed, manufactured and integrated key components in the final product and its customers used simulators to train pilots.

By 2000, however, Thales had outsourced much of its standardized component manufacturing activities in order to focus on the core systems integration task. It is working with a network of external component suppliers to ensure that product components conform to TT&S's overall systems design and can be tailored exactly to a customer's requirements.

In the defence sector, TT&S changed its strategy in the late 1990s to provide flight training services. Thales Defence is taking over responsibility for pilot training and other services previously performed by its military customers. As Vice Chairman of Thales, explained: 'Whereas a few years ago you could sell a unit and walk away, generating a profit now depends more on selling services, selling hours on simulator services' (Mulholland 2000). Thales provides military customers with simulators and training services as integrated 'training solutions' by offering to train pilots over the 20-25 year life cycle of a simulator.

In civil markets for flight simulators attempts to move flight training have been frustrated by training organizations, including the airline customers (with their own in-house training facilities) and specialized independent training schools, which purchase simulators and already provide an extensive range of flight training services. As major airlines have outsourced training, it has been the training schools – rather than simulator producers – which have taken on the training tasks, despite the efforts of Thales and other producers to move into training services.

4.2. Service firms

4.2.1. Atkins

Unlike vertically-integrated product sellers that have grown initially by providing services to support internally developed systems, Atkins is now a systems integrator and service provider, with no in-house manufacturing capabilities.

In the mid-1990s, Atkins was a seller of services such as project management, technical consultancy and support services across sectors as diverse as transport, property management, defence and public health. Atkins implemented a strategy in 1998 to reorganize the firm to meet customer demand in the public and private sectors for longer-term contracts involving the provision of ‘an increasing range of services’ (WS Atkins 1999; 6). The firm’s objective was to become ‘the world’s first choice supplier for technical services and integrated solutions for the built environment’ (WS

Atkins 1999; 4). Since 1999, Atkins has continued to develop its portfolio of services by acquiring firms offering specialized services such as facilities management and property services.

Atkins's move into integrated solutions is based on its role as a systems integrator of externally supplied product components. Rather than perform the role of subcontractor, Atkins aims to handle prime contracts for systems integration contracts and to subcontract components that it cannot provide internally. Atkins designs and project manages the integration of systems supplied large product suppliers across different industries. For example, Atkins Rail buys and integrates equipment from railway manufacturers (e.g. Alstom, Siemens and Bombardier). By offering multi-vendor solutions to its customers, Atkins Rail can compete with systems sellers to perform the role of systems integrator on major contracts. Growing rapidly by horizontal integration, Atkins developed its capabilities as a systems integrator by recruitment and acquisition of complementary businesses. In the late 1990s, for example, WS Atkins Rail acquired expertise and complementary systems technologies by purchasing British Rail's Powertrack Unit, NTES (rolling stock design), Opal (signalling), and Adtranz's signalling business.

4.2.2. Cable and Wireless Global Markets

In the mid-1990s, Cable & Wireless (C&W) was a leading international telecom operator providing services to consumer and business markets. Demand for integrated solutions first arose in 1997 when some of C&W's largest multinational customers

(e.g. Standard Charter Bank, Chase Manhattan and Compaq) began to request more complex, high-value, outsourcing solutions for their global telecom needs. In global outsourcing contracts, C&W had to take over responsibility for network ownership and service performance for a fixed contract period and a fixed price. To meet its customers' demands, David Sexton, Chief Executive of C&W Global Markets, recognized that 'suppliers must redefine their role as value-generating integrators, rather than low-cost component suppliers' (C&W 1999: 5). To achieve this, C&W had to develop its role as a multi-vendor systems integrator, able to design and integrate systems supplied by a variety of vendors.

In the late 1990s, C&W attempted to create a centralized organization to provide global outsourcing solutions for corporate telecom networks, based on internet protocol (IP) technology. The strategy entailed moving beyond the supply of components (called Managed Network Services) into higher-value systems integration and customer outsourcing services. In 1998, C&W Global Businesses were created to focus on meeting the highly profitable business demand for IP and data services. At the heart of this organization was Global Markets, a systems integrator organization which designed, built and managed corporate networks, using product components supplied by external manufacturers (for example, Nortel and Cisco Systems) and network facilities provided in-house. By 2000, C&W's strategy was reformulated in terms of a plan to move from its base as an operator of global telecom networks into the provision of 'total integrated solutions' to its multinational corporate customers needs for voice, data and IP services.

But C&W's attempts to move into integrated solutions were unsuccessful. It was unable to force its internal regional business units to relinquish control of profitable corporate accounts and faced strong competition from major systems integrators (large consultancy organizations such as Accenture and PriceWaterhouseCoopers) that were highly successful in global outsourcing solutions markets. As a result of these factors and the collapse of telecom markets during 2002, C&W finally abandoned its attempts to move into integrated solutions in 2003 when it formed strategic partnership with Accenture: C&W has reverted back to a seller of components and services in outsourcing solutions that Accenture designs, integrates and offers to corporate customers.

5. Emerging organizational forms

Since 1995 all of the case study firms have initiated many organizational changes to support their moves into integrated solutions. The path of organizational development of each firm has been shaped by the traditional activities performed by the firms prior to their repositioning (see Davies 2004). Although all five firms have integrated forwards into services, this does not support the view that firms moving into the provision of integrated solutions are adopting systems seller structures based on vertically-integrated component supply. Firms based in services with no internal product capability are moving into integrated solutions provision and the manufacturing firms in our study rely increasingly on outsourcing for the supply of many physical components. Instead the firms in our study have been adopting a variety of forms to organize the integration of product and services from a variety of

internal and external component sellers. These hybrid structures attempt to combine some of the advantages of systems selling and systems integration.

5.1. Component sellers

Our research shows that component sellers are organising to supply solutions-ready products and services that can be configured by internal systems integrator units for individual customer needs. Component sellers can be in-house organizations or external partners supplying the core product or service components of a solution.

5.1.1. Product components

Over the past decade, the three manufacturing firms in our research have become more reliant on external product sellers to supply physical components. Alstom, Ericsson and Thales still have important in-house product divisions responsible for developing the common technology and standardized product platforms. These development efforts ensure that components can be easily configured to form an integrated system for each customer. However, these internal product sellers are becoming more specialised. They have been reorganized to design and manufacture only a limited number of complex and high-value components, while outsourcing a growing proportion of their standardised component production activities. For example, Ericsson has entered into a partnership with Flextronics, a specialised product seller that has grown successfully by specializing in the design and production of major components for several of the mobile systems suppliers.

5.1.2. Service components

The manufacturing firms in our study have made significant efforts to integrate forwards into service provision. Alstom, Ericsson and Thales now provide an extensive range of services to operate and maintain their products and systems. Alstom and Ericsson have established two separate divisions to provide an augmented service portfolio as part of their integrated solutions offerings. These service divisions are responsible for creating standardised services that can be offered as part of the integrated solutions for each customer. Ericsson estimates that up to 75% of the service component of its integrated solutions can be based on pre-defined service modules: the remaining 25% of service components are customized by Ericsson's systems integrator units to meet each customer's needs. This modular, reusable approach cuts costs and improves the reliability of the integrated solutions. Based on standardized business processes, pricing, and guarantees for service reliability, the service portfolio is constantly revised to improve the process of selling and delivering solutions.

Firms based in services must enter into strategic partnerships with product sellers to provide a reliable source of technology and products. However, they have also had to develop a more extensive portfolio of services. For example, C&W extended its service offering to address its customers outsourcing needs for higher-value added and more complex services, such as providing e-commerce, security, application software provision, and business process outsourcing. Atkins offers its customers a range of

services such as design, business development, planning, safety advice, tender preparation and project management. In 2000, Atkins created a joint venture company with the Royal Bank of Scotland (RBS) called 'Total Solutions for Industry' which provides customers with integrated solutions for small outsourcing and PFI contracts: Atkins performs system design, integration and maintenance, while RBS provide the finance.

5.2. Systems integrators

The case studies show that several firms have established internal systems integrator organizations, ranging from single projects to permanent business units set up to meet a customer's ongoing needs for systems programmes. These customer-facing organizations are responsible for managing strategic engagements with each customer, developing proposals, integrating systems and arranging the provision of operational services. Since the mid-1990s, Ericsson, Alstom, Atkins and C&W have progressively reorganized their entire firms so that the components supplied by internal units and external partners are channelled to the systems integrator organizations at the point of contact with the customer.

The five firms in our study have initiated strategies to perform systems integration based on single-vendor and/or multi-vendor components. Single-vendor systems are comprised of product components developed internally by vertically-integrated manufacturers, such as TT&S's proprietary flight simulator products. While TT&S

outsources much of the production of components parts of its flight simulators, it is responsible for major technology development and design of all major components.

Multi-vendor systems are developed and integrated from externally developed components. The service firms in our research have set up pure systems integrator organisations. By developing partnerships with multiple technology and product vendors, Atkins and C&W have been able to offer multi-vendor systems integration expertise as part of their integrated solutions offerings. C&W established a specialised systems integrator organisation called C&W Global Markets to design and integrate components of IP and other components produced by Nortel and Cisco Systems. Atkins has established a number for pure systems integrators units, such as Atkins Rail, for a variety of different horizontal market segments.

Alstom and Ericsson have extended beyond their traditional single-vendor systems into the provision of multi-vendor solutions. Both firms have created internal units to perform the same function as a specialised systems integrator. Alstom Systems is a pure systems integrator division responsible for providing railway operating companies with turnkey solutions, comprised of multi-vendor products and services supplied in temporary multi-firm project consortiums led by Alstom. Ericsson's customer-facing units, such as Ericsson Vodafone, work in collaborative project teams with the customer and a variety of external suppliers to provide each global mobile phone operator with integrated system and services.

6. Conclusions

This paper has shown that provision of integrated solutions is not a radically new business model. Strategies to provide product and service components as integrated systems and solutions to customer's individual requirements originated in the early 1960s. Drawing upon different bodies of literature, we presented two contrasting types of organizations: (1) the vertically-integrated systems seller that produces all the product and service components in a system; and (2) the systems integrator that coordinates integration of components supplied by external firms. It is clear from our research on that firms moving into integrated solutions provision over the past decade have been abandoning traditional forms of vertical integration (based on backwards integration towards physical component supply) and adopting new organizational forms. However, there is no evidence to support the continuing dominance of the systems seller in these evolving markets or a simple transition from systems selling to systems integration approaches. A more complex pattern of organizational forms is emerging, combining elements of both systems selling and systems integration.

The case studies show that providers of integrated solutions are becoming less dependent on broad-based in-house product component capabilities. For example, Alstom, Ericsson and Thales are becoming increasingly reliant on specialist manufacturers, such as Flextronics, to supply them with standardised and modular components. Our research suggests that the largest proportion of activities undertaken in-house is shifting towards the service component of each firm's integrated solutions offering. All five firms have made substantial efforts to integrate forwards into service

components, including consultancy advice, guarantees of systems reliability and responsiveness, and services to operate, maintain and finance a system over its life cycle. As Levitt (1983: 89) recognized many years ago, services that enable customers to gain benefits from the system are becoming more important than the underlying technology.

Most importantly, the ability to integrate a range of components from a variety of internal and external suppliers is becoming the core activity required to provide integrated solutions. The traditional advantages of the vertically-integrated systems seller offering single-vendor designed systems is no longer a major source of competitive advantage in many industries. Customers are demanding more complex solutions, incorporating technologies, products and specialised services provided by numerous external suppliers. In response to such demands, firms with no ties to in-house technology or products, such as Atkins and C&W, created new organisations to perform the role of pure systems integrator. Alstom and Ericsson has set up specialised divisions, units and individual projects to provide a variety of customers with integrated solutions based on single- and multi-vendor components.

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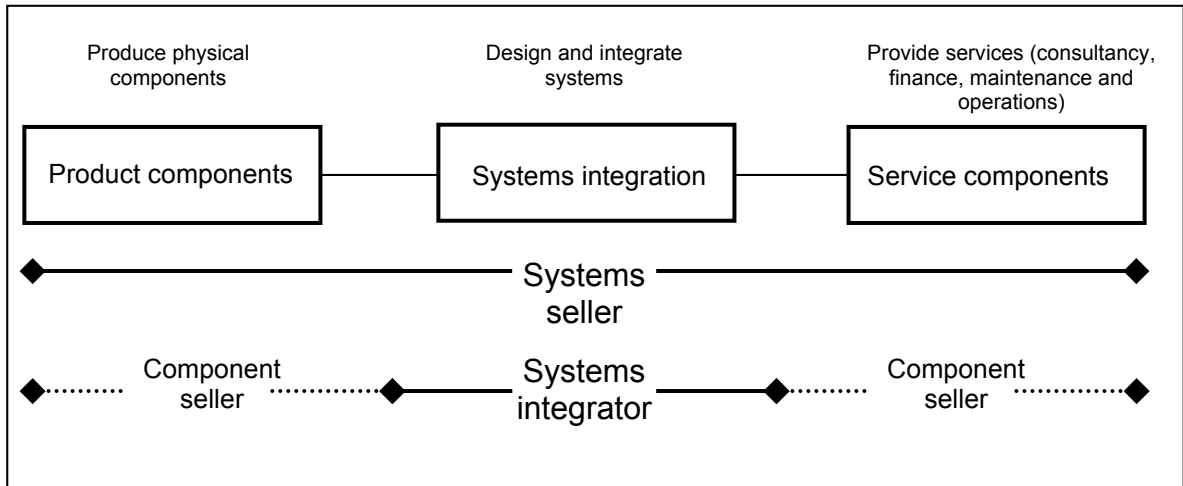


Figure 1: Ideal types: systems seller and systems integrator

Advantages of a pure systems seller	Advantages of a pure systems integrator
1. Extensive control of all components in the system	1. Integrator of outsourced components
2. Single-vendor system: deep understanding of in-house, proprietary technology and system architecture	2. Multi-vendor systems: deep understanding of competing suppliers' technologies and system architectures
3. Standardised components and proprietary interfaces (proprietary standards)	3. Modular components and standardised interfaces ('open' industry standards)
4. Vertically-integrated: backwards into products and forwards into services	4. Specialized: at the system and component levels
5. Reduced transaction costs and internal pricing	5. Compare market prices of external component offerings
6. Coordination of in-house units and divisions	6. Lead firm works in cooperation with a network of external subcontractors
7. Security of component supply and capabilities	7. Access to industry's leading suppliers of components and capabilities
8. Stable and permanent structures; functionally organised around internal product and production capability	8. Reconfigurable and temporary structures: projects set up and disbanded around each customer's needs for capabilities
9. Broad-based capabilities in product and systems manufacturing and after sales services	9. Core capabilities in systems integration and project management
10. Bundled offer of standardized components at a set price	10. Selling separate or integrated packages of standardized and customized components

Table 1: Types of systems provision