

Cite as :

Andy A. Tsay, "Designing and Controlling the Outsourced Supply Chain/" *Foundations and Trends in Technology, Information and Operations Management*, Vol 7, No. 1-2 (2014): 1-160.
doi: 10.1561/02000000030

Foundations and Trends® in Technology, Information
and Operations Management
Vol. 7, Nos. 1-2 (2013) 1-160
© 2014 A. A. Tsay
DOI: 10.1561/02000000030

now
the essence of knowledge

Designing and Controlling the Outsourced Supply Chain

Andy A. Tsay, Ph.D.
Leavey School of Business,
Santa Clara University
OMIS Department, 500 El Camino Real
Santa Clara, CA 95053, USA
ATSAY@SCU.edu

Foundations and Trends® in
Technology, Information and Operations Management
7:1-2

Designing and Controlling the Outsourced Supply Chain

Andy A. Tsay

now
the essence of knowledge

Contents

1	Introduction and Preliminaries	3
1.1	Terminology to describe an outsourced relationship....	4
1.2	Outsourcing versus offshoring.....	6
2	Motivating Case Studies	9
2.1	Boeing's 787 Dreamliner.....	10
2.2	Toysrus.com and Amazon.....	14
2.3	Factory labor headaches for Apple and Foxconn	18
2.4	The original "Nike moment".....	20
2.5	Menu Foods and the 2007 pet food recalls	23
2.6	Cisco's \$2.25 billion inventory write-down	25
3	Advantages and Disadvantages of Outsourcing	28
3.1	Constructs from foundational theory.....	29
3.2	Advantages of outsourcing.....	33
3.3	Disadvantages of outsourcing.....	39
4	Lifecycle of the Outsourcing Decision	48
4.1	Initiating consideration of outsourcing	49
4.2	Finding expertise related to outsourcing	51
4.3	Organizing to make the decision.....	52
4.4	Defining and prioritizing the goals.....	54

4.5	Making the decision.....	56
4.6	Structuring and managing the relationship.....	63
4.7	Investing resources in process control.....	70
4.8	Deciding to end an outsourcing program	71
5	Outsourcing in a Physical Goods Supply Chain	72
5.1	Outsourcing of manufacturing.....	73
5.2	Outsourcing of product design/development	82
5.3	Outsourcing of procurement.....	93
5.4	Outsourcing of logistics.....	104
5.5	Who will orchestrate the outsourced supply chain?	108
6	A Comment on the Research on Outsourcing	111
7	Conclusion	115
	Appendix: Offshoring and Offshore Outsourcing	117
A.1	Motives for offshoring.....	117
A.2	Combinations of offshoring and outsourcing	127
A.3	Hazards of offshoring and offshore outsourcing	129
A.4	Alternatives to operating offshore.....	130
A.5	Regarding the focus on national boundaries	132
	Acknowledgments	133
	References	135

Abstract

All organizations outsource. They differ only in the scope and extent of what they procure as goods and services from outside entities. These choices drive an organization's financial performance and long-term competitive viability, and establish the tenor of day-to-day operations. Outsourcing can solve many problems, but is also fraught with hidden costs and risks.

This monograph examines outsourcing from a lifecycle perspective. This means tracing the full arc from the germination of the idea to outsource, to the assessment of options, to the installation of control mechanisms, to grappling with conflicts that inevitably arise over time, all the way to the sunset of the chosen strategy. The analysis is highly attentive to the details of operational execution, especially regarding how human resources participate in these decision processes and are impacted by the choices made.

The lifecycle discussion applies regardless of the type of business process considered for outsourcing. This has standalone value, but also serves as a preamble to the topic from which this monograph derives its title: outsourcing in the endeavor of stewarding a product from concept to market and then operating the resulting supply chain. Specifically, this monograph looks deeply at the outsourcing of manufacturing, product design, materials procurement, and logistics.

This monograph also presents the phenomenon of offshoring in order to dispel the common confusion between outsourcing and offshoring. Both can be pursued simultaneously ("offshore outsourcing"), and this monograph makes clear which benefits and risks are due to offshoring and which are due to outsourcing.

This monograph targets scholars and practitioners at once, guided by a belief that both communities will benefit from a treatment

of outsourcing that ties together ideas from theory and extensive industrial evidence. Highlights include extended case studies featuring Amazon, Apple, Boeing, Cisco, Foxconn, Menu Foods, Nike, and Toysrus.com, with significant supporting appearances by more than fifty other firms from diverse industries and countries.

1

Introduction and Preliminaries

Much like “it takes a village to raise a child,” increasingly a village (possibly a global one) must collaborate in order to bring a product from concept to market. For a firm to perform every required task solo would be economically overwhelming, even if logically feasible. The decision of whether to outsource, in a supply chain or any other setting, is thus not about a yes or a no, but a matter of scope and extent. Examples of extensive outsourcing abound.

This monograph intends to shed light on this phenomenon by presenting, interpreting, and extending the corpus of current knowledge. This will include a multitude of ideas and examples from a variety of print media, presentations by industry experts, and personal data collection and interviews by the author. For the scholar this monograph will structure a dispersed pool of information, analyze it using theoretical frameworks from multiple disciplines, and provide substrate for new research. For the practitioner, this monograph will offer a basis for action. Specifically, for managers contemplating which functions to outsource, this will frame the make-versus-buy decision. Overseers of outsourced functions will receive guidance for negotiating terms, monitoring performance, and enhancing control. Because of the duality of

audiences, this is written in the tone of a tutorial, and has no intent to comprehensively review the academic research literature. The prevailing goal will be to illuminate the underlying economic and behavioral drivers, implementation challenges, and potential remedies, all with great attention to the details of operational execution.

The remainder of this section will set the stage by introducing some key terminology. Section 2 will present six case studies starring the supply chains of well-known firms or products, illustrating a range of motivations for outsourcing and various ways such efforts can go awry. These cases will serve as a unifying thread throughout this monograph. Section 3 will state the arguments in favor of and opposed to outsourcing, in terms that transcend the type of activity or process. Section 4 will walk through the lifecycle of an outsourcing decision. This spans the initial notion to outsource through to the end of the engagement, with an insource-versus-outsource assessment made along the way. Section 5 will zoom in on the outsourcing of specific functions in supply chains for physical products. Section 6 will make some observations about the existing research literature and provide direction for prospective researchers. Section 7 will conclude. The Appendix explores offshoring's motives and hazards in order to clarify the common confusion between offshoring and outsourcing.

1.1 Terminology to describe an outsourced relationship

The *Oxford English Dictionary* (OED) offers this definition:

Outsource: to obtain (goods, a service, etc.) by contract from an outside source; to contract (work) out.

The OED, which added this entry in 1993, cites as the term's earliest print appearance the following sentence in a 1979 item in the *Journal of the Royal Society of Arts*: "We are so short of professional engineers in the motor industry that we are having to outsource design work to Germany."

To some this term specifically connotes the act of shifting an internal activity to an outside party. However, the OED definition does not stipulate where the activity might have been performed previously. For

instance, a firm can correctly be said to outsource its manufacturing even if it at no point ever possessed any capability to manufacture.

The phrase "business process outsourcing" (BPO) focuses attention upon activities conducted by businesses. Standard domains for BPO include information technology, finance, accounting, marketing, and human resources. However, the operation of any given business involves a plethora of disparate processes, and no consensus exists regarding what qualifies as a "business process" from the perspective of BPO.

The antonym of "outsource" is "insource," which thus means to perform an activity internally regardless of whether it had been outsourced before. According to the OED, which added this term in 2006, both words first appeared in print roughly contemporaneously. The act of bringing back in-house an activity that was internal prior to being outsourced has recently been labeled as "reinsourcing" [228] or "back-sourcing" [216, 368]. The latter term is popular in the IT community, but neither appears to be mainstream at this time.

The act of outsourcing involves two main participants, neither having a prevailing name. Some possibilities for the one on the receiving end of the good or service are "buyer," "client," "service recipient," or "outsourcer." The providing party can be the "supplier," "vendor," "contractor," "service provider," or "outsourcee." This party may be identified as a "general contractor" if it is responsible for an entire project but delegates some tasks to other service providers (each then called a "subcontractor"). The degrees of separation from the original client in this scenario can be conveyed by labeling the (sub)contractors as Tier 1 (or I), Tier 2 (or II), and so on. Of the preceding terms, the standard usages of "buyer," "supplier," and "vendor" hint slightly at the selling of goods rather than services, although nothing in the official definitions formalizes this. "Outsourcer" and "outsourcee" draw attention to the nature of the relationship. The latter is not commonly used, perhaps since it could be misinterpreted as the internal employee laid off when his/her function was outsourced. To add to the confusion, the service provider firm is occasionally called an "outsourcer" [63, 101].

This monograph will generally refer to the two parties as the "outsourcing party" and "service provider," since these are sufficiently

neutral and clear. The latter also has support in the names for such emerging specialist categories as “procurement service providers” (PSP) [1, 235] or “manufacturing service providers” (MSP) [309]. Section 5 will reduce the need for these labels as the various parties in a supply chain can be identified by their industrial categorizations, such as OEM or contract manufacturer. Context will make evident the role of each participant in an outsourcing relationship. This monograph will use language descriptive of outsourcing by business organizations, although most of the concepts will be just as relevant when individuals outsource or when the objectives are noncommercial.

Besides naming the actors and their actions, we also acknowledge the vocabulary that alludes to the constellation of partners entailed by extensive outsourcing. A nonexhaustive list includes “virtual supply chain,” “virtual value chain,” “virtual integration,” and “extended enterprise.” The first two differ in the subtle distinction between a supply chain, which comprises the parties encountered along a physical path of flow; and a value chain, which traces the activities performed but need not map to a physical or chronological ordering or have a crisp division of labor. “Virtual integration” is a play on “vertical integration.” “Extended enterprise” may be the least explicitly suggestive of outsourcing, as it encompasses the full ecosystem needed to provide a product or service, but at no point implies a consolidated alternative. Cisco has used this term heavily in describing the architecture of its own supply chain, and at times has (along with solutions partners) marketed a package of hardware, software, and consulting services intended to hold together an extended enterprise [92].

1.2 Outsourcing versus offshoring

The keyword “offshoring” merits special attention since the concept arises in nearly every discussion of outsourcing. “Offshoring” positions work in a country other than the one containing the firm’s headquarters.¹ However, the foreign and domestic workforces may all still belong to the same organization.

¹Focusing on the headquarters as the reference point for the term “offshoring” may sometimes mislead. “Onshore” for the company might coincide

To sharply differentiate outsourcing and offshoring, note that two distinct questions about any activity are “who” (will do the work) and “where” (will it be done). Outsourcing is strictly about the “who.” Responsibility for a task and the associated resources impacts control and incentives. Offshoring is only about the “where.” Location decisions create proximity between some stages in the value chain and separation between others. Physical distance and its correlates (which include differences in culture, language, and business practices) determine the difficulty of coordination and physical transport.

A firm can outsource an activity without positioning it offshore, and vice versa. The firm can also do both at once, in which case the unambiguous label is “offshore outsourcing.” All combinations might well be present within the firm’s portfolio of activities. In this age of global free trade and increasingly complete marketplaces for virtually every good or service, firms can easily choose to serve international customers with offshore operations (some insourced and some outsourced), while simultaneously maintaining onshore operations (some insourced and some outsourced) for local customers.

Outsourcing is sometimes confused with offshoring, especially in politicized conversations [339]. Fear mongering about outsourcing (a misuse of the term since the real concern was the loss of work to India and other overseas locations) played a role in numerous recent US presidential and congressional campaigns [177, 217].² The confusion may

with the location of the headquarters, but could also reflect the historical origin of the company or the geography where a large number of the employees do their work. For example, Flextronics is described in Wikipedia as an “American supply chain solutions company” even though the headquarters is in Singapore (<http://en.wikipedia.org/wiki/Flextronics>, accessed April 9, 2014). Likewise, Wikipedia’s entry for professional services firm Accenture notes: “While Ireland is the company’s headquarters for tax and legal purposes, much of the operational administration occurs in the US, mainly New York City and Chicago.” Meanwhile, the nation containing the greatest number of Accenture employees is India (<http://en.wikipedia.org/wiki/Accenture>, accessed April 9, 2014).

²A nation has legitimate reasons to be concerned about how offshoring can divert economic value away from the home country. Layering outsourcing on top of the offshoring has the added danger of potentially placing vital activities under the control of foreign entities. But outsourcing by itself ought not to be politically inflammatory. It shifts tasks to another organization, but need not change the location at

emanate from viewing the “out” in outsourcing as a reference to the borders of a nation, whereas the correct usage conveys location relative to the boundaries of an organization.

The Appendix examines offshoring in greater detail. Such discussion is included in this monograph because offshore outsourcing is common, and clarity is needed regarding which benefits and risks are due to the offshoring part and which are due to the outsourcing.

all. The employees of service providers sometimes work alongside the outsourcing party's internal staff, live and pay taxes in the same communities, and quite possibly have similar national loyalties.

An absolute rejection of offshoring based on nationalism might be overly simplistic. Is offshoring bad on the whole if it brings lower prices or higher quality to domestic consumers, or greater returns to domestic shareholders? Offshoring may create winners and losers, as does any other structural shift, but is not necessarily unethical or unpatriotic per se. In any event, strong feelings about offshoring will be harder to sustain as locational frame of reference becomes more nebulous. Sellers of goods and services are increasingly multinational, and their supply chains can pass through multiple countries. Customers are located all over the world. Shareholders can live anywhere. In light of these developments, what is the real significance of where the corporate headquarters is located or where the company is officially registered?

2

Motivating Case Studies

Although at times maligned, outsourcing continues to increase across a broad range of business functions. Industry surveys regularly confirm this.

For instance, a survey published by KPMG early in 2013 examined outsourcing practices for 12 different process categories. For every process type only single-digit percentages of respondents expressed desire to decrease their outsourcing, while 47% or more intended to maintain or increase their level of outsourcing. The processes for which the greatest percentage of respondents would be increasing their outsourcing were “application development and maintenance” (48%) and “finance and accounting” (40%). For more than three-quarters of the respondents, operational effectiveness (cost reduction, greater scalability of operations, and process standardization) was the primary motivation for outsourcing. The vast majority of the outsourcing parties (88%) was satisfied with the cost reduction and standard delivery from service providers, but many indicated that the service providers fell short in certain strategic areas, such as improving analytical capabilities, access to talent, and achieving innovation. The KPMG survey pool consisted of 1,355 senior leaders from major global enterprises,

outsourcing service providers, management consulting firms, sourcing advisory firms, and other key industry influencers [143].

In 2013 Deloitte found current outsourcing rates ranging from 11% to 76% across eight business functions, with the highest rates in IT, finance, and human resources. Increases in outsourcing (and offshoring) were projected in all the functions. A very low portion of the respondents planned to insource any previously outsourced function. Respondents were generally satisfied with their most recent transaction, but many reported the realized cost reductions to be lower than expected. This survey collected 111 responses from 22 primary industries and 23 different countries, with representation for every major geographic region [107].

The documented rise in outsourcing validates the importance of the analysis contained in this monograph. However, we will not automatically endorse outsourcing or predict growth in its popularity. Certainly the aforementioned industry surveys identified areas of discontent. Here the goal will be a balanced tone that advocates realistic expectations and vigilance regarding hazards and hidden costs.

To bring this discussion to life, this section presents six vignettes that both illustrate the allure of outsourcing (to be explained in broad terms in Section 3 and for specific supply chain functions in Section 5) and serve as cautionary tales. Each case examines a supply chain setting, since that is the main focus of this monograph. But they were chosen to be representative of outsourcing in general, so can inform on a broader level as well. They demonstrate that even experienced and successful companies have a hard time getting outsourcing right. Figure 2.1 presents a roster of the cases.

This monograph will frequently reference these cases when explaining key principles.

2.1 Boeing's 787 Dreamliner

Boeing's 787 Dreamliner program is a contender to be the most widely publicized and analyzed outsourcing-related failure case to come along in a generation (cf. [22, 127, 234, 358, 370]). Obviously this was never

Case Outsourcing scenario Main problem areas		
Boeing's 787 Dreamliner (Section 2.1)	Boeing outsourced design and manufacturing of aircraft sections to an international portfolio of vendors	• service providers could not handle aspects of the work • unauthorized subcontracting • coordination and communication difficulties • alienation of in-house employees • loss of critical skills over time
Toysrus.com and Amazon (Section 2.2)	Toysrus.com outsourced to Amazon a key portion of logistics (order fulfillment) and the sales function (the customer interface, including Web site and customer service)	• service provider could not handle aspects of the work • service provider became a competitor
Factory labor headaches for Apple and Foxconn (Section 2.3)	Apple outsourced electronics assembly and some design to Foxconn (China)	• work conditions in contractor factories were allegedly inhumane
The original "Nike moment" (Section 2.4)	Nike outsourced production of sporting apparel, footwear, and equipment to factories in Asia and other emerging economies	• work conditions in contractor factories were allegedly inhumane • ineffectiveness of monitoring
Menu Foods and the 2007 pet food recalls (Section 2.5)	Menu Foods outsourced the procurement of pet food ingredients to middlemen working with a network of suppliers in China	• unauthorized substitutions in procured materials • inspection circumvented by falsified documentation
Cisco's \$2.25 billion inventory write-down (Section 2.6)	Cisco outsourced electronics production to contract manufacturers	• incentives discouraged realistic forecasting

Figure 2.1: Case studies of supply chain outsourcing.

the intent of the leadership of Boeing, the world's largest aerospace company and one of the top US exporters.

The 787 was the first major aircraft to make use of a predominantly carbon fiber structure, projected to enable a 20% fuel efficiency

improvement over comparably sized vehicles of the current generation and a 30% reduction in maintenance costs [249]. The composite materials would allow relative simplicity of assembly. Boeing's leadership envisioned snapping together Dreamliners in as little as three days, much like plastic model airplanes [149]. To enable this, a portfolio of parts suppliers would design and build major sections, which Boeing would then consolidate at its Seattle-area facility [250]. Subassemblies parceled out in this way included the forward nose section (provided by Spirit AeroSystems), a fully integrated center fuselage section (assembled from sections produced at Alenia Aeronautica and Kawasaki Heavy Industries), the aft fuselage (Vought), the wings (Fuji, Mitsubishi, Kawasaki, and Spirit), and the horizontal stabilisers (Alenia), with Tier I suppliers taking on primary responsibility for managing their subcontract relationships [249]. This departure from Boeing's labor-intensive, semi-custom, in-house heritage was motivated by observing successful companies in the automotive, shipbuilding, and consumer electronics industries [99].

This outsourced paradigm would allow Boeing to focus on those activities it saw as its core competencies (cf. Section 3.2.1): large-scale systems integration, lean and effective global design and production, working with exotic metals like titanium and composites, and interpreting the needs of the airline industry [99]. With the promise of reductions in development time, cost, and capital investment, Boeing's approach was poised to usher in a new way of designing and producing commercial aircraft. Officials from rival Airbus publicly acknowledged intent to increase its own outsourcing. "For any company that wants to be successful in aerospace manufacturing, Boeing's new strategy is the way forward," proclaimed Richard Aboulafia, vice president at aerospace consulting firm Teal Group [193].

These high hopes came crashing to earth before long. The 787 finally entered commercial service 3.5 years after the original target of May 2008. In a personal communication one Boeing employee called this "humiliating" for a company which long took great pride in delivering aircraft on time. The company's original goal for internal development costs was \$5 billion. Several Wall Street analysts have estimated that the litany of manufacturing problems, plus penalties paid to suppliers and airlines, has piled on an additional \$12 billion to \$18 billion [155].

To make matters worse, Airbus had the luxury of sitting back and learning from its arch-competitor's missteps. An Airbus analysis of the fiasco, intriguing due to its abundance of seemingly confidential Boeing information, leaked to the Internet in late 2008 [111]- From this report Cohan [95] distilled several key failures in Boeing's execution of the outsourcing strategy (*italicized quotations are from [111]*):

- Its partners' factory workers lacked requisite skills: *"low-wage, trained-on-the-job workers... no previous aerospace experience"*
- Some of its partners lacked design staff: Vought *"had no engineering department when selected"*
- Some of its suppliers could not produce enough parts: *"insufficient supply of frame, clips, brackets and floor beams"*
- Inability to control the 787 production schedule: *"deferred work [was] found to be incomplete or lost in transfer"* and parts that did arrive complete to final assembly required rework
- Inadequate quality assurance process: *"lack of qualified non-destructive inspection/quality assurance personnel (NDI/QA) and equipment at Tier-2 and -3 suppliers"*
- Delays in design schedule that led to a fastener shortage: the delay was due to the late redesign of a *"sleeved fastener for lightning strike protection that primarily impacted Mitsubishi's wing production."*

Boeing had overestimated the ability of its suppliers. And Boeing's supervision of these suppliers was insufficient, failing to prevent problems such as unauthorized subcontracting to unqualified vendors. The scattered footprint of the supply base also created language problems and difficulty collaborating from a distance [250]. Government regulations concerning the export of defense-related technology further obstructed communication, requiring any discussions with international suppliers to take place in designated conference rooms [265].

Boeing CEO Jay McNeerney conceded in 2009 that he would not again use such extensive outsourcing, at least not without improved

control processes:

“We asked some partners to do some things that they, technically and financially, were not able to do. I would draw the lines in a different place: more shared engineering done together, visibility on the supply chain across corporate boundaries. But I would still have the same supplier-partner concept. I would just have more control. We got the baseline wrong. We didn’t have the right oversight. We didn’t have the program management talent we needed” [328].

The aftermath played out the way an internal Boeing report had predicted years earlier. In 2001, Boeing senior technical fellow L.J. Hart-Smith warned that excessive outsourcing would raise Boeing’s costs and steer profits to its subcontractors. What Boeing proposed retaining - final assembly — is actually among the least profitable jobs in aircraft manufacturing. Meanwhile, the subcontractors would benefit from free technical assistance from Boeing, and would hang on to the highly profitable spare parts business over the decades-long life of the aircraft. The subcontractors would bear almost no risk because if they ran into insurmountable problems they would simply be acquired by Boeing [154, 156, 187].

Accompanying the immediate financial and customer satisfaction fallout from this failure were consequences that are less tangible or will take longer to play out. Critics, including the Boeing labor unions who went on a 58-day strike during the time frame of the 787 program, have insisted that the 787 outsourcing strategy jettisons critical design and supply chain coordination capabilities upon which the success of future programs would depend. The offshoring aspect also engendered negative publicity and political liability for one of Washington state’s largest employers [306].

2.2 [Toysrus.com](#) and Amazon

As the twentieth century came to a close, businesses in virtually all sectors rushed to establish a selling presence on the Internet. This threatened traditional bricks-and-mortar retailers on multiple fronts.

They feared being “disintermediated” by suppliers who could establish relationships with end customers directly by electronic means, or supplanted by online retailers who could operate with vastly lower physical overhead and inventory. Toys R Us (TRU), which itself had disrupted the toy industry and helped pioneer “category killer” retail (in which the superior size, product variety, and pricing of focused “big-box” chains suffocate the smaller players), was under siege by born-on-the-Internet upstarts such as eToys (a phenomenon termed “being Amazoned,” a label whose irony for TRU will become apparent shortly) as well as the online efforts of other brick-and-mortar retailers including Walmart [121].

TRU began selling online in 1998. In the early days the company fulfilled Internet orders from the back of a store, and by May 1999 had modestly upgraded to a 5,000 square-foot space in a corner of one of its distribution centers [61]. TRU’s serious entry to the field was Toysrus.com. This was established as a subsidiary in partnership with Benchmark Capital, a blue-chip venture capital firm that offered experience with technology startups and contacts in the online space. The project included the acquisition of a \$30 million, 500,000 square-foot, fully automated distribution center in Memphis, Tennessee.

The partnership lasted only four months, disintegrating in the summer of 1999 after having gone through two different CEOs [258]. Benchmark Capital backed out when, among other actions, TRU refused to allow the online store to set its own prices.

With limited e-commerce expertise, Toysrus.com had a disastrous Christmas season that year. Fulfillment problems prevented thousands of orders from arriving in time for Christmas morning, and offering \$100 compensation to each affected customer could not forestall a spate of bad publicity, a Federal Trade Commission fine of \$350,000, and at least one class-action lawsuit [61, 363].

Toysrus.com took on new venture investors in early 2000, including Softbank and others, but soon decided on a more dramatic solution: a ten-year alliance with Amazon.com that began in August 2000. Amazon owned superior fulfillment infrastructure (the physical assets and processes that could efficiently package and deliver small orders to individual residences) and state-of-the-art tools and expertise for

online selling. Having invested heavily in both kinds of infrastructure in anticipation of rapid growth in its own sales, Amazon was liappy for tlie opportunity to utilize these resources to generate revenue in tlie meantime. This was the beginning of a major inflection in the evolution of Amazon's business model, whereby Amazon became a provider of outsourced e-commerce solutions to third-party sellers, essentially offering a "dot-com" store off-the-shelf.¹

At the same time, Amazon's performance in the toy category was expected to benefit from TRU's tremendous brand recognition, deep knowledge, and longstanding relationships witli vendors. In the 1999 Cliristmas season, Amazon had executed well enoughli in toys on its own, selling \$65 million wortli in the last three months of the year and delivering the majority on time, but had to write off \$34 million in unsold inventory [300].

In thiis relationship, Toysrus.com outsourced to Amazon a key element of logistics (order fulfillment) and the sales function (the customer interface, including Web site and customer service), wliile retaining sourcing, product selection, and inventory planning.² Uniting the complementary strengths of the partners in this way would provide customers witli "the best toy-buying experience available online" [14]. Beginning in September 2000 the Toysrus.com URL took visitors

¹In 2001, Amazon began marketing three programs to third-party sellers (catalog retailers, physical store retailers, and manufacturers): (i) Merchant@amazon.com, (ii) Merchant, and (iii) Syndicated Stores. In (i), the third party sells product through Amazon's Web site in a fully integrated fashion. In (ii), the third party's store remains at its own URL, but Amazon provides the e-commerce features and technology for the Web site. In (iii), the third party's Web site uses Amazon's e-commerce services and tools, and offers Amazon's product selection. In (i) and (ii), the third party is the seller of record, and pays Amazon a commission for providing enabling processes (technology to power the Web site, and fulfillment services if the third party needs). In (iii), Amazon is the seller of record, and also provides the technology for the Web site, customer service, and fulfillment. Here the third party is essentially a sales agent and earns a commission on sales. In the 2002 time frame, Toysrus.com was an example of (i), Target.com of (ii), and Borders.com of (iii) [15].

²According to Amazon's 10-K statement for 2000, Toysrus.com retained responsibility to "identify, buy, manage and bear the financial risk of inventory for the co-branded toy and video games store, as well as for the forthcoming baby products store" [14].

directly to Amazon.com, which featured a new “Toys and Games” tab [300].

The deal was hammered out quickly based on strategic considerations (negotiations began in June 2000 and the contract was signed on August 9 of that year). But in the haste some fundamental operational details were overlooked, including the fact that not all fulfillment centers are created equal. At the time Toysrus.com carried some very bulky items, including bicycles, baby strollers, cribs, baby jumpers, play pens, and large toys like model planes, train sets, and doll houses. A fair percentage simply could not fit into Amazon’s conveyor system, which was designed for books, CDs, DVDs, and VHS tapes. This only became evident when the first inbound delivery trucks arrived and began unloading, and the initial fulfillment had to be done on an ad-hoc basis outside of Amazon’s efficient automated system. This inauspicious beginning foreshadowed further conflict.

Amazon acknowledged the challenges of providing services to other businesses. Referring to deals with Toysrus.com, as well as Borders Group, America Online, Circuit City Stores, Target, and others, Amazon’s 10-K report for 2001 stated,

“These arrangements are complex and initially require substantial personnel and resource commitments by us... If we fail to implement, maintain and develop successfully the various components of such arrangements, which may include fulfillment, customer service, inventory management, tax collection, and third party licensing of software, hardware and content, our strategic alliance initiatives may not be viable” [15].

In fact, several clients publicly criticized Amazon’s apparent inattention to these partnerships, specifically the failure to dedicate adequate staff to managing the operational challenges [341].

The Toysrus.com-Amazon relationship irrevocably fractured before the midpoint of the contract duration. Toysrus.com filed a lawsuit against Amazon in May 2004, alleging breach of an exclusivity agreement covering all toys, games, and baby products, a right for which Toysrus.com paid \$50 million annually [180]. Amazon’s defense was

that the contract applied only to those toy and baby products that Toysrus.com was offering, thereby ceding any others to Amazon or other merchants on the site. Amazon countersued, faulting Toysrus.com for poor planning that caused more than 20% of the toy store's best-selling items to be unavailable online during the peak of the 2003 holiday season. Amazon positioned its actions as necessary to expand the selection enough to remain competitive. After two years of legal battling, in March of 2006 the New Jersey Chancery Court ruled in favor of Toysrus.com, allowing dissolution of the contract but not awarding any monetary damages [260, 270, 300].

This episode contains multiple messages regarding outsourcing. One is that service providers can easily come to compete with their clients. It is not hard to imagine that what Amazon learned from Toysrus.com about toys and baby products, including all the customer preference information captured in the site's browsing and transaction data, facilitated Amazon's own subsequent ventures in those categories (some of which were in breach of contract). Another is that even when outsourcing makes sense at a strategic level, the devil is in the operational details. The logistics outsourcing got off to a rocky start due to failure to anticipate the fundamental misalignment between Toysrus.com's fulfillment needs and Amazon's materials handling resources, and struggled along due to apparent understaffing by Amazon. Outsourcing of the sales function broke down because of imprecision in the specification of exclusivity.

2.3 Factory labor headaches for Apple and Foxconn

"Designed by Apple in California. Assembled in China." So states the small print on the back of most Apple devices. The failure to explicitly name the assembler suggests it to be some entity other than Apple. This indeed has long been true of Apple and many other consumer electronics companies [105].

Nevertheless, most Apple customers probably never gave much thought to Apple's manufacturing strategy. And until recently few except electronics industry insiders had heard of the famously secretive

Foxconn, Apple's primary contract manufacturer. That all changed in mid-2010 when the Apple-Foxconn relationship exploded onto the front pages due to a spate of suicides among Foxconn's young factory workforce which were ostensibly caused by work stress. (Concerns had been raised as early as the June 2006 expose by *Daily Mail* of the UK, but never got much traction with the public [38, 103].) The 2010 suicides transpired in dramatic fashion, mostly as leaps off of Foxconn's high-rise worker dormitories.

Although not Foxconn's only major customer, Apple became the focus of extensive public criticism for condoning allegedly inhumane working conditions. According to accusations presented by *The New York Times*,

“Employees work excessive overtime, in some cases seven days a week, and live in crowded dorms. Some say they stand so long that their legs swell until they can hardly walk. Under-age workers have helped build Apple's products, and the company's suppliers have improperly disposed of hazardous waste and falsified records, according to company reports and advocacy groups that, within China, are often considered reliable, independent monitors” [112].

The scrutiny only intensified with several fatal factory accidents in 2011. On February 9, 2012, protesters descended on Apple stores around the world, to protest the upstream factory labor conditions. They also delivered petitions containing more than 250,000 signatures to the company headquarters [379].

The public debate often seeks simple answers and an obvious villain, whereas the reality is rarely so straightforward. While any suicide is a tragedy, was the per capita suicide rate at Foxconn noteworthy compared to appropriate benchmarks?³ Were the suicides and the workplace accidents truly due to the work conditions? If the work conditions were so harsh, why did the jobs attract so many applicants and why did the workers clamor for overtime hours? Did Apple even have enough

³The suicide rate among the Foxconn workforce for the period in question was lower than for the population at large in China as well as in the US [48, 121].

leverage in the relationship to influence Foxconn's management practices? What is not in dispute is that this matter created real financial and public relations costs for all the companies involved.

2.4 The original "Nike moment"

The uproar over Apple and Foxconn has been labeled the "Nike moment" for the electronics industry [205]. The analogy would be incomplete without acknowledging the eponymous maker of shoes, apparel, and sporting equipment. Nike and Apple share the experience of drawing the spotlight because of their prominence, even though their labor practices were not necessarily any worse than the norms in their respective sectors. These two sectors have many similarities: extended supply chain structure; rapid shuffling of suppliers and factory locations; and overwhelmingly female, often migrant, workers [69].

As early as the 1980s, Nike had been criticized for sourcing from sweatshop-like factories in Asia and other emerging economies. The company's early posture was to disclaim responsibility since these were not Nike employees. But the brand suffered from persistent public and media pressure, which included students calling for boycotts by their universities, ridicule in the *Doonesbury* comic strip, and a central role in muckraking filmmaker Michael Moore's 1997 takedown of US corporations for their insensitivity to the working class, "The Big One." In May 1998, Phil Knight, Nike's founder and then-CEO, conceded that "The Nike product has become synonymous with slave wages, forced overtime and arbitrary abuse" [102].

The 1990s saw Nike formulate its Code of Conduct for suppliers and implement various methods of factory monitoring [51, 246]. In the name of transparency and to set an example for its peers, in 2005 Nike became the first in its industry to release the names and locations of its factories (downloadable from <http://nikeinc.com/pages/manufacturing-map>) [240]. This was a bold gesture since brand owners often avoid calling attention to their outsourcing practices (especially involving offshore vendors) and are paranoid that their best suppliers may be poached.

Nike also released its factory audit findings to MIT researchers for independent analysis. A comprehensive study of 1998-2005 data

covering over 800 of Nike's suppliers across 51 countries was published in 2007. The conclusions were not encouraging:

"After years spent by Nike developing ever more comprehensive monitoring tools, hiring growing numbers of internal compliance specialists, conducting hundreds of factory audits, and working with external consultants and NGOs, analyses of the company's own data suggest that conditions have improved somewhat in some of its suppliers but either stagnated or deteriorated in many others....monitoring alone is not producing the large and sustained improvements in workplace conditions that many had hoped it would" [246].

Ratings for suppliers that had been audited more than once suggested that workplace conditions in almost 80% of them either remained static or worsened over time.

Despite extensive efforts and investments beyond this monitoring, Nike continues to grapple with incidents of worker mistreatment and exploitation. A recent internal report showed that nearly two-thirds of 168 factories making the company's Converse product line still fell short of Nike's standards [408].

These sobering findings are based on data that almost surely under-report the problems, as labor audits can easily be circumvented. Suppliers can keep two or more sets of books to conceal overtime and wage violations, with the help of readily available software. Some factories pre-stamp the time cards with the legally allowed numbers of hours, again using software that puts in just enough errors to convey authenticity. Employees can be coached to lie, and are naturally reluctant to do anything to jeopardize their jobs. Owners can establish front operations, either a model facility specifically for visitors or even a factory belonging to a different company. Subcontracting is hard to detect and substantially complicates the monitoring. Rather than make the investments needed to achieve compliance, some suppliers simply shut down a factory and open another one elsewhere under a new name. Buyer incentives may help undermine the rigor in the monitoring as well. Anne Lally, a worker advocate and consultant to the not-for-profit Fair

Category	Countries	Factories	Workers	Workers/Factory
Apparel	40 (93%)	446 (57%)	369,038 (36%)	827
Footwear	14 (32%)	165 (21%)	526,623 (52%)	3192
Equipment	23 (53%)	166 (21%)	113,835 (13%)	686
TOTAL	43	777	1,009,114	1227

Figure 2.2: Nike's contract manufacturing profile as of May 2013 (raw data from <http://nikeinc.com/pages/manufacturing-map>).

Labor Association, explains, "The truth is expensive, because then you might have to fix it" [266, 335]. For these reasons, monitoring alone will never solve the problem.

All aspects of supplier management are particularly challenging in Nike's setting due to the sheer size of the supply base. Figure 2.2 contains May 2013 data showing Nike to source from over 770 factories employing over one million workers across 43 countries.

As with Apple and Foxconn, the great misconception is that the customer in the outsourcing relationship can simply enforce compliance by threatening to take the business elsewhere. All supply relationships exhibit mutual interdependence, the extent and nature of which shape each side's leverage and inclination to cooperate. Nike should have greater potential for improvement in footwear than in apparel and equipment. The data in Figure 2.2 suggest that Nike does business with a relatively smaller group of footwear suppliers. Many of these are long-term partners that work closely with Nike designers throughout the production process. The shoe factories, which are usually large, capital-intensive facilities, also tend to employ a much larger workforce per factory (3,192, versus average headcounts of 827 and 686 for apparel and equipment respectively), so improvements in labor practices would seem to have greater potential for impact in these. In apparel, where the factories are usually smaller, easy-to-establish, and extremely labor-intensive, Nike deals with many more players on short-term contracts, so the company's influence can be limited [246].

Kenneth Lieberthal, director of the Brookings Institution's China center, has noted,

“Trouble in your supply chain can really hurt your reputation globally, extremely rapidly. The wisdom in the industry from that (Nike) experience is that you have to do a lot of work to be sure you understand what is happening in your supply chain” [205].

This statement is true in general for any industry, but the work is especially challenging in Nike's situation because the supply base is large and dispersed, and the risk is attached to an intangible activity (the treatment of workers) where monitoring can be defeated easily.

2.5 Menu Foods and the 2007 pet food recalls

During the time frame of this episode, Menu Foods Limited was the largest maker of wet cat and dog food in North America. It sold products under 95 brand names, many of them private label offerings of major retailers and pet specialty chains. In March 2007, the company had to recall over 60 million containers of pet food due to concerns of contamination. This is considered one of the largest consumer products recalls in North American history.

Investigators identified the main contaminant as melamine, which is a precursor to plastic and may also be used as a fertilizer. Melamine added to pet food ingredients such as wheat gluten could fraudulently inflate the measurable protein level and therefore the market value of the ingredients.⁴ This was the economic motive alleged by the US federal grand jury that in 2008 indicted two Chinese firms (Xuzhou Anying

⁴The ability of melamine to spoof protein content also played a central role in a 2008 crisis involving dairy products produced by leading Chinese brands such as Sanlu and Mengniu. (Unlike the discussion in the Appendix, this example involving China is unrelated to offshoring since the dairy products were mainly sold within China.) This scandal was even bigger than the pet food crisis since it involved food consumed by humans, specifically young children, and was exacerbated by a vigorous cover-up by high-ranking officials at Sanlu, the most prominent culprit. Ultimately, these actions were judged to be criminal in nature, resulting in punishments that included long prison sentences and death penalties.

Biologic Technology Development Company, and its broker for exporting to the US named Suzhou Textiles, Silk, Light Industrial Products, Arts and Crafts I/E Company) and Chemnutra, a Las Vegas-based company that imported food and food components from China for reselling to food companies including Menu Foods. According to the indictment, between November 6, 2006 and February 21, 2007, more than 800 metric tons of wheat gluten were exported to the US in at least 13 separate shipments, with invoices totaling nearly \$850,000. These were falsely labeled to evade inspection in China [407].

Under a 2009 plea bargain, the owners of Chemnutra pleaded guilty to one count of selling adulterated food and one count of selling misbranded food, agreeing to probation and paying restitution along with a fine of up to \$600,000 [24, 402]. The Chinese suppliers had already faced their reckoning earlier. In 2007, China's product safety organization, the General Administration for Quality Supervision, Inspection and Quarantine, revoked the license of Xuzhou Anying, as well as another Chinese firm also alleged to have adulterated wheat gluten with melamine (Binzhou Futian Biology Technology Co. Ltd.) [23].

The downstream parties in the supply chain took a greater financial hit. In 2008 Menu Foods and other involved pet food makers and retailers agreed to establish a \$24 million cash fund to compensate the thousands of pet owners in the US and Canada who had bought the recalled products. This was in addition to \$8 million previously paid out. The settlement was intended to resolve more than 100 lawsuits brought in the US and a dozen in Canada [344].

Sourcing of materials from external vendors always brings some level of quality risk. In comparison to hard goods (such as electronics), where testing is often straightforward and 100% inspection is an option,

The pet food and dairy crises both illustrate the risk of deliberate adulteration of procured ingredients. However, the dairy episode is not purely a failure case of outsourcing, as employees of the brand-owning companies themselves were complicit through the cover-up. This illustrates the need for monitoring of not only the external delegates in the chain of supply, but also the in-house ones.

China's involvement in numerous cases of product contamination in the last few years has intensified a global suspicion of products "Made in China." But it would be overly simplistic to cite a lack of ethics as the main root cause. Roth et al. [338] and Tang and Babich [369] provide more nuanced analysis.

food quality is especially difficult to assure. One reason is that inspecting food often makes it unsaleable. Also, testing for all possible food quality issues is impossible since the number of potential contaminants is virtually limitless. Minor deviations in production processes can compromise stability or shelf life in ways that are not immediately observable. Since special handling during transit is often required, new problems can easily arise after food products pass any exit inspections conducted in the controlled factory environment [338].

2.6 Cisco's \$2.25 billion inventory write-down

Cisco Systems, a leading name in telecommunications networking equipment, was one of the darlings of the dot-com boom of the late 1990s. During that era Cisco was briefly the most valuable company in the world by virtue of a stock market capitalization of over \$500 billion.

The so-called "New Economy" meant unprecedented rates of change, which favored the lean and nimble. Avoiding ownership of ponderous assets such as factories was seen as a means to the agility necessary to thrive in such an environment. President/CEO John Chambers described Cisco's implementation of this idea:

"Our approach is something we call 'global virtual manufacturing.' First, we've established manufacturing plants all over the world. We've also developed close arrangements with major CEMs (contract equipment manufacturers). So when we work together with our CEMs — and if we do our job right — the customers can't tell the difference between my own plants and my CEMs' in Taiwan and elsewhere" [233].

Cisco even used its own supply chain excellence in its marketing message, as an exemplar for how a global patchwork of resources could be seamlessly unified into a "single enterprise" by the power of telecommunications networking (which, naturally, relied heavily upon Cisco gear). This strategy promised reductions in cost and inventory levels, faster time-to-market and time-to-volume, dramatic scalability,

and enhanced responsiveness to customers, with much of the product physically bypassing Cisco altogether on the way from factory to end customer [67, 92, 174, 380].

The denouement is familiar by now: in the third fiscal quarter of 2001, with the dot-com bust underway, Cisco wrote off \$2.25 billion of inventory. Cisco's stock price spent much of 2001 at well under \$20 a share, whereas it had reached an all-time peak near \$80 just the previous year. The share price has largely remained below \$25 since then.

Hindsight easily calls to question how Cisco and others seemed to have been blindsided by this collapse in demand. Certainly they were not the only ones guilty of irrational exuberance during that era. But the Internet networking equipment industry in particular was too young to have seen bad times, so over-optimistically extrapolated its past growth into the foreseeable future. This led Cisco and its peers to double or even triple order chips, capacitors, and resistors from component suppliers and distributors as a way of assuring access to parts expected to be scarce. The worst-case scenario transpired when end customers not only abruptly stopped buying, but also under duress flooded the market with like-new surplus equipment [44, 372].

OEMs,⁵ especially for emerging technologies like Cisco's, focus on early penetration and rapid market share growth. They usually enjoy margins richly enough to justify maintaining a cushion of surge capacity and inventory that can be quickly diverted to breakout products. Outsourcing encouraged this to an extreme, since without having to directly attach these assets to their own balance sheets the OEMs could seemingly have their cake and eat it too. The contract manufacturers were happy to oblige as long as the OEMs were willing to sign the contracts and bear the downside risks [132, 233, 285]. In this kind of arrangement everyone wins as long as demand continues to boom. But no market grows forever.

Outsourcing did not push this sector's market demand off a cliff. But the outsourced supply chain model was complicit in handicapping OEMs like Cisco from seeing the storm clouds and preparing for rain. The node in the supply chain that could have provided a reality-check

⁵See Section 5.1 for a discussion of this term.

had neither the direct incentive nor the clout to do so. In the summer of 2000, Ajay Shah, CEO of the Technology Solutions Business Unit of contract manufacturer Solelectron, had customers from every corner begging for more manufacturing capacity. Even so, his forecasts were slowly diverging from those of his customers in the networking equipment sector, including Cisco. His were less optimistic, based on his superior visibility across a broader swath of the sector and the general economy. But conveying a dissenting view to the customer is a delicate matter. Shall noted,

“Can you really sit there and confront a customer and tell him he doesn’t know what he’s doing with his business? The numbers might suggest you should. At the same time, I’d like to see someone in that conference room doing it” [50].

An in-house production manager at the OEM might have been more willing and able to sound an alarm.

This case study is perhaps not as gripping as some of the ones presented earlier. It contains no human rights violations or imagery of beloved pets in sickened states. The brand involved is not one that mainstream consumers interact with intimately. This was just a very bad business outcome that derived from good intentions. It is noteworthy due to the sheer magnitude of impact, and the subtle connection to how the outsourcing relationships were organized.

These case studies are not intended to condemn the practice of supply chain outsourcing, which is not going to vanish. They are best seen as describing flawed implementations of potentially useful concepts, highlighting the need for caution, vigilance, and discipline. Most of the above names are fantastically profitable and are considered role models of supply chain management.⁶ From this we can conclude that even the most successful firms can have difficulties managing the outsourced supply chain. The remainder of this monograph will provide readers with frameworks and knowledge to hopefully avoid breakdowns such as in the above case studies, which will be revisited along the way.

⁶Apple, Amazon, Cisco, and Nike are perennials on Gartner’s Supply Chain Top 25 [195].

3

Advantages and Disadvantages of Outsourcing

Even if, as noted in Section 1.1, the term “outsourcing” might be fairly new, the actual practice is not. Because no organization can do everything itself, each one must choose a division of labor in every endeavor, defining its own roles and ceding any remaining duties to other parties. The key questions are which activities and to what extent.

Bodies of foundational theory have provided conceptual frameworks that inform these questions. Key elements of Transactions Cost Economics, Principal-Agent (Agency) Theory, the Resource-based View (of the Firm), and the Knowledge-based View (of the Firm) are noted in Section 3.1.

The decision naturally relies on juxtaposition of the advantages and disadvantages that accrue to the party that outsources.¹ Major ones are listed in Figure 3.1 and explained in Sections 3.2 and 3.3, respectively.

¹The discussion could be further structured by separating barriers/enablers (“things that make outsourcing easy/difficult”) from advantages/disadvantages (“good/bad things that result from outsourcing”). However, such a distinction is somewhat artificial and can become convoluted. For instance, a barrier to outsourcing (e.g., shortage of qualified service providers) can be directly mapped to a disadvantage of outsourcing (e.g., dependence on service providers who may have performance problems and will act in their own self-interest). The barrier/enabler

Advantages (Section 3.2)	Disadvantages (Section 3.3)
• Focus on "core" • Financial/operational flexibility • Cost efficiencies due to specialization, scale, and risk pooling • Access to new capabilities or knowledge • Increase quality of service • Create distance from undesirable activities	• Difficulty of communication and coordination • Loss of ability to perform the outsourced task • Dependence on service providers who may have performance problems and will act in their own self-interest • Discomfort for in-house staff • Leakage of scale advantage to smaller competitors

Figure 3.1: Advantages and disadvantages of outsourcing.

Section 4 then sketches out key stages throughout the lifecycle of the decision to outsource or not, from the point of initial consideration through termination. Sections 3 and 4 will maintain generality because so many of the motivations and implications are common to any type of outsourcing. This thread can apply to the outsourcing of corporate IT, legal counsel, housekeeping, event planning, architectural design, or any other function that can be procured. The logic should be relevant for outsourcing at any scale, whether a multimillion dollar contract by a Fortune 500 company or a mundane transaction in an individual household. However, the language throughout this monograph will tend to center on initiatives of greater size and complexity because of the richness of the issues.

3.1 Constructs from foundational theory

Various bodies of foundational theory comment on the benefits, costs, and risks of outsourcing. Those theories include Transactions Costs

perspective perhaps focuses more on conveying when and to what extent the specific advantages and disadvantages will arise. This is integral to the insource-versus-outsource decision calculus, so is better addressed in Section 4.5. What matters most is that all the relevant factors are included somewhere in the framework, and our approach to organizing the arguments accomplishes that.

Economics, Principal-Agent (or Agency) Theory, the Resource-based View of the firm, and the Knowledge-based View. Doing any one of them justice would easily require several books. This monograph does not have that intent, nor will it advocate any of the theories over the others. The modest objective here is to provide something of a glossary of key theoretical concepts and terms. Illustrations of many of the ideas will arise throughout the monograph.

Transactions Costs Economics (TCE) posits that “transactions costs” (e.g., costs of search, contracting, negotiating, monitoring, and dealing with changes/disagreements) are a key determinant of an organization’s extent of vertical integration [94, 403, 404]. The principal conclusion of this literature is that firms outsource (thereby relying on outside “markets”) when those transactions costs are tolerable, and insource (using internal “hierarchies”) as a way to avoid outsized transactions costs. Melvor [269] provides this concise statement of TCE concepts:

“The primary factors producing transactional difficulties include bounded rationality, opportunism, small numbers bargaining, and information impactedness... Bounded rationality refers to the cognitive limitations of the human mind, which increases the difficulties of understanding fully the complexities of all possible decisions. Opportunism refers to decision makers acting with guile, as well as out of self-interest. Small numbers bargaining refers to the degree to which the buyer has alternative sources of supply to meet its requirements. Information impactedness refers to the presence of information asymmetries between the buyer and supplier, which means that either party may have more knowledge than the other. These transaction difficulties and associated costs increase when transactions are characterized by asset specificity, uncertainty and infrequency.

Asset specificity refers to the level of customization associated with the transaction. Highly asset-specific investments represent costs that have little or no value outside the transaction. The costs can be in the form of

physical asset specificity (level of product or service customization), human asset specificity (level of specialized knowledge involved in the transaction) or site specificity (location). Asset specificity can be non-specific (highly standardized), idiosyncratic (highly customized to the organization) or mixed (incorporating standardized and customized elements in the transaction). TCE asserts that the potential for opportunistic behavior is most likely when an exchange requires one or both parties to make significant transaction-specific investments, since such investments create quasi-rents that are subject to the hold-up problem. When asset specificity and uncertainty is (sic) low, and transactions are relatively frequent, transactions will be governed by markets. Hierarchical governance occurs when uncertainty and high asset specificity lead to transactional difficulties. Medium levels of asset specificity lead to bilateral relations in the form of co-operative alliances between the organizations — intermediate governance. Although asset specificity, uncertainty and frequency are all important variables, asset specificity is regarded as the most critical.”

The Nobel Prizes for economics in 1991 (Ronald Coase) and 2009 (Oliver E. Williamson) recognized the impact of TCE.

Principal-Agent (or Agency) Theory [126], which focuses on relationships in which one party (the principal) delegates work to another (the agent), has been used to analyze various types of transactions costs, called “agency costs” in this framework² [35, 248, 284, 414]. This framework highlights the “moral hazard” inherent in any relationship in which the principal’s goals conflict with the agent’s goals, and the principal has difficulty verifying the agent’s actions (i.e., asymmetric information, specifically incomplete information on the principal’s part). “Adverse selection” is a consequence of asymmetric information, such as when a principal’s focus on cost disproportionately attracts

²Neither transactions costs nor agency costs are necessarily out-of-pocket costs. They could be opportunity costs or risks. And they might show up in the accounting records in a way that is hard to tie to the activity in question.

agents with inferior work ethic or higher-than-desired tendencies to take risks. Principal-Agent Theory emphasizes incentives, and seeks contracts/monitoring mechanisms/compensation schemes that can reduce the impacts of incentive conflicts and information asymmetry. Although the agent in the classical scenario is an individual, nothing in the framework prohibits imagining a service provider firm in that role.

The Resource-based View (RBV) draws its name from the seminal piece by Birger Wernerfelt [398]. One of the major conceptual frameworks in the study of strategic management, RBV builds upon many of the same works that influenced TCE. In RBV, the firm is an aggregation of resources that can create competitive advantage if deployed appropriately. McIvor [269] summarizes the criteria of Barney [41] and others for identifying such resources:

“A resource with the potential to create competitive advantage must meet a number of criteria, including value, rarity, imitability and organization. Resources and capabilities are considered valuable if they allow an organization to exploit opportunities and counter threats in the business environment. The rarity criterion is related to the number of competitors that possess a valuable resource. Clearly, where a number of competitors possess a valuable resource, then it is unlikely to be a source of competitive advantage. The imitability criterion is concerned with considering the ease with which competitors can replicate a valuable and rare resource possessed by an organization. In effect, this analysis is concerned with determining the sustainability of the competitive advantage in the resource. Finally ... a firm must be organized to exploit its resources and capabilities. The organization criterion includes a number of elements, including the reporting structure, management control systems and compensation policies.”

The RBV posits that resources that contribute to competitive advantage should be internalized within the organization instead of being put at risk by outsourcing. Complementary capabilities can be obtained from external providers.

The Knowledge-based View (KBV) of the firm [166, 227] can be viewed as an extension of RBV that considers knowledge as the resource with the greatest impact on a firm's competitive advantage. In KBV a key driver of insourcing is the presence of important tacit knowledge that must be shared between activities (one residing within the firm and another being considered for outsourcing). This sharing can happen more easily within a firm than with a separate entity. While such knowledge is often high in asset specificity, a key difference between KBV and TCE is that KBV does not rely on the assumption of opportunistic behavior as the motivation to maintain certain activities in-house. Outsourcing is also a way to utilize superior knowledge that resides outside the firm. The success of the outsourcing will depend on the nature (quality and accessibility) of the firm's knowledge of the outsourced activity as well as the firm's learning capability [72].

These theories are tremendously helpful in framing the discussion of outsourcing. At the same time, a few caveats merit mention. These theories are conceptual and explanatory vehicles that do not by themselves offer any new methodology for quantification. The theories are distinct but not alternatives, as they have many ideas in common and share many influences. (TCE has special status as the earliest of these theories to emerge, and had a role in shaping the others.) They can frustrate when taken as a set, because they can lead to different conclusions [269, 377, 412]. This is not necessarily because any of them directly contradict the logic of the others, but because they all differ in the relative weight assigned to the salient factors.

3.2 Advantages of outsourcing

Some outsourcing is purely a means to obtain additional capacity for performing a well-defined task of little strategic consequence. In these cases the advantages and disadvantages are very straightforward and explicit, and merit little further discussion.

This monograph considers cases beyond these, which have a breadth of motives and implications. Outsourcing may enable the outsourcing party to better focus on those important activities that have been

retained in-house. Service providers may provide savings or capabilities not available internally. Outsourcing may enable a firm to distance itself from high-liability or otherwise undesirable activities. And service providers may be more motivated than internal employees. These potential advantages will be explored below.

3.2.1 Focus on “core”

A theme that arises in many modern business conversations about outsourcing is paraphraseable as “Focus on your core competencies,³ and outsource everything else.” The underlying premise is that focus is valuable, and outsourcing can eliminate distractions. Below we explore the roots and variants of this idea.

Prahalad and Hamel popularized the notion of core competency in a 1990 *Harvard Business Review* article [316]. Their core competencies, of which most firms will have not more than five or six, are defined by three key attributes:

- they provide potential access to a wide variety of markets;
- they make a significant contribution to perceived customer benefits of the end product; and
- they are difficult for competitors to imitate.

That article’s basic message is that an organization can maximize its competitive advantage by identifying its core competencies and organizing activities around them. This theme is highly reminiscent of the RBV [269]. Prahalad and Hamel deem the outsourcing of core competencies

³A semantic matter is whether the second word in the term should stand for “competence” or “competency.” The OED views these as interchangeable. Neither “core competence” nor “core competency” appears in the OED as of February 2014. Google searches on February 10, 2014, provided the following numbers of results:

“core competence” and “core competences”: ~1,290,000 and ~514,000, respectively

“core competency” and “core competencies”: ~576,000 and ~1,750,000, respectively

Interestingly, for singular references the “competence” version dominates the “competency” one, but the relative frequency of use is reversed when pluralizing.

to be a strategic error of the highest order, but make no pronouncement about how to handle the noncore activities.

Quinn and Hilmer [323] directly advocated the goal of outsourcing everything that is not core. They defined core competencies as:

- skill or knowledge sets, not products (which can be reverse-engineered) or functions (since core competencies tend to cut across traditional functions, e.g., production, engineering, sales, finance);
- flexible, long-term platforms that are capable of adaptation or evolution;
- limited in number to perhaps two or three (more than one, but fewer than five);
- unique sources of leverage in the value chain;
- areas where the company can dominate;
- elements important to customers in the long run; and
- embedded in the organization's systems (rather than dependent upon key individuals).

In the eyes of both sets of authors, core competencies are not “things we do very well or very often,” but instead are “things that are strategically important.” These are rarely confined to individual product departments or functional areas.⁴

Geoffrey Moore of The Chasm Group [278] has articulated the notion of “core versus context,” which has influenced strategy at firms like Cisco [263, 279]. This defines “core” as those activities that differentiate a company in the marketplace and thereby drive the company stock's valuation, while “context” is everything else the company does. Moore advises assigning the best people to the core while outsourcing as much of the context as possible.

⁴Current usage has become somewhat of a perversion of what the source references expound, as evidenced by oft-heard statements such as “We outsource manufacturing because design and marketing are our core competencies.” Perhaps this can be reconciled through the way the term's meaning has evolved since the early 1990s, which is captured in far too many articles to document here.

Peter Drucker has argued that a firm should “outsource everything for which there is no career track that could lead into senior management,” thereby proposing a way to infer what is truly important to the firm (which is needed to identify core competencies). The pursuit of focus underlies Drucker’s idea that outsourcing can “greatly improve the quality of the people who still work for you,” by offloading tasks that insiders do not perform often enough to achieve the excellence of a specialist [342].

3.2.2 Financial and operational flexibility

Outsourcing can increase financial and operational flexibility by converting some fixed costs to variable costs. This means avoiding ownership of, say, a factory or cargo ship, by instead leveraging someone else’s as needed and paying on the basis of the capacity used. This is sometimes called “paying by the drink” in business slang, a favorite phrase of Amazon founder/CEO Jeff Bezos in promoting the suite of computing and marketing/distribution channel services his company sells [259].

Flexibility can be obtained in the human resources as well. In-house labor costs are only flexible to the extent that the employers hire and fire as demand fluctuates (or at least cut and add shifts, or perhaps pay on piecework basis), which they are often reluctant or unable to do. Outsourcing thus becomes especially beneficial in parts of the world where labor laws make eliminating internal employees particularly difficult (e.g., in India [36] or parts of Western Europe), but are silent with respect to scaling down or terminating a contract with a service provider firm.

Separating asset ownership from usage opens the door for creativity in structuring the payment scheme to better fit the outsourcing party’s needs. This is a form of financial flexibility as well. An example is the “power by the hour” (a term coined and trademarked by Rolls-Royce) relationship structure, also known as “performance based logistics” in defense and aerospace industries. In this type of contract, an equipment vendor charges per hour of usage, inclusive of maintenance and repair, rather than the more complicated conventional approach of selling the hardware and billing separately for any after-sales service [224, 226].

Running an operation that is lean in capital assets and full-time personnel can directly enhance company valuation by making a firm look more productive to outside parties, such as Wall Street analysts, who might focus on metrics such as return-on-assets or revenue-per-employee. These metrics, by the way, overlook many of the hidden costs that will be discussed later.

3.2.3 Cost efficiencies

How might shifting a task from one party to another create net value for the system, as opposed to simply moving costs around? Service providers ostensibly enjoy superior cost structures due to specialization, scale economies, and “risk pooling” (balancing the peaks in some customers’ needs with the valleys in others). These arise because the service provider is positioned to collect tasks from across multiple clients that would be less efficient for each client to perform on its own. Chopra and Meindl [87] call this “aggregation,” with benefits that can manifest in areas such as capacity, inventory levels, transportation, warehousing, procurement, information (consolidation into a single repository, thus reducing search costs), receivables (pooling of default risk and achieving scale in the collections process), and relationships (creating a single point of access to a multitude of partners or customers).

Of course the benefit to the outsourcing party will depend on if and how the service provider shares these savings. Something that creates value for the system might yet be detrimental to an individual part of the system. For instance, many forms of the aforementioned aggregation efficiencies arise because a service provider holds capacity or inventory that is, in essence, shared by its customers. However, if the service provider discriminates when allocating the capacity or inventory in situations of shortage (e.g., the customer with the larger contract always gets priority), the non-favored customers might have been better off holding dedicated resources in-house.

3.2.4 Access to new capabilities or knowledge

Outsourcing need not be about replicating an existing function. An outside party may offer competencies that are simply not available

any other way. This may be because a specialist can cost-justify large investments in certain skills or equipment.

A service provider that works with diverse clients is positioned to perform “knowledge brokering.” This refers to the cross-pollination of ideas across disparate settings. The industrial design firm Design Continuum that helped create the Reebok Pump athletic shoe (released in 1989 and popular throughout the 1990s) exemplified this phenomenon by drawing upon ideas from inflatable splints, medical IV bags, and tiny pumps and valves used in diagnostic equipment [182]. Had Reebok’s internal designers worked alone they might never have had the notion or means to incorporate these structural elements.

Linder [244] defined four types of candidates for “transformational outsourcing,” each seeking a distinct type of fundamental change: (1) “startups,” which need partners to launch a novel idea to market and scale the business quickly, (2) “crouching tigers,” which outsource to fix a key process that obstructs growth, (3) “fallen angels,” which outsource to signal broad change and focus on adding value, and (4) “born-again organizations,” who need to dramatically improve core operating capabilities in order to survive. The first two types of firms seek quick access to capabilities that fall beyond current capital constraints, and are less concerned that the outsourced services might be more expensive than what could hypothetically be achieved in-house. A change in the financial circumstances might lead to insourcing. The latter two types aspire to simultaneously achieve strategic change and cost reduction, and outsourcing should be made permanent if it accomplishes these goals.

3.2.5 Increase quality of service

Outsiders may actually provide better service with fewer headaches than would a company’s own employees. This could simply be because outsiders are easier to terminate and therefore ought to be more willing to please [120, 388]. This can become a disadvantage, though, if the outsiders do not feel empowered to challenge the client on unreasonable or unwise requests [8]. This dynamic was present in the Cisco-Soletron case study of Section 2.6.

3.2.6 Create distance from undesirable activities

Outsourcing can provide a means to create distance from actions that might damage one's reputation or image, such as being a pit bull in negotiations, taking liberties with the truth in dealing with the public or the media, or even breaking laws. This may be intended to create plausible deniability or a buffer from liability [49]. Nike's initial response to accusations of using sweatshop labor in its supply chain (Section 2.4) had such a flavor: those were someone else's factories. This theme also arose in a recent fire with 1000+ fatalities at a Bangladeshi factory making apparel for Walmart and others [6, 275], and hardball practices by the bill collection agency hired by nonprofit hospital operator Fairview Health Services [337].

If the situation turns ugly, the client can feign shock and disgust before terminating the service provider in a highly public fashion. The service provider presumably understood the prospect of being scapegoated to be an unspoken part of the deal all along and built appropriate compensation into the original fee structure. Cynics might interpret this as an insurance premium paid by the outsourcing party.

3.3 Disadvantages of outsourcing

The surveys mentioned in the opening of Section 2 described ongoing interest in outsourcing, but respondents on those and other broad-based surveys have identified points of disappointment. Section 2 contained extended examples of outsourcing gone wrong.

Publicly available information about outsourcing might even underreport the failure rate. Most news articles are written during the honeymoon period just before or after the contract is signed, when the bulk of the benefits are still a long way from becoming reality. Failed outsourcing projects are rarely publicized, as the outsourcing parties seek to protect their own reputations and avoid retribution from the service providers [45].

This section will describe the disadvantages of outsourcing. These include difficulty of communication and coordination with service providers, loss of ability to perform the outsourced task, dependence

on service providers who may have performance problems and will act in their own self-interest, discomfort for in-house staff responsible for managing service providers, and leakage of a firm's scale advantage to its smaller competitors.

A decision maker can easily overlook or underweight many of these disadvantages since they might not present as immediate out-of-pocket costs. The best contemporary advice about managing outsourcing emphasizes awareness of all the relevant costs and risks, both the explicit and the nebulous, and both the short-term and the long-term. Here the concept "total cost of ownership" (TCO or TCOO⁵) is often invoked. The wisdom of this logic is not in dispute. The difficulty lies in the quantification, as discussed in Section 4.4.

3.3.1 Difficulty of communication and coordination

Perhaps the most obvious and immediate disadvantage is that outsourcing increases the difficulty of communication and coordination. This would be classified as a transactions cost by TCE and is also a key consideration in the KBV (cf. Section 3.1). A persistent challenge even among internal stakeholders, communication can be harder by an order of magnitude when attempted across corporate boundaries. Different firms often have computer systems that do not talk well with each other. Information that might be exchanged more informally among employees within one firm must instead be codified in emails, memos, and reports. These documents have to be written in a more airtight way, since ambiguity between firms can have financial consequences or lead to litigation. And any desired changes over time usually need to go through a chain of approval on both sides. The degree of difficulty rises further when an ocean is inserted between the parties by offshoring, either literally or metaphorically due to differences in language, culture (national, corporate, or both), or mindset.

The complexity, fragmented decision making, and broken information flows can often be countered by process redesign and investments in additional human and information technology resources. This could

⁵TCOO sometimes refers to "total cost to own and operate," which conveys the same idea as TCO.

be taken to suggest that improvements in IT will impel outsourcing by reducing the costs of remote transactions and communications [73], which was one of the underlying premises for Cisco's "global virtual manufacturing" model outlined in Section 2.6.

3.3.2 **Loss of ability to perform the outsourced task**

Outsourcing of a critical capability puts it at risk, especially when the conduct of the activity is based on tacit knowledge. This kind of knowledge is learned by experience, and communicated indirectly, through metaphor and analogy, as opposed to explicit knowledge, which can readily be captured in manuals and procedures. The likelihood of retaining tacit knowledge as institutional knowledge (sometimes called "tribal knowledge") is higher when the activity resides in-house. Thus any outsourcing must be coupled with great efforts to codify whatever tacit knowledge is at risk, and even then the challenges are great. Success in this endeavor is a double-edged sword: a firm's effectiveness in codifying such knowledge for its own protection can open the door for that knowledge to be acquired and exploited by competitors [167]. The KBV (Section 3.1) accentuates the protection of key knowledge assets.

Critics of Boeing's 787 outsourcing approach (Section 2.1) raised concerns about the erosion of essential tacit knowledge, referring to the nuances involved in applying complicated engineering concepts to develop a jet airliner. Said Tom McCarty, president of the Society of Professional Engineering Employees in Aerospace (SPEEA) local representing Boeing engineers in the Puget Sound region:

"It's a very unique skillset. And schools don't turn out people who know how to do that. And there is a culture that has developed the composite knowledge of all those skills ... As we outsource part of this work, we're removing opportunities for learning this trade, for learning these skills" [306].

The stakes are high since the tacit knowledge at risk might be critical not just to completing the task at hand, but also to future innovation [290]. Pisano and Sliem [310, 311] make this argument specifically about how firms that outsource manufacturing (which might not be seen as

a core competence) jeopardize their ability to create new products and processes (which would be core).

3.3.3 Dependence on service providers who may have performance problems and will act in their own self-interest

To the extent that outsourcing compromises critical capabilities in the present and future, it increases dependence on service providers. This creates susceptibility to service providers' performance problems, holding hostage of critical assets (like scarce parts or custom tooling), using their clients' product or process knowledge to benefit the firms' competitors, or even the service providers going into competition with their clients [29, 310]. These concerns are all raised by TCE. Examples follow.

Financial stability of the service provider is a key determinant of the service provider's ability to perform. Indeed, in a recent KPMG survey to determine the relative importance of service provider attributes, the most respondents deemed financial stability as mission critical [143]. In 2009 Satyam Computer Services Ltd. (since renamed as Mahindra Satyam) was caught egregiously falsifying its balance sheets in a scandal through which it earned the label "the Enron of India." In fact the formerly high-flying IT services firm was in dire financial straits, and was left essentially rudderless as the executives on duty were consumed by the legal fallout. Peter Barta of the advisory firm Everest Group described the outlook for Satyam's clients as they raced for a back-up solution: "How do I get a good deal when I'm hostage to a bad situation, and need someone to rescue me? And not all of Satyam's customers are desirable to other suppliers. Perhaps not at the price or for the kind of work" [117].

Due diligence in outsourcing therefore must address any doubt about the service provider's financial stability. This includes asking for financial records as part of the request-for-quote (RFQ) and attempting to verify them independently. Firms like HP formally incorporate these findings into the supplier selection methodology [211]. However, the risk cannot be completely eliminated, so long as the data is at least in part self-reported. As the case of Satyam showed, records can be faked, and

even reputable auditors can be fooled or simply negligent.⁶ Section 4.3 explains the magnitude of resources that should be invested in due diligence, especially for high-stakes programs. Section 4.7 stresses the need for ongoing monitoring.

An example of a service provider allegedly holding key assets hostage is the case of Flextronics (a contract manufacturer of electronics) and Beckman Coulter (a seller of test equipment to medical labs and drug companies). In 2003 a California jury ordered Flextronics to pay \$934 million for breaching its contract to produce circuit boards for a blood analyzer designed by Beckman Coulter. The 5-year contract had originally been signed in 1997 by contract manufacturer Dii Group Inc., acquired by Flextronics in 1999. Beckman alleged that prior to prematurely terminating the contract in 2000, Dii/Flextronics had demanded additional payments and refused to relinquish crucial materials unless Beckman also bought unrelated parts. The case ultimately settled for \$23 million [158, 374]. This amount compensated Beckman in excess of actual damages and legal expenses, but that was little consolation. The outsourcing failure had jeopardized the company's future and the litigation was a major distraction for more than two years.

Also from 2003 comes an example of a service provider suspending service to its client and then become a direct competitor. That year Jones Apparel Group, which for the eight years prior had overseen production and delivery for various apparel categories for Ralph Lauren, slapped Lauren with a \$550 million breach of contract lawsuit and abruptly halted production of the Lauren portfolio. The conflict arose because the two firms could not agree on a royalty rate. In response Lauren accused Jones of bland designs and cutting corners on quality. On abruptly terminating the contract Jones unveiled its Jones Signature line, which it had been quietly preparing to compete directly with Lauren in case negotiations failed [47].

And of course in Section 2 we learned of the travails of Boeing and Menu Foods in dealing with unauthorized subcontracting and upstream quality failures, and Toyru.com in finding that Amazon had neglected

⁶Satyam's auditor was PricewaterhouseCoopers [117].

the relationship and then breached their contract to partner with rival toy sellers. This is all to say that even when you are the one in an outsourcing relationship signing the checks, you might have less power than you think.

Recurring themes in the above examples are conflicts of interest and the potential for opportunism by service providers, as underscored by the Principal-Agent framework (cf. Section 3.1). Conflicts arise because, no matter how strong the business relationship, independent parties fundamentally have their own interests at stake. This tension can be addressed through the normal negotiation and contract-writing process, as long as behaviors on both sides are fairly transparent. Limitations in the outsourcing party's ability to dictate and monitor the crucial details of the provider's actions (which are only exacerbated by any geographic or cultural separation) create the possibility for a service provider to deliberately act against its client's best interests [285]. As noted in Section 2.4, Nike has certainly discovered that more than a decade of extensive monitoring has not eliminated labor policy violations among its suppliers. Oversight of service providers can be particularly baffling for organizations whose institutional knowledge of the intricacies of the outsourced activity have been lost over time, or never existed in the first place [20].

A common hedge against supply risk of various sorts is to work with multiple vendors. This preserves a pool of qualified sources which are kept sharp by healthy competition, and provides data and context for benchmarking. Firms that are particularly concerned about intellectual property loss sometimes chop up the outsourced activity and delegate an innocuous chunk to each of multiple service providers. But these approaches add overhead and engender a separate set of headaches.

Many processes conducted in-house also suffer from some variant of these challenges, but at least play out under the auspices of the company's own internal checks and balances and among actors with ostensibly common goals. However, many companies equate outsourcing with reductions in resource and staff requirements, and fail to recognize that investments in business controls must actually increase to address the new risks. For some activities, properly overseeing the service provider

may require such intimate involvement that the firm may be better off not outsourcing in the first place.

3.3.4 Discomfort for in-house staff

Besides worrying about service provider risk, outsourcing parties can expect some antagonism from their internal staff. After all, when the word “outsourcing” is uttered, the word “layoffs” often comes not long after. This can demoralize and destabilize the existing workforce, which has the power to sabotage any outsourcing initiative. Consider the labor actions that exacerbated Boeing’s 787 crisis:

“A 58-day strike by 27,000 agitated workers caused further delays into the already delayed Dreamliner program. One of the major issues in this dispute (the second time in three years) was the employees’ concern about their job security, which had been intensified by the extensive outsourcing in the Dreamliner program. What made the unhappy workers even more aggravated was all the travelled work (supplier’s unfinished parts), which they were asked to fix. While Boeing’s employees felt that they were losing their jobs to outside suppliers, at the same time, they were asked to use their considerable experience and expertise to fix all the unfinished works which the inexperienced suppliers failed to complete.” [127].

Sometimes outsourcing simply transfers an activity from one organization to another without any meaningful relocation, in which case the displaced workers might simply shift over to the service provider’s payroll. But if the service provider can do the work more efficiently, outsourcing likely will reduce the total number of jobs available. In any case, changing employers is massive disruption to one’s professional life.

Remaining employees might find their day-to-day duties to have morphed in disconcerting ways. In-house tasks are usually staffed with workers chosen for their technical and process knowledge, much of which is deployed inwardly. Peiscli [304] points out that “Managing

external resources requires an entirely different set of skills than managing the same services internally.” Outsourcing shifts priority to relatively outward-facing competencies such as relationship-building, negotiation, program and project management, and contract management [21]. Critical to getting the work done are the ability to clarify ambiguous specifications and the power to persuade [9].

As many of these skills cannot be exercised effectively from a distance, face time with the service provider becomes critical to the job, especially when due diligence and quality assurance are involved. Outsourcing increases this need due to the intrinsic potential for incentive misalignment when working with outside parties. Joe Sutter, who led the design team that developed Boeing’s 747 jumbo jet, declared that if relying on partners to supply key components, “you better damn well have a high percentage of Boeing guys there looking over their shoulders” [340].

3.3.5 Leakage of scale advantage to smaller competitors

For a firm that represents the lion’s share of its service provider’s business, the aggregation effect of outsourcing may actually backfire by enabling competitors to piggyback off the firm’s own scale economies. Under the right circumstances, insourcing is a legitimate strategy for increasing the costs of a firm’s competitors.

This dynamic appears in Walmart’s taking over of some inbound logistics from its product suppliers. Of the increased transportation-related overhead those vendors will experience, former Walmart executive Randy Huffman explained, “Suppliers are going to have to apply that increased freight cost somewhere, so it’s more than likely it will be passed onto other retailers” [405].

Walmart made an analogous move in 2001 when it stopped sharing its point-of-sale data with information aggregation and analytics specialists such as Nielsen and Information Resources Inc. (rebranded in 2013 as IRI). Walmart was such a large portion of the industry data set that it obtained little new insight by participating, and “had more to gain by keeping competitors — and to some extent, suppliers — in the dark on exactly how things were going” [267]. Circumstances had

changed enough by 2011 that Walmart resumed participation in these surveys.

The next section will explore how outsourcing initiatives begin and end, which includes an assessment of the advantages and disadvantages in the course of deciding if and how to outsource. It will describe how organizational energies and resources should be deployed along the way in order to increase the likelihood of success.

4

Lifecycle of the Outsourcing Decision

Defining which activities a firm should perform is among the most fundamental and profound of management duties, with consequences felt in every day of operation. Contemplation of the pros and cons, as articulated in Sections 3.2 and 3.3, will affirm that the decision merits deep reflection that is best performed away from the influence of herd mentality. The decision-makers must accept that outsourcing is no panacea. It is most prudently understood to be an exchange of one set of headaches for another. Doig et al. [110] caution, "Don't assume that it is easier to manage suppliers than to improve your company's own performance." Skill at making this decision is itself strategically momentous enough to merit consideration as a core competence [148, 164].

"Make-versus-buy" is a traditional term for this challenge, and appears in the index of many business textbooks, especially in accounting, economics, operations, and supply chain management. To avoid the hint of materials-centrism in that term, this monograph will use "insource-versus-outsource" since many such evaluations concern the procurement of services rather than goods.

This section will present key phases in the consideration and ongoing reconsideration of the insource-versus-outsource decision. These include the following:

- initiating consideration of outsourcing;
- finding expertise related to outsourcing;
- organizing to perform due diligence and make the decision;
- defining and prioritizing the goals and quantifying the costs of achieving them;
- making the decision;
- structuring and managing the relationship with the service provider;
- investing resources in process control; and
- terminating the relationship.

We do not presume that every program of outsourcing follows all the steps, follows them in this exact order, or conducts them in a linear and well-compartmentalized fashion.

4.1 Initiating consideration of outsourcing

The subject of relatively little formal study, but of critical practical interest, is the notion of the “trigger point” that at a particular moment ignites serious consideration of outsourcing. In some cases this could be as straightforward as managerial bandwidth freeing up just as the relevant drivers reach sufficient urgency. Other scenarios might have little at all to do with the attributes of the specific activity. Indeed, many events within many organizations come to pass for reasons that are not entirely transparent or logically satisfying.

Monczka et al. [276] postulate the following possible triggers of major outsourcing decisions:

- strategic redirection for the company and the resulting need to downsize or shed non-core businesses, capabilities, or activities;
- the need for new capabilities to support new products or meet new requirements that are beyond the company’s ability to respond with internal resources;

- cost pressures and the need to find radically lower cost alternatives, either due to an earnings shock or the emergence of a new, significantly lower cost competitor; and
- the arrival of a new CEO with experience using outsourcing strategically in a former company.

Related to the last point, in a personal communication a Vice President of the electronics contractor manufacturer Flextronics mused that the most common catalyst for his clients' outsourcing programs is the desire of a new COO or Operations VP to make a mark or shake things up. This presents another motive for outsourcing (or insourcing), albeit one of questionable defensibility: to serve as a "signature" strategic initiative.

The theories reviewed in Section 3.1 largely assume perfectly rational economic thinking and struggle to reflect the political context within the organization, which can include motives such as mentioned above. McIvor [269] presented case studies in which political considerations influenced the mode of outsourcing, for example leading a utility company to pursue a spin-off configuration since employees were perceived to prefer this over being transferred to an independent service provider. In the end this decision process had to somehow incorporate some difficult-to-quantify tradeoffs, although this does not automatically mean the chosen strategy was incorrect or irrational. Mantel et al. [261] used controlled experimental surveys (scenario-based mailed questionnaires to implement a controlled experiment among geographically dispersed subjects) to investigate behavioral factors and biases influencing the insource-versus-outsource decision for the manufacture of a product component. These researchers emphasized that such decisions are made not by firms, but by individuals within firms. Likewise, Bidwell [56] called attention to the role of managers' pursuit of their own intra-organizational interests. This study highlights how outsourcing decisions can be a consequence of the structure that the organization adopts, and specifically of the internal politics created by that structure. The attributes of the activity being evaluated for outsourcing are therefore less important than broadly assumed.

4.2 Finding expertise related to outsourcing

A source of expertise in managing the sourcing of goods and services from external partners is the well-established discipline of purchasing and supply management. This community has established active professional organizations (e.g., the Institute for Supply Management (ISM), founded in 1915), certifications (e.g., the ISM's Certified Purchasing Manager (CPM) and Certified Professional in Supply Management (CPSM) credentials), university undergraduate and graduate degree programs, and a rich body of practitioner and academic literature (e.g., textbooks such as by Monczka et al. [277] and numerous journals). At least one organization is dedicated to the management of outsourcing, the International Association for Outsourcing Professionals (IAOP) that describes itself this way:

“IAOP is the global, standard-setting organization and advocate for the outsourcing profession. With a global community of more than 120,000 members and affiliates worldwide, IAOP is the leading professional association for organizations and individuals involved in transforming the world of business through outsourcing, offshoring and shared services” (<http://www.iaop.org>, accessed February 10, 2014).

Companies that reach a certain size typically already employ procurement specialists whose expertise should be drawn upon by any major outsourcing program. The survey of Monczka et al. [276] reports that companies' procurement organizations tend to be most deeply involved in outsourcing decisions related to supply-side activities: procurement/supply management itself, manufacturing, and distribution/fulfillment. Procurement also is moderately involved in the outsourcing of operations-related activities such as call centers, field service, product development, and engineering and detailed design, as well as corporate support activities such as human resources, information technology, finance, and accounting. Procurement's role is significantly lower in sales, marketing, research, and legal activities. This reflects the traditionally strong linkages between procurement and operations,

especially in manufacturing-oriented firms. The survey data showed a clear positive link between the level of the procurement organization's involvement in the outsourcing process and the degree of success.

This finding by Monczka et al. [276] is consistent with a growing acknowledgement of the strategic import of the procurement function [4, 288, 358]. By extension, success in outsourcing increasingly depends on attracting strong employees to work in procurement or supply management [159], which entails compensating them well and offering professional development opportunities. This contrasts with a past in which "Purchasing offices were ... corporate backwaters, filled with people who didn't dream of advancing to the top rungs of their organizations. Many buyers saw themselves as industrial bureaucrats, filing purchase orders with the same short list of familiar, mostly nearby suppliers" [4].

Smaller firms (and large ones as well, for various reasons) might prefer to look outside their own boundaries to obtain procurement expertise. One option is to work with partners that sell procurement as a service. Section 5.3 will identify some such service providers, which can be pure-play procurement specialists or firms which bundle procurement along with other types of services (e.g., various kinds of intermediaries/brokers, or contract manufacturers on occasion). But a firm that outsources any kind of service, including the procurement function itself, by definition is still internally managing one or more external service providers. So the expertise described in this section is still worth maintaining within the firm.

4.3 Organizing to perform due diligence and make the decision

To whatever extent a firm's insource-versus-outsource decision methodology is systematic or quantitative, for major outsourcing efforts the decision process can (and arguably should) consume much time and effort. In 2005 consumer products firm Unilever NV decided to outsource many personnel-related tasks, such as tracking its 200,000 employees, payroll, training, and most recruiting functions. Unilever executives prepared a 200-page project description for prospective bidders. Seven service provider firms responded, with proposals of

1,000 pages or more. Nine Unilever employees worked full time for five months to assess the bids, visiting 12 processing centers along the way. Unilever hired EquaTerra Inc., a Houston-based outsourcing-advisory firm (acquired by KPMG in 2011) to assist in the evaluation process. (Interestingly, the evaluation process for an outsourcing decision can be cumbersome enough to itself require partial outsourcing.) Together they selected two finalists, interviewed references, and then conducted site visits of two to three days in length. In June 2006, Unilever announced a seven-year contract with Accenture with a value of approximately \$1 billion. The first of eight planned global centers began operating in Britain in November of that year. EquaTerra CEO Mark Toon has noted that after completing the evaluation process roughly one-third of his clients opt not to outsource, mainly because they doubt their organizational ability to handle the magnitude of change [375].

HP conducted a similar type of assessment for a decision on whether to outsource a certain amount of computer hardware production, which included consideration of multiple contract manufacturers and geographic options. The analysis was performed by a Request For Quote (RFQ) Negotiation/Evaluation core team, constituted of representatives with responsibilities for operations, procurement, supply chain engineering, commercial negotiation, finance, logistics, and integration delivery engineering. The project plan allocated roughly five months for the committee to generate a recommendation, with the longest steps being the development of the RFQ guidelines and the creation of the evaluation criteria. The activities of the evaluation team were a large portion of the team members' workload during this time. The structure is representative of HP's approach to such decisions, although this particular program was relatively large even by HP standards [211].

In 2011 the Norton Rose Group (now Norton Rose Fulbright LLP) surveyed 74 firms that participated in outsourcing activities, 69% of which were the outsourcing party and the rest were service providers. 66% of the outsourcing parties and 61% of the service providers thought that due diligence processes had tightened in the preceding two years. Respondents on both sides agreed that capability analysis and financial checks were the most important due diligence activities. The outsourcing parties were particularly concerned about the solvency of potential

service providers. 35% of service providers were prepared in some cases to disclose their margins, which the outsourcing parties tended not to believe anyway. Some service providers emphasized the need to perform due diligence on their customers as well [327].

4.4 Defining and prioritizing the goals and quantifying the costs of achieving them

Clarity about the objective is crucial to the proper framing of any decision problem. Therefore the organization should spend time up front explicitly identifying and prioritizing the desired goals. This should be coupled with efforts to quantify the benefits and what achieving them would entail. Ideally the decision framework will be robust enough to handle situations in which outsourcing increases costs, but the structural change is worthwhile anyway as a means to add critical new capabilities or enhance existing ones. A major obstacle in this exercise is the difficulty of coming up with hard numbers for some of the factors, which are needed to grasp the “total cost of ownership” described in Section 3.3.

Existing accounting frameworks, which already struggle to assess the true cost of performing activities in-house [388], are largely powerless at quantifying abstractions such as a sharpening of organizational focus or the atrophy of the knowledge and capabilities that can be preserved only by regularly doing a task oneself [26]. Measuring the true cost of coordination across organization boundaries is also tricky. The sizes of certain financial flows appear explicitly in the contract, and salary impacts can be tallied. But how does one measure an increase in the difficulty of communication? How does one put a price on the increased risk of opportunistic behavior by service providers, the possibilities of which are limited only by one’s imagination? Labeled as transactions costs or agency costs in Section 3.1, these are much more elusive than explicit out-of-pocket costs.¹

¹Some analysts use a cost adder term (much like the way traditional accounting allocates overhead) to incorporate hidden costs into the make-versus-buy cost-benefit analysis. While methodologically suspect in many ways, this at least avoids the obvious mistake of treating those costs as zero.

4.4. Defining and prioritizing the goals and quantifying the costs 55

Decision makers can easily fall into the trap of prioritizing those factors that can be observed or quantified while ignoring the ones that cannot. This bias can lead to unintended consequences because, as the old saw in management warns, “You get what you measure.”

As noted in Section 3.2.2, by avoiding ownership of fixed assets outsourcing can indeed improve an organization’s standing vis-à-vis various metrics that investors use for valuation, such as return-on-assets or revenue- or profit-per-employee. Critics would argue that imprudent outsourcing could reduce the numerator of those ratios significantly as well, such as when customer service or product quality is compromised. Those critics would also intimate that decision-makers whose compensation is tied to short-term improvements in stock price might have a hidden agenda. Explicit financial motives of individual employees aside, publicly traded companies feel pressure to show good results on a quarterly basis. But the full ramifications of outsourcing might take a while to play out, possibly too long to establish causality or impose accountability for the decision.

In a 2011 speech at Seattle University, Boeing Commercial Airplanes Chief Jim Albaugh, who was not involved in designing the 787 Dreamliner’s outsourcing strategy, acknowledged the folly of fixating on financial metrics of this sort:

“Part of what had led Boeing astray was the chasing of a financial measure called RONA, for Return on Net Assets. This is essentially a ratio of income to assets and one way to make that ratio bigger is to reduce your assets. The drive to increase RONA thus spurred a push within Boeing to do less work in-house — hence reducing assets in the form of facilities and employees — and have others do the work” [156].

The decision logic of Boeing’s leadership appears to have underestimated the communication and coordination challenges of working with a global network of contractors, the strategic value of the assets outsourced, and potential for the contractors to extract the lion’s share of the profits from the supply chain.

This drive to divest in-house assets can be intensified by a distortion created by standard cost accounting. Bettis et al. [54] observed that

when an activity is partially outsourced, certain overhead costs (which were not liquidated in the course of outsourcing) tend to be allocated to the activities that remain in-house, making those activities look even worse relative to outside alternatives. This fallacy can make outsourcing a self-reinforcing state. Hart-Smitli [187] directly warned Boeing of this phenomenon long before the 787 outsourcing crisis.

Another manifestation of “you get what you measure” is when the metrics lead to an overly localized perspective. Consider the procurement managers who are rewarded for reducing the cost of the bill of materials, but do not bear direct responsibility for warranty costs incurred downstream. They are only acting rationally by outsourcing to the lowest-cost vendor, while underweighting quality and reliability. The real blame lies with the incentive scheme.

Attempts to articulate a comprehensive and workable set of metrics will sometimes reveal that the firm does not have the activity under control even when done in-house. This does not bode well for successful outsourcing, and consequently Allen and Chandrashekar [8] and Aron and Singh [28] discourage outsourcing a process until it is well-understood and has coherent metrics.

4.5 Making the decision

The progression from Section 3 through the preceding parts of this section laid out advantages and disadvantages of outsourcing, and proposed some ways to think about the goals. The next step is to integrate all these pieces to produce an actual decision.

Published guidance is plentiful. Most of the proposed decision frameworks are qualitative lists of issues to consider or questions to ask (possibly organized into a flowchart), and rely a great deal on managerial judgment. This is not to say that computations cannot play a role. But, as this monograph has already established, many of the salient costs, benefits, and risks can be estimated only subjectively, and the decision-maker must consider numerous multidimensional tradeoffs. This is not a criticism of the extant approaches, but an acknowledgment of the complexity and context-specificity of the problem. Here we

will sketch as illustrative examples a few such insource-versus-outsourcing decision frameworks.

Section 3.2.1 mentioned the school of thought that advocates focusing on core competencies and outsourcing everything else, a thread that can be traced through Prahalad and Hamel [316] and Quinn and Hilmer [323]. This seems straightforward, but identifying core competencies is a nontrivial task, and is far easier to do retrospectively. Strategic significance is rarely easy to ascertain in advance. Furthermore, this heuristic oversimplifies by ignoring the difficulty of finding appropriate service providers and working well with them.

Quinn and Hilmer [323] acknowledge this limitation, echoing the themes of TCE:

“If supplier markets were totally reliable and efficient, rational companies would outsource everything except those special activities in which they could achieve a unique competitive edge, i.e., their core competencies. Unfortunately, most supplier markets are imperfect and do entail some risks for both buyer and seller with respect to price, quality, time, or other key terms. Moreover, outsourcing entails unique transaction costs — searching, contracting, controlling, and recontracting that at times may exceed the transaction costs of leaving the activity directly under management’s in-house control.”

The capabilities and limitations of the supply base are teased out in Quinn and Hilmer’s seven-part framework:

1. Do we really want to produce the good or service internally in the long run? If we do, are we willing to make the back-up investments necessary to sustain a best-in-world position? Is it critical to defending our core competency? If not,
2. Can we license technology or buy know-how that will let us be best on a continuing basis? If not,
3. Can we buy the item as an off-the-shelf product or service from a best-in-world supplier? Is this a viable long-term option as volume and complexity grow? If not,

4. Can we establish a joint development project with a knowledgeable supplier that ultimately will give us the capability to be best at this activity? If not,
5. Can we enter into a long-term development or purchase agreement that gives us a secure source of supply and a proprietary interest in knowledge or other property of vital interest to us and the supplier? If not,
6. Can we acquire and manage a best-in-world supplier to advantage? If not, can we set up a joint venture or partnership that avoids the shortcomings we see in each of the above? If so,
7. Can we establish controls and incentives that reduce total transaction costs below those of producing internally?

This set of questions implies a flowchart terminating in a spectrum of possible structures (“full ownership,” “partial ownership,” “joint development,” “retainer,” “long-term contract,” “call option,” and “short-term contract”). As seen in Figure 4.1, choosing from among these options exchanges control (greatest with full ownership) for flexibility (greatest with short-term contract).

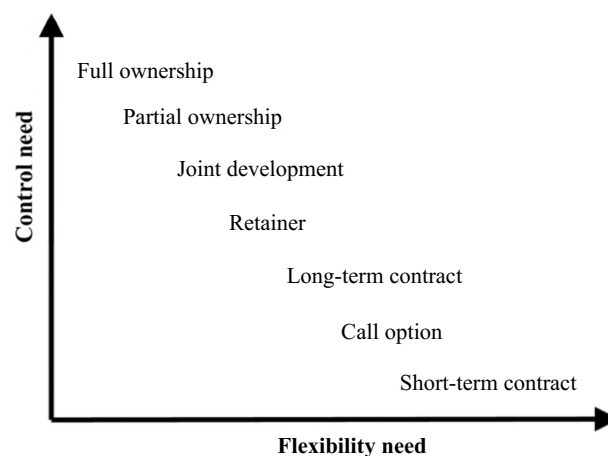


Figure 4.1: Potential contract relationships. (From Quinn and Hilmer [323]).

A key message here is that the insource-versus-outsource decision is not binary. Furthermore, meaningful activities invariably contain many subtasks, each of which is a candidate for outsourcing. These give rise to many permutations that differ in divisions of labor, relationship lengths, and ownership of assets and liabilities.

A related idea, not explicitly articulated in Figure 4.1, is that even for a single activity a firm may choose to outsource some portion while retaining the rest in-house. This risk-mitigation strategy has names such as “partial integration” [313], “taper(ed) integration” [186], “partial outsourcing” [20], or simply “make-and-buy” [197, 303].²

The framework of Aron and Singli [28] evaluates activities for outsourcing and offshoring simultaneously (cf. Section 1.2 and the Appendix regarding how these distinct strategies relate to each other). Although couched in terminology geared toward practitioners, this work strongly echoes the themes of TCE and Agency Theory. The method starts by rank-ordering the organization’s activities in terms of value created for customers (e.g., importance to the customer relationship), and then ranks the activities separately by the amount of the created value that the organization can capture (e.g., ability to contribute to profit). Each activity’s two numerical rankings are summed to convey strategic importance (lower means more important), the logical limitations of ordinal rankings notwithstanding. Important activities (those with low sums) should be kept close by, in both organizational distance (by insourcing) and geographic distance (by onshoring). Activities with higher sums (i.e., lower importance to customers, lower value capture for the organization, or both) proceed to the next phase of the analysis, which evaluates each activity with respect to the risks brought by outsourcing or offshoring. The risk assessment considers both operational risk (the risk that the process will not operate smoothly after being outsourced and/or offshored, whose key drivers are the codifiability of knowledge about the process and the existence of meaningful

²A similar risk-mitigation consideration can influence offshoring strategy as well. Seitz [347] notes, “Japanese consumer electronics firms have moved much of their manufacturing to Taiwan and China to cut costs, but have kept a core manufacturing base in Japan... That gives them enough capability ‘so they’re still in the game.’”

Codifiability of work	easy	MODERATE RISK (opaque processes) Insurance underwriting, invoice management, cash-flow forecasting	LOW RISK (transparent processes) Transaction processing, telecollection, technical support
	moderate	HIGH RISK (codifiable processes) Equity research, yield analysis, litigation support	MODERATE RISK (codifiable processes) Customer service, account management
	difficult	HIGHEST RISK (noncodifiable processes) Pricing, working capital management	HIGH RISK (noncodifiable processes) Supply chain coordination, customer data analysis
		<i>imprecise/subjective</i>	<i>precise/objective</i>
		<i>Precision of metrics used to measure process quality</i>	

Figure 4.2: Evaluating operational risk. (From Aron and Singli [28]).

Ability to monitor	easy	HIGH RISK Equity research, litigation support, R&D support	LOW RISK Transaction processing, insurance claims processing, customer service
	difficult	HIGHEST RISK Pricing, product design	MODERATE RISK (noncodifiable processes) Supply chain coordination, customer data analysis
		<i>imprecise/subjective</i>	<i>precise/objective</i>
		<i>Precision of metrics used to measure process quality</i>	

Figure 4.3: Evaluating structural risk. (From Aron and Singh [28]).

metrics of process quality) and structural risk (the risk that relationships with service providers might not go as expected, which reflects Principal-Agent issues such as incentive conflicts and observability of the actions). Figures 4.2 and 4.3 elaborate upon these and provide examples for each level of risk.

The preceding two figures collapse an activity's multitude of risk factors into a position along each of the two axes of Figure 4.4, which recommends a combination of location and organizational form. The

Operational risk	HIGH	Outsource to service provider located nearby (nearshore) Litigation support	Set up captive center nearby or onshore R&D, design	Execute process in-house and onshore Pricing, corporate planning
	MODERATE	Offshore and outsource to service provider over time Insurance claims processing, customer support	Use extended organization³ offshore, but monitor closely in real time Supply chain coordination, bioinformatics	Set up captive center offshore Equity research
	LOW	Offshore and outsource to service provider Data entry, transaction processing	Use extended organization offshore Telecollection, technical support	Use extended organization offshore, but conduct frequent process audits Customer data analysis, market research analysis
		LOW	MODERATE	HIGH
		Structural risk		

Figure 4.4: Choosing the right location and organizational form. From Aron and Singh [28].

embedded logic uses location (onshore, nearshore, or offshore) to contain the operational risk, and adjusts the organizational structure (such as captive centers or joint ventures) to the structural risk. Like Quinn and Hilmer [323] this conveys a continuum of options, in this case a two-dimensional one.

These kinds of frameworks, as nicely structured as they may be, are somewhat narrow in scope. They evaluate the outsourcing of one activity at a time while holding the rest of the system fixed, so need only consider the costs of coordination between the one activity and the rest. In fact, all activities are simultaneously candidates for outsourcing, so a theoretically complete analysis would account for the coordination needed across the many-to-many interfaces. For instance, a Design

³"Extended organization" is a hybrid form in which companies specify the desired quality of services and work closely alongside providers to get that quality. It is outsourcing coupled with a high degree of supervision and monitoring.

for Manufacturability (DFM) motive, while generally silent on the insource-versus-outsource question, favors keeping design and manufacturing together (cf. Section 5.2). However, evaluating each in isolation could conceivably suggest insourcing product design but outsourcing manufacturing, or vice versa. The analyst could incorporate such natural linkages by preordaining that certain portfolios of activities move together as a block. However, this approaches the problem as a series of local optimizations, with no guarantee of global correctness. A related factor is implied by the strategy that advocates focusing management energy on a small set of core competencies. Given the premise that the breadth of the portfolio of insourced activities determines performance, at what point does the breadth become a distraction? What kind of analytical framework would be equipped to make this determination?

Furthermore, typical frameworks make an assessment at a point in time. Because the factors that drive the insource-versus-outsource decision are constantly in flux, the correct course of action will actually be a moving target. Even within a given industry, a particular set of environmental stimuli might elicit disparate responses from direct competitors. For instance, the circa-2008 global economic slowdown led some consumer electronics firms to insource more production activities (to maintain utilization of existing in-house capacity), while others increased outsourcing (to reduce costs and achieve flexibility for responding to demand volatility) [131, 389, 392, 410]. Perhaps some of the firms were right and some were wrong, or perhaps all were responding appropriately to their own circumstances of the time.

The right decision likely also reflects the lifecycle stage of the company and its industry [90, 145, 146, 244]. Charles Fine postulates a cyclical effect in which any equilibrium will be unstable. That is, once outsourced value chains become the dominant form in a sector, insourcing will provide a competitive advantage, and vice versa. He describes the mechanism as follows [146]:

- When the industry is vertically integrated and the product architecture is not modular, the following forces push toward disintegration of the value chains into a more “horizontal” industry structure and modularity in product architecture:

1. The relentless entry of niche competitors hoping to pick off discrete industry segments;
 2. The challenge of keeping ahead of the competition across the many dimensions of technology and markets required by an integral system; and
 3. The bureaucratic and organizational rigidities that often settle upon large, established companies.
- When the industry structure is horizontal (highly outsourced), another set of forces push toward more vertical integration and nonmodular product architectures.
 1. Technical advances in one subsystem can make that the scarce commodity in the chain, giving market power to its owner;
 2. Market power in one subsystem encourages bundling with other subsystems to increase control and add more value; and
 3. Market power in one subsystem encourages engineering integration with other sub-systems to develop proprietary integral solutions.

These concepts of modular and integral product architecture will be defined more precisely in Section 5.1.

4.6 Structuring and managing the relationship with the service provider

By this point, the prudent decision-maker should have invested the appropriate time and resources to carefully evaluate whether to outsource the particular activity at all. This should have thoroughly considered the pros and cons from Sections 3.2 and 3.3 and information about candidate service providers obtained through due diligence as in Section 4.3, using concepts and frameworks such as described in Section 4.5.

In moving toward any actual outsourcing, the outsourcing party should continue to exercise caution and vigilance. This means

pondering the tradeoffs related to the number of service providers and the closeness of the relationship(s), and carefully writing specifications (“specs”) or a statement of work (SOW). The state of the art in the profession of procurement (cf. Section 4.2) provides extensive guidance on these tasks. This community would agree on the wisdom of the following pursuits, to be explained in Sections 4.6.1 through 4.6.5:

- agree on monitoring mechanisms that establish clear accountability;
- build long-term strategic relationships based on trust;
- have reasonable expectations that consider more than price;
- collaborate with service providers to create and disseminate best practices; and
- adjust for the added difficulty of procuring services instead of goods.

The reader is reminded that this monograph is mainly focused on outsourcing initiatives of meaningful size and complexity, where the aforementioned five guidelines have established credibility. They remain applicable for transactions in which the stakes and risk are lower, such as when procuring standard materials through a relationship with low asset specificity. However, in such cases the outsourcing party may adjust the weight placed on each of the guidelines, while respecting them all in spirit. Kraljic [230] and Dyer et al. [119] segment supplier relationships into categories that merit differing styles of management by the buyer.

4.6.1 Agree on monitoring mechanisms that establish clear accountability

The engagement with a service provider should make best efforts to anticipate and structurally address potential incentive conflicts, which include designing appropriate monitoring mechanisms. Tadelis [368] advocates assigning accountability for every contractible action, articulating escalations and paths to resolution, and, whenever possible, building in penalty and performance clauses. One approach to making penalty clauses seem less antagonistic comes from Agilent, which

deposits the fines in a special escrow account for funding improvements in the relationship [53]. A complete negotiation would even speak to the endgame [45, 216], much like a prenuptial agreement determines how to divide the assets and liabilities in case the marriage dissolves.

This is not advocacy for generating an inches-thick contract that overwhelms both sides with minutiae. Besides being costly to create, such a cumbersome document would be of limited utility in day-to-day management. Both parties would likely breach it unintentionally on a regular basis, undermining its enforceability. The contract would have even less power if the business activity was being conducted in a region with a weak legal system.

4.6.2 Build long-term strategic relationships based on trust

The accepted best practice is to build long-term strategic relationships based on trust, which could entail open-book accounting and avoiding frequent re-bidding of contracts. Over time, this can create an environment in which partners fulfill their obligations out of desire to preserve the mutually beneficial relationship, rather than out of fear of litigation. Canon and HP's supply partnership lasting over 20 years is an archetype of such a relationship [241]. This philosophy is also a major contributor to Toyota's legend.

In a relationship based on trust and collaboration, the contract document (which may simply be a short statement of intent) is a minor part of the framework for keeping the relationship sane and stable, not the primary vehicle for imposing control. But building that framework requires that both parties do the necessary homework, because the details matter and need to be hashed out vigorously enough to avoid misunderstandings. In this sense the principle in this section does not conflict with Section 4.6.1, since being willing to discuss unpleasant scenarios and agree on accountability is both an indicator of and a contributor to a strong and trusting relationship.

The ill-fated alliance between Amazon and Toyru.com (Section 2.2) might have turned out differently had the parties taken the time up front to generate a detailed statement of work. That dialogue could have predicted the mismatch between Toyru.com's package sizes

and Amazon's extant materials handling systems, and clarified expectations about staffing. The statement of work might not have prevented the breach of the exclusivity agreement, but stronger mutual trust and a desire to preserve that trust might have. In 2005 John Etler, then-CEO of Toys R US, testified during the lawsuit, "We are at a point in the relationship with Amazon where we have no trust whatsoever in dealing with this organization" [260].

4.6.3 Have reasonable expectations that consider more than price

Overemphasis on price without compromising anywhere else sets up a zero-sum game that makes trust difficult and will likely lead to underperformance or cutting of corners in other areas. Michael Marks, former CEO of Flextronics, warns that when the client drives too hard a bargain the service provider will "under-resource the project to try and make at least a few bucks" and adds "Look, if your supplier can't make a fair return on the business they will either find a way to hide some money from you, or they'll end up kicking you out. Either way it's expensive and counterproductive" [364].

The "Iron Triangle"⁴ of project management suggests that of (low) cost, (short) time, and (high) quality, at best you can achieve two of the three and tradeoffs are always necessary. Shifting the activity to a different party might alter the exchange rates among these competing goals, but does not eliminate the fundamental tension. An outsourcing client that does not understand this is destined for disappointment. End customers share responsibility inasmuch as they drive the entire supply chain's obsession with price.

The corporate social responsibility (CSR) movement has added CSR as a fourth element of the framework [69]. This suggests that a business that appears to have transcended the tradeoffs in the Iron Triangle might have done so by violating CSR principles, such as with sweatshop factories or by ignoring environmental regulations. The controversies surrounding the contractor factories of Nike and Apple (Sections 2.3 and 2.4) can be interpreted in this way.

⁴This is sometimes known as the Barnes Triangle, in honor of Dr. Martin Barnes who formulated it in the late 1960s [202].

4.6.4 Collaborate with service providers to create and disseminate best practices

A recurring theme thus far is about cultivating collaboration rather than antagonism. This extends beyond the specification of the rules of engagement, to how the partners approach process improvement.

Nike's current approach, which concedes the limitations of monitoring mechanisms, may provide a blueprint for Apple and others going forward. This entails collaborating with suppliers to disseminate best practices to their factories, while reviewing Nike's own upstream business practices (e.g., in product development, design, and commercialization) to identify potential drivers of excessive demands on the suppliers⁵ [246]. Partnering to improve troublesome processes, rather than relying primarily on inspection, is consistent with the principles of lean production. Efficiencies generated in this way can be applied to relieve the tension within the CSR-extended version of the Iron Triangle. Besides being more ethical, this mitigates a variety of business risks.

Regarding the specific challenge of abusive labor practices, Nike found a direct path from lean principles to the desired result:

“As these particular suppliers improved the efficiency and quality of their own operations, they were better able to

⁵Auret van Heerden, CEO of the Fair Labor Association, has elaborated on how overtime and underpayment of wages are caused by high-maintenance customers and the suppliers' own lack of operations management expertise: “The brands book and confirm orders really late. And they often change their orders after booking. The brands want to order later and they don't want to hold product. Then you add price pressures into that and it is really tough for the supplier [to not overwork its workers]. But the factory often doesn't order the materials until too late and they are often delivered late [to the factory], too. The factory production layout is often a mess, so the supplier gets behind schedule and over budget even before they know it. Then they have to catch up. And to save money, they extend hours, but don't pay overtime premiums. And the suppliers also lack proper training. The styles [of clothing and footwear] are becoming more complicated and are changing more frequently ... There are lots of reworks and quality problems and then there are lots of charge-backs [fees charged by the labels to the suppliers]. There are charge-backs for all kinds of things: If they are late with the product delivery, there is a charge-back. And if there are defects, there is one, too. And these guys [the suppliers] will do anything to avoid air freighting [which is much more expensive]. And these are not companies that can call up SAP and say we need the software to manage my production” [334].

schedule their workload (hence, avoid excessive overtime) and increase their workers' wages (sharing the efficiencies gains). Moreover, having invested tremendously in training aimed at enabling their workers to effectively operate their new production and quality improvement programs, managers at these factories were wary of mistreating these highly skilled workers for fear that they would leave and work for a competitor. Similarly, workers who have been trained to 'stop the line' when they see a possible defect, and those trained to work in more autonomous production cells, are also more likely to resist management abuses on the shop floor." [246].

The detailed case study by Locke and Romis [247] provides supporting evidence.

4.6.5 Adjust for the added difficulty of procuring services instead of goods

Process control is on average more difficult for procured services than for procured materials. The intangibility and higher human element of what is being purchased complicates quality assessment and retrospective attribution of liability for problems [8, 116, 129]. The TCE framework equate these with high transactions costs [130].

When human resources are critical to the task, the client might include in the statement of work some guarantees about the types of skills that the service provider will staff. Some firms have even listed by name the specific employees for the service provider to bind by contract, although ultimately no contract can force any worker to stay. This level of attention to staffing is still not common practice, though. In the survey of Rebeiro [327], nearly two-thirds of outsourcing parties reported that they do not conduct detailed due diligence on service provider personnel, and some service providers also were unwilling to name key personnel in the contract.

Figure 4.5 elaborates upon the differences between the sourcing of products and of services. These are intensified for knowledge-heavy

Factor	Product	Service
Definition of Expectations	Precise. Represented by engineering drawings and standards.	Usually imprecise. Broad definitions with many exceptions.
Quality	Emphasis on objective and measurable criteria.	Some objective and many subjective and perception-based criteria.
Points of contact	Few. Communication usually channeled by a few people, such as purchasing or the project manager.	Many. The service provider often interacts directly with end users as well as the program managers.
Physical separation of host firm and contractor facilities	Separation is normal from host company. This allows the use of any contractors - even international -- to control costs, etc.	Separation is difficult as most services must be provided on the host company's site and cannot be inventoried or stored.
Predictability of demand	Dependent on the accuracy of forecasts for final customer demand.	Dependent on both internal priorities and external demand, both of which are dynamic.
Work content/cost determination	Work content is a direct function of the number of units consumed, so costs are easy to determine.	Work content is situation specific, so needs to be monitored and accounted for.
Security of information/data	Information can be shared with contractors on a need-to-know basis.	Contract workers may be exposed to confidential information during the delivery of their services (hallway conversations, access to restricted areas).
Problem resolution	Formal procedures with clear responsibilities can be easily specified.	Difficult to create a process because problems often occur due to interpersonal issues or vague, ill-defined expectations; problem resolution requires greater flexibility.
Transition between contractors	With planning, it is usually possible to change contractors with no noticeable effect on supply; inventory can be maintained during change.	Transition is more visible, requires more communication to minimize problems; disruption is often unavoidable because services cannot be stored and new contract workers are introduced to the site.

Figure 4.5: Difference between the purchase of products and services (adapted from Figure 2.2 of Allen and Chandrashekar [8].)

professional services. This distinction is crucial since traditional procurement thinking has been oriented toward the purchase of materials.

The simplest approach may be to view all outsourcing as the procurement of services. This is literally correct in many cases, such

as when hiring legal, travel, or accounting service providers. Even procured materials are almost always embedded within a bundle of services, for instance the seller's channel management efforts (e.g., delivery of product with associated tracking, category management, user training, and financing). Another perspective is that one is never buying just a good; one is buying a portfolio of services embodied by the good (design, component sourcing, production, delivery, and warranty).

4.7 Investing resources in process control

Given the risks that outsourcing creates, the outsourcing party must accept the need to invest resources in new control processes. The financial analysis in an insource-versus-outsource methodology used by HP includes the costs (mainly indirect labor) of establishing a "control tower"⁶ comprising staff with experience in the operational/transactional elements of the outsourced activity. Besides ongoing management of the service provider, the control tower is crucial for continuity if the firm decides to move the program to a different service provider [211].

Logical candidates for these positions would be the staff whose work was outsourced, but as discussed in Section 3.3.4 those individuals might not have the right skillset. Any major organizational redesign requires proper change management, which includes proactive handling of human resources issues and special efforts to facilitate any career transition. This entails giving the workers time to develop professionally, being vigilant for burnout, and properly compensating them. Traditional rewards systems tend to mishandle this scenario, as they focus on the internal resources managed (which makes such staff look more like individual contributors) rather than the entire extended enterprise these staff bring to the table [9]. The survey of Rebeiro [327]

⁶This term has become popular since 2011 or so, and appears to be a new label attached to the old concept of integrating IT systems and planning processes across silos throughout the supply chain. In this usage a (supply chain) control tower is a unified dashboard of real-time data and metrics [55, 378]. This differs from HP's reference to the personnel tasked with managing the outsourcing relationships and facilitating any transition to subsequent service providers.

suggests that neither outsourcing parties nor their service providers are making the investments necessary to train their staff to properly manage projects.

4.8 Deciding to end an outsourcing program

Earlier this monograph advocated frequently revisiting the outsourcing decision. A shift in the balance between the advantages and disadvantages could justify the sunset of an outsourcing relationship. As when outsourcing is first triggered (cf. Section 4.1), the impetus could be an organizational transition, such as a change in company ownership or new arrivals to positions of influence.

Of a firm's extricating itself from a (large) outsourcing contract and the aftermath, KPMG [228] declares:

"In every case of termination for cause there is, or has been, a good reason. However, given the critical nature of the services within large complex outsourcing deals, even large failures at a service level rarely, if ever, result in termination without there being other attractive underlying reasons for change. For example, change of ownership, change in the size of the organisation, change of key decision makers, and change of service and financial strategy. Also, the much vaunted 'bring it back in-house' is almost always closely coupled to a 're-outsourcing' of at least the significant majority of the services under discussion."

To go further into how best to manage the outsourced relationship requires delving into the idiosyncrasies of the specific activity. Section 5 will do this for functions in the supply chain for a physical product (specifically manufacturing/production/assembly, procurement/sourcing, logistics, and product design/development), which is this monograph's main agenda.

5

Outsourcing in a Physical Goods Supply Chain

This section examines outsourcing in the context of the endeavor of stewarding a manufactured product from concept to market, and then operating the resulting supply chain. The terminology of the well-known Supply Chain Operations Reference (SCOR) model¹ would describe this as the DESIGN-SOURCE-MAKE-DELIVER value chain. SOURCE (sourcing and procurement of materials and services), MAKE (manufacturing, production, assembly), and DELIVER (logistics, distribution) are the primary physical functions common to most supply chains, and each will receive individual treatment here. We include DESIGN (product design, development) to acknowledge that design

¹The SCOR model is the product of the Supply Chain Council (SCC), an independent, nonprofit, global corporation focused on applying and advancing the state-of-the-art in supply chain management systems and practices. As of June 20, 2013, the SCC Web site (<http://supply-chain.org/about>) stated a membership figure of nearly 1,000 corporations. The SCC describes SCOR as the “world standard for supply chain management.”

The SCOR model presents the main supply chain functions as PLAN, SOURCE, MAKE, DELIVER, and RETURN. The scope of Section 5 excludes PLAN, which is not treated separately since it is embedded in the other functions, and RETURN (reverse logistics, repair, recycling), which is included in the discussion of DELIVER.

decisions strongly preordain the supply base, the manufacturing processes, and aspects of what must happen during transport. Also, in modern practice, the insource-versus-outsource decisions for design and manufacturing are often convolved.

Rather than following the stated sequence, we will discuss MAKE first (Section 5.1). DESIGN, SOURCE, and MAKE are the activities directly involved in creating a product, and among these three MAKE tends to be the one that firms first consider outsourcing. Next comes DESIGN (Section 5.2), since it is so intimately tied to MAKE. SOURCE follows (Section 5.3), since it is significantly influenced by the design decisions and is often contingent on the treatment of MAKE, with MAKE and SOURCE sometimes bundled together for outsourcing to a single service provider. We conclude with DELIVER (Section 5.4) since it is chronologically last, but this piece is amenable to being read out of sequence.

This section will not restate the general discussion of Sections 3 and 4, but rather provide elaboration of nuances specific to MAKE, DESIGN, SOURCE, and DELIVER. So the reader should not look to Sections 5.1, 5.2, 5.3, and 5.4 for self-contained expositions, but instead consult each one after studying Sections 3 and 4.

The analysis of the distinct activities in the value chain proceeds with the caveat that they do not segment cleanly and sequentially. Because of cross-functional coordination issues, the insource-versus-outsource decision for each activity depends somewhat on how the others are conducted. Furthermore, service providers are increasingly blending these into a package solution.

5.1 Outsourcing of manufacturing

For many, outsourcing in the supply chain of a manufactured product first brings to mind the treatment of manufacturing/production/assembly. The most basic form is the purchase of a standard material. Here the requisite control processes are generally well understood and efficient. The need for managerial concern grows when the buyer obtains more complex manufacturing services from an outside party,

such as when a brand owner engages a contract manufacturer to produce a noncommodity product using nonstandard processes.

Practitioners use the following terms to characterize the key players in such settings:

OEM: Original Equipment Manufacturer

OBM: Original (or Own) Brand Manufacturer

CM: Contract Manufacturer

The acronym OEM has classically identified a party that makes and sells a branded product, but (somewhat anachronistically) continues to be applied to the brand owner even if the “M” is performed by another party [326]. A suitable replacement term would need to concisely emphasize that the firm might or might not perform the manufacturing, and thus far no such term has gotten any traction. To further confuse matters, the OEM firm may decide “to OEM” a component, which means that the procured part will retain the supplier’s brand identity. Two OEM parties exist in this scenario: (1) the supplier as the OEM of the component, and (2) the OEM of the product that incorporates the component. This monograph will follow the practitioner usage of the term OEM, and rely on context to make clear the precise meaning.

The OBM label emphasizes that the brand owner also performs the manufacturing. In this sense, OBM is a relatively new term for an old phenomenon (the classical OEM model). The electronics industry began using OBM as early as 2004 [307], and the term has appeared in sectors as diverse as bicycles, home appliances, and apparel.

A CM manufactures products that ultimately bear another party’s brand. A CM traditionally does not own the intellectual property of the design, but may deviate from this in some arrangements described in Section 5.2. In the electronics industry, the term EMS (Electronic Manufacturing Services) refers to the segment of CMs who generally do more than manufacture, with the S in the name covering related services such as design, test, distribution, or repair. Foxconn and Flextronics are the two largest EMS firms.

The above terms are often applied to an entire firm. This can be imprecise since firms that reach a certain size tend to operate a

portfolio of disparate activities. For instance, Foxconn is a CM to OEMs like Apple, HP, and Dell, but is also an OBM for a broad range of electronic components.² This monograph will label firms according to the activities for which they are currently most well known, and clarify as necessary.

5.1.1 Forces driving manufacturing outsourcing

This monograph presents the consequences of outsourcing from the OEM's perspective, since the OEM controls the outsourcing decision. The motives which were discussed in general terms in Section 3 certainly apply to the decision to outsource manufacturing. Here the OEM's specific priorities are typically to avoid ownership of the factory assets, infrastructure, and workforce, and to tap into specialized manufacturing capabilities that can quickly and cost-effectively ramp to required volumes. Section 2 provided case studies of such OEMs, including Apple, Nike, and Cisco.

The emergence of competent CMs in virtually every product category enables this supply chain strategy. This is a boon to startups which may lack the capital or know-how to insource production. The lowering of these entry barriers has profoundly affected the competitive dynamics in many industries. The combination of contract manufacturing and the "crowd-funding" model represented by online platforms such as Kickstarter has presented entrepreneurs the potential of bringing product concepts to market with unprecedented speed, although this production strategy does not eradicate the challenges intrinsic to new product introduction [371, 222].

A vast body of practitioner literature advises on when to outsource manufacturing (e.g., [163, 209, 361, 397]), and provides operational advice on how to most smoothly utilize CM services (e.g., [42, 144, 162, 165, 280]). This demonstrates ongoing interest in the approach.

5.1.2 Costs and risks of manufacturing outsourcing

The general downsides to outsourcing also persist when outsourcing manufacturing. Per Section 4.6, these are heightened when sourcing

²See <http://www.foxconnchannel.com>.

complex or non-standard manufacturing services rather than commodity products. Special hazards highlighted below are (1) losing the ability to manufacture as well as to design, (2) losing control of intellectual property, and (3) losing integrity of the product information that coordinates manufacturing with other key functions. These are knowledge-based phenomena related to the KBV theory of Section 3.1.

Losing the ability to manufacture and design. Section 3.3.2 already warned of the gradual erosion of knowledge of the outsourced activity. A more nefarious risk exists when outsourcing manufacturing in particular. At stake is not just the means to manufacture in the future, but also the ability to innovate in product design. Pisano and Shih [310] elucidate the domino effect that links the two:

“Once manufacturing is outsourced, process-engineering expertise can’t be maintained, since it depends on daily interactions with manufacturing. Without process-engineering capabilities, companies find it increasingly difficult to conduct advanced research on next-generation process technologies. Without the ability to develop such new processes, they find they can no longer develop new products.”

These kinds of firms no longer have a well-grounded sense of what products are possible. In a later article these authors caution that manufacturing capabilities are hard to acquire and easy to destroy, making the outsourcing of manufacturing often a one-way street [311].

Section 4.5 suggested hedging against this risk by in parallel maintaining in-house some portion of the outsourced activity, an approach called “partial integration,” “taper(ed) integration,” “partial outsourcing,” or “make-and-buy.” In the 1990s, in spite of a strong devotion to the concept of outsourced manufacturing, Sun Microsystems (acquired by Oracle Corporation in 2010) used a make-and-buy approach for some computer components, such as CPU boards. Sun wished to maintain its understanding of the technology and ability to perform design for manufacturability (DFM) and testability (DFT). Also, Sun occasionally needed to develop a new product in total secrecy, which was easier to accomplish with internal manufacturing [197]. Make-and-buy also

generates data and expertise that come in handy when benchmarking the costs and performance of service providers.

Defense contractors in the US are increasing their outsourcing of electronics manufacturing on a selective basis, but they want to maintain in-house capabilities as well. According to Charlie Barnhart, an EMS industry consultant, "When the government looks at the OEM and if the OEM appears it doesn't have ability to actually manufacture, the government won't view them as a viable supply solution" [76].

Losing control of intellectual property. Another concern specific to the production context is the loss of control of intellectual property related to product design or production processes. This knowledge could end up in the hands of the firm's competitors or be used for counterfeiting.

A particularly troublesome manifestation of intellectual property theft is the "third shift" problem (also known as "midnight shift" or "ghost shift"). This refers to rogue production by otherwise authorized contractors [302]. The name invokes a scenario in which the CM performs legitimate production during the (two) daytime shifts, but then spends the night (third) shift leveraging the factory resources and process knowledge to produce unauthorized goods, possibly using inferior materials. This is especially hard to police since the brand owner by necessity must entrust the CM with all the detailed specifications, drawings, and know-how to support complete production.

A well-publicized episode of third-shift production involved the sports apparel firm New Balance in the late 1990s. New Balance had contracted with Taiwanese businessman Horace Chang to manufacture its shoes in China. Initially these were only for export, but later New Balance licensed Mr. Chang to distribute in the China market. A disagreement about strategy led New Balance to terminate the license in 1999. Claiming that the termination was invalid, Mr. Chang continued to produce large volumes of New Balance shoes, in particular a low-end line which conflicted with the brand's overall pricing strategy. New Balance sought remedy in the Chinese legal system to little avail. New Balance suspected corruption and filed a complaint with the Chinese government reporting that the judge had requested bribe money. A judgment finally came in 2005 that was mostly in Mr. Chang's favor.

By that point, after having shipped hundreds of thousands of pairs of shoes in defiance of New Balance, Mr. Chang appeared to have moved on from direct use of the brand. He had turned his attention to a brand of his own that bore a logo with strong resemblance to New Balance's, with designs similar to the low-end styles he formerly made for the firm [212, 302, 343].

Although this case study may seem to warn firms not to manufacture in China, these sorts of problems can arise in any location. Regardless of location, outsourcing almost surely compromises control. However, distance created by offshoring increases the difficulty of monitoring, and the risks of intellectual property loss are elevated by weakness in the region's laws or their enforcement. A company that insists on offshoring can mitigate some but not all of these risks by insourcing.

Losing integrity of product information that coordinates manufacturing with other key functions. Even without deliberate malfeasance, coordination problems arise from inserting company boundaries between manufacturing and other key OEM functions such as product design or sales/marketing. A major coordination challenge centers on maintaining the integrity of the bill of materials (BOM), which drives decisions all along the supply chain.

A BOM lists the parts required to build a product. The record for each component includes a part number, approved manufacturer list (AML), and performance attributes, and may link to any number of other descriptors or design schematics. This data might appear to be easy to maintain, but in reality the BOM is a dynamic document whose accuracy is constantly under siege.

Product designs evolve over time, as the engineers make improvements and parts reach end-of-life or are replaced with cheaper or better ones. Changes are not always captured in a systematic engineering change order (ECO) process and may fail to reach all the appropriate stakeholders due to overreliance on ad-hoc email or phone communications. As a result, BOMs commonly contain defects such as incorrect part numbers, invalid information about suppliers, or even information in the wrong language. One electronics industry report estimated that between 40% and 80% of BOMs have errors on arriving to manufacturing [88, 286]. Yet a CM cannot generate a project quote until the BOM

is correct, and the cleansing process might take days or weeks. One electronics CM has approximately 80 employees whose full-time function is to translate customer data for use in the CM's own production system [88]. Once a manufacturing program is underway, undetected errors can cause parts shortages that stop production or cost overruns when parts are ordered unnecessarily. Buyers can only procure whatever the BOM specifies, and one wrong character in a part number is enough to cause these kinds of problems.

While BOM accuracy is elusive even when manufacturing is insourced, outsourcing dramatically increases the degree of difficulty, as Section 3.3.1 would suggest. The requisite tasks entail communication among multiple stakeholders and any changes must go through a chain of approval, all of which becomes exponentially harder when attempted across company boundaries. Besides the organizational challenges, the software systems of the OEM and CM might use different data formats. File type and structure vary by company and even within a company, if it is highly decentralized or has grown by mergers and acquisitions. Even the most sophisticated firms occasionally resort to copying and pasting information from PDF documents or spreadsheets, or manually retyping information from a hard copy. An additional obstacle can arise from disparities in nomenclature, such as when the OEM and CM use different text descriptors or part numbers to identify the same part. These barriers to coordination proliferate quickly since each CM has many OEM clients, and an OEM may engage multiple CMs in bringing a single product to market and throughout the lifespan of the product.

Maintaining the integrity of the BOM falls under the purview of Product Lifecycle Management (PLM) methodologies, especially the subspecialty called Product Data Management (PDM). These are usually facilitated by specialized software, which may be part of a comprehensive Enterprise Resource Planning (ERP) informational technology platform that attempts to achieve coordination across all the value chain functions, including outsourced ones [40, 70, 181, 301, 332, 373].

This coordination requires more than just technical connectivity. The data formats and business processes of all the partners must be compatible. This is the intent of standards such as the Partner-Interface-Protocol (PIPs) framework of RosettaNet (<http://www.rosetta.net>).

rosettanel.org) or the programs of the Voluntary Interindustry Commerce Solutions (VICS) consortium (<http://www.vics.org>) that include Collaborative Planning, Forecasting, and Replenishment (CPFR). These require a willingness to share information with partners and, to reiterate a recurring theme, nontrivial investments of human and financial resources.

The effectiveness of these coordination efforts can be enhanced by involving the CAI very early in the OEM's product design timeline, or even outsourcing design and manufacturing as a bundle to a qualified CM [281, 387]. This may cause a different set of problems, as Section 5.2 will explain.

An intriguing implication of this analysis is that a firm whose products are somewhat complex and compete on the basis of innovation must possess more than creativity and technical competence. Regardless of who executes the actual manufacturing, this firm must also excel at managing the information flows and decision processes required to shepherd ideas from concept to production, and through the design changes that inevitably occur on the way to end-of-life. These skills are part of the firm's competitive advantage, and thus could qualify for status as core competencies. That being the case, they should not be entrusted to outside parties.

Besides the BOM accuracy problem, which resides at the manufacturing-design and manufacturing-procurement interfaces, product information issues can also disrupt coordination at other interfaces. For instance, OEM sales and marketing managers can struggle to monitor quality and manufacturing status when manufacturing has been outsourced, particularly when products are spread across multiple CMs. These managers face frustrations trying to respond to seemingly innocuous questions from end customers like "Where is my order and when will it ship?" or "Can I still change the configuration?" [317]. Difficulties in obtaining correct BOM and production status information are just some examples of the operational details that are often overlooked in executive-level decisions to outsource for strategic reasons.

The many challenges and risks mentioned above and in Section 3.3 make insourcing of manufacturing a legitimate strategy. OEMs in various industries have affirmed their commitment to this approach.

For instance, for many years Nokia has famously diverged from many large competitors in the mobile handset business by predominantly insourcing its production (and even placing it in high wage regions) in order to maintain control of its supply chain and achieve high quality [318, 330, 238]. Nokia did outsource its first Windows Phone handset (the Lumia 800) in 2011 to leverage and learn from contract manufacturer Compal's expertise with the Microsoft-mandated Qualcomm chipset, but then brought later models back in-house [262]. Samsung outsources less than 10% of its total production, relying on contractors only for peripheral items such as components, feature phones, and handset cases. According to company executive Mok Jangkyun, "At Samsung, out of over 200,000 staff worldwide, more than half are manufacturing jobs, which indicates we are very much a manufacturing-driven company and it is where our core strength is." Mok credited Samsung's ownership of smartphone plants in South Korea, China, and Vietnam for providing flexibility to adjust Galaxy S production in response to demand fluctuations or production problems [223]. Lenovo produces 70% of its mobile devices in-house [86]. In 2007, Sharp Corporation broke ground in western Japan on a \$9 billion factory complex making liquid-crystal-display panels and solar panels [214], which as of 2012 was still regarded as the world's most advanced LCD factory [220]. Zara, Procter & Gamble, and Intel are other prominent believers in in-house manufacturing [358].

5.1.3 Role of product architecture in the outsourcing decision for manufacturing

The above points confirm that success in outsourcing is a function of the information needs of the partners in the resulting extended enterprise and the degree of difficulty of meeting those needs. This underlies the argument that product architecture drives supply chain architecture, which reflects manufacturing outsourcing decisions.

A "modular" architecture includes a one-to-one mapping from functional elements to components, and specifies decoupled interfaces between components. An "integral" architecture includes a complex (non one-to-one) mapping from functional elements to components

and/or coupled interfaces between components [386]. Decomposability reduces the need for communication, the writing of detailed specifications, and iteration in designing the parts for which each party is responsible. So modular products (e.g., personal computers) tend to be built (and designed) by modular supply chains (heavy outsourcing; many suppliers for each component), whereas integral products (e.g., high-performance automobiles) tend to come from integral supply chains (heavy insourcing; vertically integrated industry) [146, 147]. In short, the supply chains can be “mix and match” only to the extent that the product components (and the associated business processes and IT platforms) are “plug and play.”

5.2 Outsourcing of product design/development

Design entails a vast range of activities, from generation of product concepts all the way to the creation of very precise schematics of product configuration [231]. Each of these can be subdivided further, and any of the segments are candidates for outsourcing [322]. If an end product is composed of multiple parts, the design of each part or subassembly can be handled separately as well.

The scope could be broadened beyond the design of specific products to consider innovation in processes or business models [245]. Some firms even outsource the pursuit of breakthrough innovation (R&D) to specific organizations [289] or to the open community through “crowdsourcing” platforms such as the Eli Lilly spinoff InnoCentive or Procter & Gamble’s “Connect & Develop” program³ [58, 89, 203, 324]. This crowdsourcing approach is best suited for scenarios in which (1) customer desires are not widely known, (2) product development is cheap, and (3) product development does not rely on collaborations with other important processes such as manufacturing and distribution [89].

Because being able to compartmentalize the design process from the rest of the value chain is somewhat exceptional, we will focus primarily

³InnoCentive and Connect & Develop are exemplars of “open innovation” as described by Chesbrough [83]. This is based on the principle that organizations should seek innovation from outside as well as within their own boundaries. Any form of design outsourcing resonates with this theme.

on the setting for which cross-functional coordination is critical and the cost of performing design is nontrivial. These conditions limit the OEM's options for design outsourcing.

5.2.1 Forces driving design outsourcing

While typically not as asset-intensive as manufacturing, superior product design capability can be imposingly expensive to maintain in-house, particularly due to the specialized human capital. Besides this cost motive and the general ones described in Section 3.2, the cross-functional coordination difficulties noted earlier may also favor the outsourcing of design in order to collocate with manufacturing activities that have been outsourced.⁴ Consequently, design outsourcing has become a common practice in many industries, including many categories of consumer and industrial electronics, industrial equipment, automotive, pharmaceuticals, and office furniture [17, 18, 84, 135, 136, 152, 210, 283, 346, 359, 360, 413].

5.2.2 Costs and risks of design outsourcing

Design outsourcing faces the challenges of services procurement explained in Section 4.6. The requisite communication and coordination across company boundaries are particularly difficult because even though design can be performed much more systematically than commonly believed, it is still inherently a creative activity that entails working with ideas that are not fully developed and with many interdependencies among the decisions. Furthermore, the staff members assigned to liaison with the design service providers often, at least in the early going, lack the disposition, experience, and organizational support to handle the increased emphasis on project and relationship management [12, 18, 19, 21, 43, 381]. This scenario can easily transpire since a natural tendency upon shifting design work to an outside party is to repurpose in-house designers into program managers. But

⁴Although theoretically possible, there is no evidence that any OEMs are outsourcing significant amounts of product design while simultaneously retaining manufacturing in-house [387].

designers are often technical experts who excel as individual contributors and never needed to direct outside parties on what to do or how to do it, or devise schemes to hold those parties accountable. They also might resent the increased need to spend time in meetings and dealing with conflicts.

Yet the stakes are high, especially for the many design decisions that have implications for manufacturing and supply chain management [387]. This is the basis of the Design for Manufacturability (DFM) movement, which has spawned the concept of Design-for-Supply-Chain [79]. Among other impacts, design decisions strongly constrain the possibilities for materials, suppliers, and manufacturing processes. The folk wisdom is that 70% or more of a product's lifecycle costs (manufacturing, supply chain, quality) are preordained at the design stage.⁵

5.2.3 Outsourcing design together with manufacturing: CDM and ODM

The preceding discussion applies whether the design work is outsourced to a focused design specialist or to a service provider who offers design services in conjunction with other capabilities. We now shift consideration to the latter approach, which usually aspires to improve the coordination between design and manufacturing decisions in an outsourced supply chain [171]. Two paradigms for such joint outsourcing have arisen in a variety of industries:

⁵That design decisions are important is not in dispute, but the concrete evidence for this numeric rule of thumb is apocryphal. Barton et al. [46] note, "Where authors support it by reference to published work, the references are to authors who themselves provide no substantive proof to support their claims. These referenced authors assert it themselves or quote a study by, or give a quote from, a major corporation. Examples of such corporations are Boeing, British Aerospace, General Electric, Rolls-Royce, Westinghouse, and Ford. With the exception of Rolls-Royce, the studies reportedly carried out by these major corporations cannot be easily traced as they are inadequately referenced, for example as '... a Boeing study of turbine engines...' [172] or '... according to General Motors executives...' [401]." Regarding Rolls-Royce, Barton et al. [46] emphasize that the widely quoted original study by Symon and Dangerfield [367] concluded that good design decisions can reduce 80% of "unnecessary" costs rather than total costs. Obviously the determination of what costs are unnecessary is subjective.

CDM: Contract (or Custom or Collaborative) Design and Manufacturing⁶

ODM: Original (or Own) Design Manufacturing (or -er, whereby this acronym refers to a company operating this business model⁷)

The primary difference between CDM and ODM is in the ownership of the intellectual property (IP) in the product design [255]. In the CDM model the OEM generally intends to retain ownership of the IP (although the exact terms are subject to negotiation), whereas an ODM owns and may use the IP to create its own brands, products for other OEMs, generics, or white-box products [115, 350, 351]. Additionally, ODMs take on inventory liability, while the OEM usually owns the inventory in the CDM model. In these respects, a CDM is primarily a service company while an ODM is primarily a product company [74].

The historical evolution of both CDM and ODM practices reflects the reality that, in many industries and for many product types, manufacturing excellence has become a commodity. This means that it acts as a baseline requirement, rather than a competitive differentiator that endows market and pricing power. This is the notion that underlies the “(Stan Shih) Smile Curve,” attributed to the founder of Acer who proposed it in 1992 [97]. One version of the framework appears in Figure 5.1.

The Smile Curve originally addressed what semiconductor and electronic CMs (mostly Taiwan-based) experienced in the 1990s, a phenomenon which persists in many industries today: the lion’s share of the wealth accrues not to the manufacturer but to the owners of activities preceding and following manufacturing in the value chain. This contributes another entry to Section 5.1’s list of OEM motives for outsourcing manufacturing. This also explains why the pure-play CM business model, in spite of enjoying focus, economies of scale, and risk pooling, is so often a way station on the journey to either CDM or ODM.

⁶This is sometimes called Joint Design Manufacturing (JDM) [396].

The terms ODM and CM are sometimes used interchangeably. This is problematic because the CM could be operating in any of several modes, including ODM, CDM, or as a traditional CM.

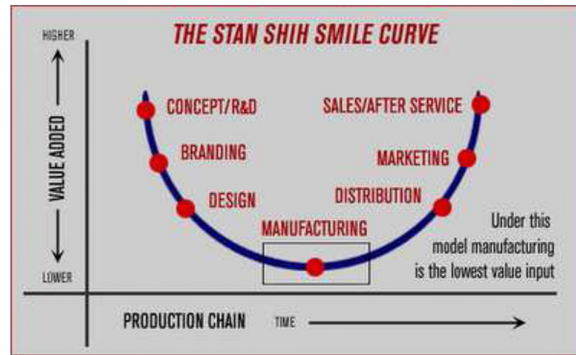


Figure 5.1: Smile Curve (version from <http://www.madeintaiwan.tv/blog/7p-10>).

Indeed, many traditional CMs have added CDM or ODM services in search of higher profit margins. This is true of Flextronics [84, 133], Foxconn [200], and the semiconductor fabricator TSMC [268].

CDM is less dramatic of a transformation for a CM, so the documentation of this phenomenon seems to focus more on the ODM format. The majority of written coverage of ODM has been in the press surrounding the electronics industry, where the ODMs are heavily concentrated in the Asia-Pacific region [140]. There the ODMs grew out of the motherboard companies in Taiwan, who moved into computer systems, especially notebook computers [123, 291, 350]. A resulting misconception is that this organizational format is unique to electronics. In fact, the model appeared earlier in bicycle manufacturing [406] and possibly elsewhere. ODMs also exist in apparel, with many based in Asia, especially Hong Kong [287] and Korea [225].

CDM and ODM service providers both enable an OEM to tap into an upstream supply chain possessing many of the benefits of vertical integration. An ODM, in particular, provides a virtually complete product off-the-shelf to fill out an OEM's product portfolio, a fast solution that allows the OEM to reduce in-house R&D expense albeit with limited customizability [74, 96]. However, the ODM needs to use the same product platform to supply multiple OEMs in order to recover the R&D and tooling expenses and to mitigate the inventory risk. As noted, ownership of the IP entitles the ODM to supply the OEM's

ODM	Original model	Derivative models
Quanta	Prototype of Centrino-based notebook by Quanta	• Acer's TravelMate 800 • Legend Soleil A820 • Sanyo Skywalker 3100
Quanta	HP Pavilion ze4000 and ze5000	• HP/Compaq Presario 2100 and 2500
Quanta	A prototype wide-screen notebook by Quanta	• Best Buy vpr Matrix 200A5 • BenQ Joybook 8000
Samsung ⁸	Dell's new slim-type 12.1-inch notebook (model number unknown), mass production planned for May 2003	• Samsung's own slim-type notebook model (for China and Korea markets)
Samsung	Dell Latitude X200	• Samsung Q10 • Gateway 200
Samsung	Gateway 400	• Best Buy vpr Matrix 175B4
Wistron	Dell SmartStep 250N and 200N (with desktop CPU)	• One of Fujitsu Siemens' models with a desktop CPU • One of Medion's models with a desktop CPU • One of Japan-based Sotec's models with a desktop CPU

Figure 5.2: Personal computer models with a common design base, March 2003 (adapted from Tzeng and Chang [383]).

direct competitors, as well as to become a competitor via white-box or own-brand products.

Figure 5.2 shows notebook computer ODMs using the same basic design across the offerings of competing OEM brands. For instance, Acer's TravelMate 800, Legend's Soleil A820 and Sanyo's Skywalker 3100 were all variations of a common ODM internal architecture by

⁸"Samsung is known to many consumers today as an OEM of numerous product categories. However, Samsung once was an ODM to brands like Dell (from 2001-2006, according to Digitimes [109]). Samsung subsequently focused on laptops bearing its own brand, and in 2012 started sourcing them from ODMs such as Compal [236].

Quanta Computer. Acer designed its own external casing, while Legend and Sanyo used Quanta's designs [383].

This raises the ultimate question for the OEM that sources product designs from an ODM: how can the OEM differentiate its brand when its product is technically equivalent to many others on the market? For this reason ODMs are very protective of the identities of their clients, lest end-consumers come to view the products as a commodity [74]. For notebook computers, a category which is predominantly supplied by Asian ODMs, OEMs such as HP pursue differentiation through the industrial design of the chassis, the software bundle, and after-sale support. Nevertheless, weakness in the brand's distinctiveness leads customers to be more open to alternatives.

Figure 5.2 demonstrates that the client of an ODM could be a retailer (e.g., Best Buy) executing a private label strategy. In this scenario the OEM, which is one of many links between the ODM and the end customer, has been pushed out of the supply chain. Some end customers might go even further and cut out all layers of middlemen. In recent years Amazon, Facebook, Google, and Microsoft have changed how they purchase network switches for their data centers, increasingly buying directly from ODMs in China and Taiwan rather than from brand name OEMs like Cisco, HP, and Juniper. Likewise, Amazon, Facebook, and Google are bypassing HP and Dell and going straight to ODMs for servers [274]. This method is cheaper and allows greater customization. Wireless services providers like AT&T, Orange, and T-Mobile sometimes obtain mobile phones this way as well [308]. Risks related to quality and performance are minimal since in many cases the same ODMs are the anonymous back end behind the branded OEM product, raising questions about the *raison d'être* of these kinds of OEMs.

ODMs have both the motivation (as indicated by the Smile Curve) and the prerogative to become OBMs [124, 393]. Indeed, the evolutionary path from CM to ODM to OBM is well-documented for firms in late-industrializing economies such as Taiwan, Korea, Singapore, and Malaysia [65, 194]. Firms that started as traditional CMs offering cheap labor absorbed design skills and market knowledge from their clients. Eventually these ODMs aspired to develop their own brands to increase

their control and financial returns. Giant Bicycles,⁹ Acer,¹⁰ and HTC¹¹ are among the most successful examples of ascension from ODM to full-fledged international brand [37, 91]. Foxconn is laying the groundwork to expand its OBM activities beyond components by launching mobile phones of its own [352]. If this comes to fruition, Foxconn would immediately become a force to be reckoned with given its deep resources and years of experience designing and manufacturing handsets on behalf of the sector's leading brands.

Indeed, if an OEM does not design or manufacture, what competitive capabilities does it retain that are so hard for ODMs to develop? Initially the Taiwanese electronics ODMs had only limited success achieving sustained global brand awareness [104], forcing them to compete on price. Getting to the next level requires distribution channels with infrastructure for functions such as handling returns, offering credit, providing warranty service, and marketing expertise that can generate the deep customer knowledge critical to the conception of attractive products. In some cases a CM or ODM can obtain these rapidly through an acquisition [213]. In the earlier example of the ODMs who supply network gear directly to Amazon, Facebook, Google, and Microsoft, new intermediaries like Cumulus Networks and Pica8 are emerging with the specialty of bringing together ODMs and lower-volume end customers [274]. These specialists enable an ODM to access (by outsourcing) the marketing channel functions needed to approximate an OBM's capabilities.

ODMs might lose some business by competing with their OEM clients in this way. Acer [106], Asustek [93, 81], and BenQ [242] are among the electronics manufacturers who have felt compelled to split their ODM and OBM businesses into separate companies to avoid conflicts of interest. Whether this can assuage OEM concerns about

⁹Giant Bicycles was founded in 1972 as Giant Manufacturing Company, a pure CM. It launched its own brand in 1981, first in Taiwan then globally over time. Giant is currently the world's largest bicycle manufacturer.

¹⁰Acer was founded in 1976 as Multitech, a CM for computers. It took the name Acer in 1987, and operated as both an ODM and OBM in the mid-1990s before spinning off its ODM business as Wistron in 2000.

¹¹HTC was founded in 1997 as an ODM of mobile phones. It launched its own brand of phone in 2007.

leakage of IP and market intelligence is another matter. Ultimately an OEM that outsources design to its manufacturing partner should proceed with the mindset that this partner will eventually become a direct competitor [29, 133, 201, 272, 294].

Not all firms are willing to take the risks described in this section, perhaps viewing design as a core competency to be protected. Indeed, in early 2009, amidst a broad economic crisis that laid many of its rivals conducting massive layoffs, Apple was aggressively hiring specialized chip designers to work on key technologies. This reflected Apple's desire to get critical new features to market quickly without sharing too much of its technology roadmap with external chip suppliers [215].

5.2.4 Operational guidance on managing outsourced design

We close this discussion of design outsourcing with operationally focused guidance which comes from the author's personal interviews with dozens of managers across multiple divisions of a major electronics OEM that extensively uses both ODM and CDM modes for obtaining designs. Those managers affirmed many of the general principles formulated in Section 4, which we need not rehash. The insights specific to design outsourcing appear below.

- Residing within the same firm does not guarantee that the design and manufacturing functions will automatically communicate well. This coordination is well known to be difficult when the OEM hosts both functions, and outsourcing both to the same service provider does not by itself solve the problem. This is especially true of the CDM model, since many CMs are not actually organizationally suited to operate this way. They are manufacturers first, who have added on but not fully integrated ancillary offerings like design or logistics. The CM's design team might stay together just long enough to deliver a finished design to the OEM. The OEM, rather than the design team that has since disbanded and moved on, must still step in to work through design issues with the CM's manufacturing team, especially when problems arise later in the product lifecycle. The actual implementation might fall far short of the vision of a seamless and integrated

progression through design, prototype, product launch, and ramp to volume.

- “Sustaining engineering (design)”¹² is often overlooked in the initial contract, which in practice tends to focus more on the tasks and fees for the upfront “non-recurring engineering” (NRE) work that creates the original design. Outsourcing means the key design staff are under the control of a different firm, which may too quickly shift those individuals to other projects after delivering the initial design, as mentioned in the previous point. The OEM might later find itself with only very expensive options for the requisite sustaining engineering. Criticisms of Boeing’s approach to developing the 787 Dreamliner identified sustaining engineering as a means by which Boeing can be extorted. According to Stan Sorscher, a former Boeing Engineer,

“Boeing will have to depend on suppliers for any changes or modifications in the future, for the parts that will go onto the 787... The design principles and the calculations are all with them and they own it legally and intellectually.” [127].

- Designers are crucial participants in maintaining the integrity of the bill of materials and related product data, and therefore must be involved in the PLM/PDM (product lifecycle management/product data management) process described in Section 5.1.2. The specification of the outsourcing relationship should be explicit about each side’s duties in managing the product data. In at least one project covered by this author’s interviews, the OEM pulled PLM/PDM back in-house since it lost confidence in the CM’s ability to properly manage the vital information and documentation over the life of the product.
- Firms who are the strongest in design might not be the strongest in manufacturing, and vice versa. In deciding whether to

¹²Sustaining engineering/design refers to the ongoing efforts during the product’s lifecycle to make improvements in function or manufacturability, or fix bugs in the design that are revealed only after ramping up production and getting product into the field.

outsource both activities to the same party the OEM must trade off the benefits of a one-stop solution (which might be overrated, as implied by the preceding points) against the value of employing the “best in breed” for each activity. Separating design and manufacturing into different firms also avoids concentrating too much knowledge and capability in one place and thereby reduces the risk of inadvertently creating a ready-made competitor.

- Service providers sometimes promise what they have no way to deliver at the stated price. This could be a calculated artifice to win the business with a low bid and then profit by overcharging for the inevitable design changes. But, because uncertainty is intrinsic to new product development and the clients themselves are not always sure exactly what they want, well-intentioned service providers can easily fail to understand the magnitude of the task. This reinforces the need for the OEM to write clear specifications, perform due diligence, and use small projects first to test out the service provider. Independent cost-engineering allows benchmarking, although this requires in-house resources with deep understanding of the outsourced activity. This would be one of the vital duties of the control tower described in Section 4.7.
- An OEM that uses ODMs across product generations must be especially careful to maintain interoperability among a given end customer’s purchases over time. This need varies with the customer type. Purchases by smaller customers (including individuals and small businesses) can be considered “transactional,” meaning that one item is purchased at a time, with essentially no connection from one purchase to the next. Here a traditional ODM engagement can work very cleanly, with the OEM providing some general specifications and then shopping for the ODM who can deliver the complete product at the best price. However, enterprise customers tend to require continuity across purchases, specifically with respect to compatibility in technology and standards. Frequent changing of ODMs or the fundamental fact that ODMs are not under the captive control of OEMs threaten this continuity. So the OEM needs a way to support the specific platform over a longer period of time, with forward and backward

compatibility in aspects such as software applications (including device drivers) and network infrastructure. Ultimately the only way to achieve this may be to perform the bulk of the design in-house, together with final assembly and integration. This concept of forward and backward compatibility is not limited to enterprise products. Many consumer products come with accessories, including protective cases, adapter cables, power chargers, and batteries. OEMs may still want to manage product design in a way that does not obsolete the old accessories with every new product introduction.

- More than just the OEM and a single outside party might be involved if the product requires integration of subsystems. The Boeing Dreamliner is an example of extremely high complexity, but even simple consumer electronics products entail at least software, hardware, and industrial design. Communication and coordination become dramatically harder as the number of parties increases. Even more complications arise if some of the service providers are direct competitors or have bad blood for other reasons. Thus the outsourcing strategy needs to contemplate not just the OEM's interface with each service provider, but also the interfaces among all the service providers.
- Pure ODM or CDM approaches are rare. The reality is more likely to take some intermediate form, such as with an OEM providing a reference design for the service provider to tweak. Such cases call for careful clarification of the ownership of the IP.

5.3 Outsourcing of procurement

Procurement already implies outsourcing, in that some good or service is being purchased from outside the firm. Management of the procurement activity is itself a service that can be either performed internally or outsourced to an outside party.

That outside party may be a focused procurement specialist [39, 80], to which some apply the label "Procurement Service Provider" (PSP) [1, 235]. Alternatively, procurement might be just one element of the

service provider's portfolio of capabilities, which creates an option for the OEM to bundle procurement with other activities for outsourcing to a single entity.

Of note is that in electronics, some CMs are becoming procurement service providers for OEMs who are not current buyers of their manufacturing services [78]. For the CMs this is a revenue source and a way to get a foot in the door for future manufacturing contracts.

5.3.1 Forces driving procurement outsourcing

The value proposition for procurement outsourcing is generally similar to that which motivates outsourcing of any kind, as discussed in Section 3.2. Monczka et al. [276] translate this into constructs specific to procurement:

“Procurement outsourcing providers may achieve greater impact by consolidating volumes across customers and securing more attractive pricing on the aggregated spend. However, these providers may also have access to scarce or proprietary skills, knowledge, and tools that allow them to tap into additional value in the supply market (e.g., firsthand knowledge of suppliers in nontraditional markets or the ability to develop innovative workarounds to change the balance of power in captive-to-supplier relationships). On the efficiency front, procurement outsourcing providers may have the scale and scope of operations in their particular area of expertise that makes possible investments in tools and technologies that most individual companies could not afford.”

Examples of such tools and technologies are comprehensive supplier databases and platforms for conducting reverse auctions.

This logic would apply to both direct procurement (for materials that are part of the firm's finished products) and indirect procurement (everything else). Since this monograph is focused on supply chains for physical goods, the following discussion centers on direct procurement.

The insource-versus-outsource decision process described in Section 4.5 can certainly be applied to procurement as an isolated activity. However, just as colocation of design and manufacturing can create many benefits, natural interdependencies between materials procurement and manufacturing decisions may favor strategies that keep these together. Such coordination can prevent myopic actions such as choosing the cheaper component in ignorance of the downstream impact on assembly or repair costs. Due to the popularity of such strategies, this section will emphasize approaches that send procurement to the CM if outsourced at all. Of course, aspects of the proposed control methods would also have merit when dealing with PSPs. The discussion is largely invariant to whether the CM is operating in the traditional mode, as a CDM, or as an ODM. (One exception is that ODMs tend to have their own supply bases, so conflict may arise if the OEM wishes to dictate the suppliers.)

CMs are highly motivated to take over the OEM's procurement of direct materials. They typically earn a percentage markup on the cost of materials.¹³ In addition, the investment community uses a company's revenue as one measure of size and/or success. Flowing more materials through a CM's books will increase the revenue figure, and hence the CM's public stature. The impact can be quite significant, such as in the electronics sector where materials can constitute 75-80% of a CM's revenue. At the same time, competition has pressured the margins that CMs can earn solely by manufacturing. Some CMs now view direct manufacturing as a loss leader for driving business through the profit center that direct procurement has become. This is one catalyst of the trend of CMs producing many of the OEMs' direct materials themselves (sometimes referred to as "vertical integration") instead of

¹³ This is a fairly standard industry practice. However, some procurement executives have criticized this as being nonsensical and incentive-distorting: "If that's how they (CMs) get paid, do you think they want the bill of materials to go down?" [319]. Some alternatives include paying on a "fixed-fee basis rather than the percentage uplift on the BOM" [273] or as a percentage of the CM's overhead used, with open-book accounting to enable computation of the overhead.

just handling the procurement. Balfour and Culpan [38] note,

“Therein lies the beauty of the Foxconn model. The margins on the parts it provides for its customers’ machines are extremely high, so when it comes to the final assembly work for the likes of Dell, Nokia, or Sony, Foxconn is willing to sacrifice profits — or even do the job at a loss — because it makes so much money from the parts.”

Likewise, Flextronics can provide its customers with printed circuit boards, plastics, tooling, sheet metal, camera modules, power supplies, chargers, LCD displays, lenses, and even cardboard boxes. This echoes the discussion of Section 3.2.3 in that the CM may have some natural economic advantages in insourcing certain activities that OEMs prefer to outsource. But the CM cannot just cherry-pick the most lucrative activities. To get to those might require taking on unattractive ones. This is a reminder that theories that aspire to predict the boundaries of the firm (the CM in this case) must go beyond evaluating individual activities in isolation.

5.3.2 Costs and risks of procurement outsourcing

Like any form of outsourcing, outsourcing of procurement has costs and risks. The ones peculiar to procurement reflect its central role in directing the flows of materials and funds in the supply chain, as explained next.

A strategic view of procurement understands that control of the buying decision is a precious asset. The livelihood of any seller depends on keeping buyers happy, and savvy buyers use this to extract preferential treatment from suppliers. Examples of preferential treatment include special pricing (either straightforwardly or indirectly through rebates and other subsidies), short lead times, liberal return privileges, forgiveness of occasional contract noncompliance, assurance of supply in times of scarcity, influence over technology road-maps, and technical support. Thus, something more profound than a markup on materials is changing hands when an OEM outsources procurement; the OEM may be giving away the preferential treatment as well.

This preferential treatment may sway the CM to choose suppliers, materials, quantities, or pricing terms that conflict with the interests of the OEM. Thus the hidden costs to an OEM who outsources procurement can include unauthorized part or supplier substitutions, overbilling, mistreatment of the supply base, and the loss of the OEM's procurement leverage. Principal-Agent Theory (cf. Section 3.1) would view this as a fertile ground for moral hazard for reasons that include the following. Procurement is highly transactional and the OEM cannot easily monitor all the formal and informal dealings between the CM and materials suppliers. Some flavors of preferential treatment are readily masked or divorced from any particular transaction, as when a CM directs one OEM's spend toward a particular supplier in exchange for attractive terms when purchasing on behalf of a different OEM. Regardless of fault, the OEM's brand is the one that will suffer from association with quality problems, usage of environmentally unfriendly materials, or exploitative labor practices. The CM may have less vested in the relationship with a particular supplier than does the OEM.

We do not intend to imply that CMs are predisposed to act illegally or unethically. Although we can always find examples in which firms willfully and directly violate contract terms, problems are more likely to arise in areas where the terms are vague or silent. It is unreasonable to fault either party for interpretations that are self-serving.

5.3.3 Options for handling procurement when manufacturing is outsourced

Many of the above principles are embedded in the various strategies that OEMs use for handling procurement while outsourcing manufacturing. These make tradeoffs between overhead cost and risk.

The presentation below begins with two extremes: full in-house management of procurement, in which the OEM foregoes the potential benefits of outsourcing, and "turnkey" outsourcing, which ostensibly produces tight integration between manufacturing and procurement but exposes the OEM to a long list of hazards as delineated earlier. These appear in practice but also serve as straw men for interpreting alternative procurement models that incorporate various

preventive and reactive business controls [128]. The ones discussed below are turnkey with audits, supplier rebates, buy-sell, and consignment. Portions of the discussion are adapted from Amaral et al. [10, 11], who analyze the pros and cons of each approach much more thoroughly.

In-house: With in-house procurement, OEMs buy materials directly from suppliers, and manage storage and transit to CMs. When electronics OEMs first outsourced manufacturing they provided prepackaged part kits to CMs, who served only as overflow capacity for assembly. The OEM completely controls procurement in this way, which minimizes outsourcing risks.

Such control is costly. In-house procurement requires fully staffed organizations, highly integrated information systems, and distributed sites for planning, executing, and managing the inbound supply chain from suppliers to CMs. OEMs must stay abreast of technical developments and in contact with potential suppliers around the world. They must also maintain inventory storage locations (hubs) near the various CM assembly sites. In short, the OEM foregoes many of the benefits of outsourcing. Meanwhile, all this investment does not guarantee low material costs.

Turnkey: In the turnkey model, the CM does the buying from parts suppliers.¹⁴ Thus the OEM can keep its own procurement overhead low while leveraging the CM's ability to break bulk and superior buying power (where it exists). This can be a boon for small OEMs. Also the CM can pool the demand uncertainty of multiple OEMs to reduce safety stocks. In principle, this efficiency should translate into lower costs and higher service levels for the OEM.

The turnkey model carries many hazards, including forfeiture by the OEM of preferential treatment from the supply base and loss of visibility into true procurement and material costs. For large OEMs and for noncommodity parts, the CM's procurement leverage will probably be weaker than the OEM's [85]. Tlicresa Metty, former Chief Procurement

¹⁴In pure turnkey the CM handles all aspects of materials procurement. In one variant, the OEM directly negotiates prices for some components with suppliers, and the CM is authorized to make purchases off these contracts.

Officer of Motorola, has labeled as “the great myth” of outsourcing the idea that CMs have greater buying power and, therefore, get lower component prices than OEMs. Metty has written,

“The myth might be true if you outsource 100% of all your manufacturing to only one contract manufacturer, use only industry standard components and other OEMs outsource all of their manufacturing to the same contract manufacturer and use the same industry standard components you do. But, even if that were the case, how do you ensure that you capture 100% of the benefit of that buying leverage?” [273].

This resonates with Section 3.3.5, which would warn that a CM might free ride on an OEM’s economies of scale and possibly divert the benefits to competing OEMs. In 2013 component supplier Xilinx sued Flextronics, alleging that Flextronics has a pattern of

“purchasing Xilinx products based on misrepresentations about who the ultimate end-user of these products will be...(whereby) Flextronics is able to purchase Xilinx products at a more favorable price than it is entitled to receive. It then sells the products to other customers at higher prices, pocketing the difference... (thus obtaining) large, wrongful profits at Xilinx’s expense” [100].

The complaint went on to claim that Flextronics had created an internal inventory tracking system that facilitated obfuscation of the true origin of parts. That the supplier was the one to file suit does not indicate a lack of liability to the OEM legitimately entitled to the preferred pricing. Other recipients of the CM-purchased parts may or may not have been that OEM’s direct competitor, but certainly these kinds of control breakdowns will make a supplier less enthusiastic about offering discounts in the future.

OEMs with lower purchase leverage do not automatically benefit either. Some complain that CMs sometimes fail to “stay on top of pricing and pass those savings on to an individual customer, because they are buying in such huge volumes” [209].

The ability of CMs to obtain high margins on materials procurement may lead them to complacency about reducing manufacturing costs. To avoid some of these hazards, some OEMs have added retrospective audits to their turnkey strategies.

Turnkey with Audits: This approach intends to retain the benefits of the turnkey model while relying on auditing to reduce error and fraud. The OEM may perform the audits itself or rely on a specialist firm [365]. Depending on the scope of the audits, the OEM can investigate whether the CM followed through on pre-specified supplier volume splits (e.g., 50%/50% or 40%/30%/30% among a set of preferred suppliers to hedge against supply risk, maintain goodwill across a broad supply base, and preserve healthy competition), paid suppliers on time, produced accurate invoices, provided truthful performance data, and shared suppliers' price reductions expeditiously.

Audits do not provide comprehensive control. Even when problems are discovered, OEMs might not be able to recover damages in full and lose the time value of money in the meantime. Because the overall approach is still turnkey, the OEM will still forfeit its preferential treatment from suppliers and lack visibility into true procurement and material costs. When OEMs believe they have greater procurement leverage than their CMs, they often choose from among the following procurement models.

Supplier Rebates: OEMs that believe they can negotiate superior prices may authorize CMs to purchase from the suppliers at the CMs' own prices (presumably higher) and then collect private rebates from the suppliers ex post. This allows the suppliers to safely offer preferential pricing to one OEM without revealing their prices to CMs and other OEMs. That is, this scheme achieves "price non-disclosure" (sometimes called "price masking").¹⁵

The OEM retains a direct relationship with the suppliers. The value of this is not only strategic, but operational as well. Communication

¹⁵Deshpande et al. [108] propose a way to run the price negotiation/bidding process to encrypt the price information. The method is somewhat complex and has never been implemented in practice

with suppliers provides a mechanism for detecting inappropriate behavior by CMs.

The supplier rebate scheme adds overhead costs for both the OEM and its suppliers. Tracking and collecting the rebates is a cumbersome process that is hard to get right. One large electronics OEM got a rude awakening when an external audit revealed that it had lost track of \$5 million of rebates owed by suppliers. This could easily have been unintentional on the part of the suppliers, as in many cases their own accounting systems are not up to the task either. Suppliers also dislike the administrative burden of negotiating the price for each item separately with the CM and the OEM. This scheme increases an OEM's requirements for working capital, as an interest-free loan to the supplier is embedded within each purchase. Meanwhile, the CM is still regarded by suppliers as the buyer, and may use this role to enhance its own procurement leverage.

Buy-Sell: In the buy-sell model the OEM buys directly from the supplier at a private price and immediately resells to the CM at a higher price. Once the buy-sell transaction is complete, the supplier delivers the material directly to the CM. In this way, the OEM can outsource tactical purchasing while retaining strategic procurement. This achieves price non-disclosure and the benefits of maintaining direct OEM-supplier relationships, without the need to track any rebates owed. With buy-sell systems, OEMs can enforce supplier volume splits, establish supplier-friendly ordering practices, pay suppliers promptly, ensure accurate invoicing and timely deliveries, resolve problems effectively, and eliminate timelag in learning of price reductions. Buy-sell transaction data allow OEMs to monitor CMs' materials choices and forecasting practices. By controlling procurement, the adopting OEMs gain influence over investments in support resources. This strategy can even facilitate tax savings, because a multinational OEM has ways to specify the location of the intermediate transaction¹⁶ so as to obtain low tax rates [59].

¹⁶A popular trend is for multinational companies to establish centralized procurement centers in tax-friendly regions. One motivation is to capitalize on the ability of these and other kinds of procurement mechanisms to shift where profits are realized and therefore taxed (the international tax arbitrage described in Section A.1.4). For

The buy-sell model is most appropriate when the OEM has greater procurement leverage than does the CM. Some electronics OEMs, including HP, IBM, Motorola, and Dell, and some automotive OEMs have installed variants of the basic concept since at least the early 1990s [60, 75, 128, 199, 206, 207, 208, 319, 353]. Some, including HP, have dabbled with purchasing of amounts in excess of their own consumption. The “sell” portion of their established buy-sell mechanisms include sales channel functionality that can easily be extended to reselling components in the open market, including to competing OEMs [196]. This would make buy-sell into a profit center and should further enhance the OEM’s procurement leverage. One might expect suppliers to object to this idea (as in the Xilinx vs. Flextronics lawsuit in Cotchett et al. [100]), but suppliers regularly work with various forms of resellers provided that the pros outweigh the cons. HP found suppliers to be supportive because HP pays invoices relatively quickly, is not at risk of default, and is generally easier to deal with than many of their other customers.

The primary disadvantages for OEMs are the overhead required to manage procurement and any investment in systems and processes to enable the buy-sell execution. In addition to maintaining supplier relationships, the OEMs must replicate the channel functions of a materials reseller. Also, the CM still controls the inventories after taking physical possession of them.

Consignment: Consignment is an arrangement in which OEMs buy and own the inventory, which the CMs store.¹⁷ OEMs often use this model for parts that are unique, slow moving, proprietary, or scarce. OEMs

instance, Kraft, SABMiller, Unilever, Procter & Gamble and Johnson & Johnson have moved their procurement operations to Switzerland [399].

¹⁷ Consignment generally refers to any situation where ownership of the material is transferred only upon usage. A manufacturer might ask its input materials suppliers to preposition inventory at or near its factory in this way. The usage in the outsourced manufacturing context of this section is specific to the case in which the CM’s customer (the OEM) wants, for reasons explained earlier, to insert itself between the supply base and the CM factory. So the OEM pre-purchases materials from suppliers, and effectively becomes a materials supplier that consigns inventory to the CM. This does not preclude arrangements for other components in which the OEM pays suppliers only when the inventory is consumed by the CM factories, or in which the CM is the direct customer to whom the supplier consigns inventory.

can thus mask prices and assure inventory availability superior to what the CMs might arrange.

With consignment, the OEM is responsible for most of the procurement activities, which adds overhead but provides control. Because the inventory officially belongs to the OEM, CMs cannot readily divert the materials to other OEMs. However, by decoupling inventory ownership from inventory management, the OEM gives CMs no financial motive to reduce excess inventory. Unless the OEM links its information systems to those of its CMs, the OEM will have difficulty in monitoring inventory levels at CM sites and may be in for unpleasant surprises when eventually making accurate counts.

An OEM need not limit itself to just one of these procurement strategies. In the time frame described by Billington and Kuper [60], HP used buy-sell for strategic commodities (those for which shortage would be highly disruptive, or which are high cost), that is, the 20% of parts representing about half of its production spending. Using this approach, HP typically achieved a return on investment of more than eight-to-one, including setup costs and IT investments. For the next 50% of parts, HP used audits (to verify pricing) and rebates (to mask pricing). HP allowed CMs to procure the remaining commodity parts in turnkey fashion. HP [199] confirms that roughly \$20 billion of HP's 2005 total spend of \$43 billion was handled via buy-sell.

This is consistent with a general trend of the past decade or longer. After mixed results from turnkey outsourcing, OEMs have been taking back control of procurement on a selective basis [77, 409]. Some analysts see this as a cause of shrinking profitability in the CM sector in electronics. As noted by Adam Pick, an analyst for iSuppli, "Materials costs savings was a form of a revenue source for them (the CMs). .. Now that has largely disappeared" [78].

OEMs should note that CMs may attempt to increase other fees to offset erosion of earnings from procurement. One Chief Procurement Officer of a Fortune 500 OEM welcomes this, since it ought to reveal what CMs need to charge for manufacturing when not subsidized by the earnings on materials. OEMs can then benchmark more accurately, quite possibly concluding more frequently that in-house production is better after all.

5.4 Outsourcing of logistics

The Council of Supply Chain Management Professionals (CSCMP) defines logistics as

“the part of supply chain management that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services, and related information between the point of origin and the point of consumption in order to meet customers’ requirements.” [271].

The prevalence of logistics outsourcing is evident whenever one makes a purchase online, which usually culminates in a visit from a UPS or FedEx delivery person.

Like the supply chain functions discussed earlier, logistics can be divided into specialized elements, with labels such as “freight forwarding,” “inbound logistics,” “warehousing,” “outbound logistics” (distribution), “service logistics” (for spare parts), and “reverse logistics” (flow in the upstream direction toward recycling or repair). All of these, as well as their subtasks, are candidates for outsourcing [184]. Some providers now offer non-traditional services such as light manufacturing/assembly [16, 179, 257], after-sale repair [190], ordering and inventory management of spare parts [98], packaging of products into store displays [122], and even financing of inventory [298].

How these responsibilities are grouped and managed is reflected in the terms used to differentiate the types of logistics service providers:

3PL = 3rd-Party Logistics provider

4PL = 4th-Party Logistics provider

LLP = Lead Logistics Provider

Lynch [251] advocates the following definitions:

3PL (from the Council of Supply Chain Management Professionals, quoted in Vitasek [390]): A firm which provides multiple logistics services for use by customers. Preferably these services are integrated, or “bundled” together by the provider. These firms facilitate the

movement of parts and materials from suppliers to manufacturers, and finished products from manufacturers to distributors and retailers. Among the services they provide are transportation, warehousing, cross-docking, inventory management, packaging, and freight forwarding.

4PL (from Accenture, quoted in Franzetta [153]): A supply chain integrator that assembles and manages the resources, capabilities, and technology of its own organization with those of complementary service providers to deliver a comprehensive supply chain solution.

LLP [251]: A party that serves as the client's primary supply chain management provider, defining processes and managing the provision and integration of logistics services through its own organization and those of its subcontractors.

Lynch [251] notes that "3PL" was first used in the early 1970s to identify intermodal marketing companies (IMCs) in transportation contracts. Prior to that, transportation contracts involved only a shipper and a carrier. IMCs became the third party to these contracts as intermediaries that accepted shipments from shippers and tendered them to rail carriers. Since then the definition of 3PL has broadened to cover any company that offers a logistics service. This can include brokers of logistics services in addition to the actual carriers.

Accenture registered the term "4PL" as a trademark in 1996 (when the firm was still known as Andersen Consulting). While Accenture's definition describes a 4PL as an integrator, nowadays some consultants, software companies, and even 3PLs call themselves a 4PL. A 4PL is much like a general contractor [118], one that does not necessarily provide any of the logistics functions itself. Some regard "LLP" as a more accurate label than 4PL.

5.4.1 Forces driving logistics outsourcing

The existence of logistics service providers is critical to countless manufacturers and resellers, small and large. Indeed, insourcing of logistics (via "private fleets") along even selective segments of the supply chain is feasible only for firms of a certain scale. This is due to the asset-heavy

nature of logistics, which requires extensive infrastructure for transportation, handling, storage, and, increasingly, information technology for real-time, global tracking at the individual item level of detail. At the same time, a strong enabler for the existence of logistics service providers is the fungibility of such assets across many customers and materials categories.

The value proposition of these service providers includes a reduction in inventory holdings. Cycle stocks will decrease to the extent that clients feel relief from the need to completely fill containers or vehicles. Pipeline inventories will be lower if the transit times are shorter. Greater delivery reliability and visibility into inventory status reduce the need for safety stock. On this last point, Bot and Neumann [63] call markdowns and lost sales “information-related logistics costs” because these discrepancies between supply and demand can be reduced through improved visibility. In many industries, these costs make up a larger percent of logistics costs (nearly 70% in apparel and 60% in toys and games) than asset-related direct costs like freight and warehousing. The potential savings is frequently larger for information-related logistics costs than for asset-related ones, which in many cases have already been squeezed dry.

Logistics service providers with an international footprint offer critical expertise in moving product through disparate physical, legal, and regulatory environments [185]. Maher [257] reports that the trend of manufacturing offshoring is increasing the outsourcing of logistics. Longer routes magnify the complexity and costs of transportation, and especially the need for advanced tracking technologies.

5.4.2 Costs and risks of logistics outsourcing

The prominent role played by general contractors speaks to the unwieldy number of 3PLs that might be involved in a single logistics solution and the prevalence of subcontracting. This fragmentation arises because different modes of transportation might make sense for different links along the shipping path, and the service of moving product from point A to point B is at times, rightly or wrongly,

viewed as a commodity and shifted among carriers on the basis of price or availability. Thus, quite often multiple carriers and landoffs are involved. Even holding fixed the origin, destination, and package contents, a shipping client might experience a substantially different combination of carriers and intermediaries from one transaction to the next.

The discussion of Sections 3.1 and 3.3.1 would suggest that this type of fragmentation would lead to greater incidence of miscommunication and moral hazards. A major problem area is the liability for damaged product. Obviously each party would prefer that some other party pay the claim, and this becomes a problem due to difficulty in retrospectively isolating the exact leg of the trip in which the damage occurred. Unauthorized substitutions are also an issue, as in the scenarios in design and procurement outsourcing discussed earlier. That is, did the shipper use the mode of transportation originally agreed upon (such as ground vs. air transport)? This matters because requirements for insurance coverage and rules of liability can vary with the transport mode. Did the 4PL or LLP select the most appropriate subcontractor, or did some hidden agenda induce favoritism? Extensive subcontracting adds a special risk in that if the general contractor fails to pay a subcontractor as promised, the subcontractor will sue the client as well as the general contractor. All this calls for extreme care in the contract-writing stage [31] and subsequent monitoring.

Process monitoring along the entire logistics path is particularly crucial when special handling is required, as with temperature-sensitive products (this kind of supply chain is sometimes called a “cold chain”) or controlled substances. Integrity of these supply chains is difficult to maintain even with insourcing. Outsourcing significantly raises the degree of difficulty.

As with the other forms of supply chain outsourcing, a large body of practitioner literature provides advice on when to outsource logistics and then how best to engage the service provider [122, 183, 221, 252]. The themes tend to mirror those we have covered in depth several times, so in the interest of brevity we simply refer the reader back to Sections 3 and 4.

5.5 Who will orchestrate the outsourced supply chain?

The availability of options for firms to outsource nearly all supply chain functions has engendered the punchline that OEM must be an acronym for “Outsource Everything but Marketing” [181]. However, this monograph makes apparent that such heavily outsourced supply chains can succeed only with extensive coordination effort. This requires excellence in managing complexity and designing mechanisms to contain transactions costs and moral hazards. As autocratic hat does not exist in such extended enterprises, negotiation and relationship-building prowess become crucial [9, 13, 356].

To achieve such coordination some OEMs have evolved into the role of a supply chain “orchestrator” or “integrator.” This resembles the charter of the 4PL/LLP in logistics, but with a more comprehensive scope. HP takes this approach in some of its electronics segments [21]. Germany-based Medion operates a similar model in the PC industry.¹⁸ While bearing a variety of Medion-owned brand names, these products primarily serve as semi-private labels for large retailers like Aldi and Best Buy [297].

¹⁸From Medion’s corporate Web site (http://www.medion.com/en/investor/stock_corporation/, accessed June 20, 2013): “MEDION acts not only as a supplier to its customers — large, internationally operating retail chains — but also as a full-service provider that manages and controls the entire value chain, from the development of the product idea to manufacturing and logistics to after-sales service...MEDION does not perform all steps in the value chain using its own capacities, but instead taps its global procurement process to integrate highly capable international partners into the various stages of a project. After the product idea and design have been developed by MEDION in coordination with the customer, the components and products are procured from well-known manufacturers with global operations, thus incorporating their know-how and production expertise into the procurement process. . . . MEDION organizes, manages, and monitors the logistics process carried out by highly capable forwarding agents. A key success factor for MEDION and its customers is MEDION’s comprehensive, efficient after-sales service... By engaging the most efficient and capable partners, particularly at the investment-intensive links in the value chain, MEDION guarantees flexibility with respect to both its product portfolio and cost structure, making it possible to offer its customers cutting-edge products at extremely attractive price-performance ratios.”

Alternatively, the locus of coordination may reside one level upstream in the supply chain. Here a classic example is the venerable Li & Fung Group [256] in apparel, which orchestrates for its client brands without owning any manufacturing asset. An example of the model is Li & Fung's relationship with Liz Claiborne. In 2009 Claiborne decided to focus on design and marketing for its brands that include Juicy Couture, Kate Spade, and Lucky Brand jeans. So Claiborne turned over to Li & Fung the responsibility for all aspects of production, from finding materials to manufacturing garments. Li & Fung plays a similar role for Talbots, Toys 'R' Us, Timberland, and Sanrio (the merchandiser of Hello Kitty) [125]. While there is no indication that Li & Fung intends to insource manufacturing, the company has been integrating on its downstream side by purchasing product brands, spending \$432 million on five deals in the first half of 2013 after doing ten deals in 2012 [411]. This blurs the distinction between Li & Fung and the likes of HP and Medion.

Others approach orchestration by utilizing much more vertical integration on their own upstream side. In electronics, this is the approach that Foxconn has taken to an extreme, which has been emulated by Flextronics as well. Terry Gou (Foxconn founder and CEO) discovered that he could sustain an efficient workforce in China by providing housing, food, and health care in-house. These costs represent an imposing entry barrier for his competitors. Michael Marks, CEO of Flextronics when Foxconn was building out its Shenzhen operations in the late 1990s, observed, "They were making wire out of ingots of copper. They had chicken farms to lay the eggs for the cafeteria. One building had 2,000 toolmakers. We had none at the time. But we did after that" [38]. As noted in Section 5.3, Foxconn continues to expand the scope of components it produces in-house for inclusion in its clients' final products. This approach also extends to critical services that complement manufacturing, including external design, internal design, logistics after volume production, and repair [296]. A similar model is used in the apparel sector by premium cotton shirt maker Esquel, which is famous for upstream vertical integration that assures quality and availability in its fabric inputs [305].

It is worthwhile to distinguish between two types of vertical integration. One is integration of the upstream supply chain that stops short of the independent OEM who owns the brand and controls the relationship with the end consumer but does not manufacture. The other is practiced by firms like Samsung, which vertically integrate and are also the powerful brand [173]. This important difference raises an intriguing question: if outsourcing of the upstream supply chain is such a good idea for the OEM, why is vertical integration appropriate for the OEM's upstream service provider?

How much long-term power can an OEM have if it is only an orchestrator, or has outsourced that role as well? As implied by Section 5.2, risk of creating a competitor would seem to be high when outsourcing to a CM who excels at full orchestration and also has some design capabilities, and even higher if that CM is also vertically integrated.

6

A Comment on the Research on Outsourcing

What counts as research on outsourcing? From a broad perspective, investigation of any scenario that includes a transaction between any two entities could qualify. Such settings have been examined for decades, resulting in thousands of publications.¹ However, this monograph recommends a more focused definition, which sees the outsourcing literature as those works that consider the creation and management of an outsourcing relationship and inform some problem explicitly ascribable to the outsourcing. Although the intention of this monograph was never to comprehensively review the research literature, this corpus of work merits some comment.

Some research is descriptive or explanatory in nature. It aims to document or measure some phenomena. The information collected can be quantitative (e.g., using direct observation, secondary data, or

¹The scope of this statement becomes even larger upon realizing that research may be applicable more broadly than the way it is officially packaged. This is especially true in supply chain scenarios where, for instance, an OEM outsourcing to a CM (thereby creating a supplier-buyer dyad) is in many ways isomorphic to a manufacturer choosing to sell through an intermediary (as opposed to using direct channels to reach end customers). The latter is the domain of a vast body of marketing channels research, where the main keywords generally do not include the terminology of outsourcing.

surveys) or qualitative (e.g., using case studies), and can be pursued in the field or in a laboratory setting.

A large portion of this monograph's citations are questionnaire or interview-based surveys. This kind of research is tremendously useful, especially to the extent that it documents industry practice, identifies decision-maker intent, sharpens awareness of the correlates of success and failure for the strategies in question, and proposes improved ways to quantify the relationships. Under certain conditions such research can be prescriptive, i.e., that which recommends actions, by correlating performance outcomes with the decisions to outsource (or not). Scholars in strategy use the term "transactional alignment" to refer to matching the conditions (e.g., complexity of the problem domain, level of tacit knowledge) with the make-buy decisions (e.g., [27, 253, 292, 293]). Transactional alignment is hypothesized to result in better performance outcomes, although empirical support is not always consistent. This literature also provides decision support (e.g., [269]).

Much of the prescriptive research on outsourcing takes a mathematical modeling approach, and has appeared in numerous disciplines including economics, accounting, finance, and operations research/management science. For reasons of tractability the analytical work tends to focus on the tradeoffs among a very small number of factors, primarily those that are easier to measure. Examples that study supply chain settings with outsourcing, typically using multivariate optimization or Game Theory, include [30, 32, 82, 139, 141, 142, 175, 218, 219, 312, 384, 385, 394, 395].

Challenges faced by the mathematical modeling approach, which the researchers themselves readily acknowledge, should be apparent from the preceding sections. To be precise, consider that a realistic problem formulation would need to incorporate, or credibly justify the exclusion of, at least the following:

- multiple parties: buyer, service provider(s), materials supplier(s), and competition for each firm;
- conflicting agendas, possibly also with internal conflict among agents within each firm;
- multi-attribute objective functions;

- private information that obstructs complete monitoring of the service providers and materials suppliers, so as to allow the possibility of deliberate deception;
- knowledge assets (such as institutional knowledge, intellectual property, and price information that OEMs and their suppliers might want to keep private), since outsourcing jeopardizes the retention of these;
- power, since outsourcing creates dependence on outside parties;
- a cost model for buyer activities that reflects changes in organizational complexity, since outsourcing reduces complexity in some ways (in enabling focus on core competencies) but increases it in others (for managing the outside parties and maintaining information integrity); and
- a representation of the final product that includes attributes beyond price, since upstream outsourcing decisions influence non-price attributes such as quality and differentiation.

Even this challenging list is not complete. It does not address numerous other angles appearing throughout this monograph, such as the plausible deniability motive for outsourcing, political factors that trigger outsourcing/insourcing decisions, and how ex ante investments in due diligence influence the levels of operating risk. Also, the best wisdom available is that firms must think of these factors strategically, and avoid obsessing on short-term financial impact. This necessitates a longer-term (and more nebulous) objective function and a model formulation containing a time dimension.

This discussion should make clear why prescriptive research that captures well the true essence of the outsourcing decision, even in a stylized way, remains sparse. How will the gap between existing research and the real setting be narrowed?

The mathematical modeling approach has its place, and will continue to make contributions in very targeted settings. Empiricists are accustomed to dealing with messy realities, so can help bring the big picture into sharper focus. Thus, this monograph also encourages more empirical research, including case studies of outsourcing successes and

failures (e.g., Bidwell's study of the IT department of a large financial services firm [56], as well as this monograph itself with Section 2's six major cases and other smaller ones), empirical work that tries to identify the drivers of successful outsourcing (cf. Macher and Richman's [254] review of empirical research related to transactions cost economics), and scenario-based experiments in which participants role-play as parties in outsourcing relationships (e.g., [13], which simulated an outsourced supply chain comprising five independent firms).

Empirical research can also improve the fidelity of mathematical models. Given that those models break down rapidly as complexity is added, modelers need to be very discriminating about what they include. Empiricists can help separate the salient factors from those that are appropriate to assume away, and then calibrate the functional forms and parameters used to model the relationships that matter.

Of course, empirical work has its own limitations. Getting inside of companies and accessing the key decision makers are difficult tasks. Data collection can be a costly endeavor, and the data are often noisy. The findings of empirical research are rarely as precise as the ones provided by mathematical models (although the latter may be a false precision due to the simplification generally necessary to obtain tractable models). A full discussion of the relative strengths and weaknesses of these research approaches is beyond the scope of this monograph.

We hope readers of this monograph will not be deterred by the obstacles, and will view it as a roadmap to many unexplored but important research opportunities. All methodological approaches are welcome in the quest to provide rigorously defensible knowledge and advice to managers of outsourced enterprises.

7

Conclusion

This monograph has focused on the use of outsourcing as an instrument in achieving business goals, and documented and explained factors relevant to the design and management of supply chains with meaningful amounts of outsourcing. It has provided a deep and realistic look at what is necessary to keep an outsourced business process under control. This illuminates the skillset needed by the managers on duty, what their day-to-day work will entail, and the operational details that determine success or failure. This monograph has described how the process of making the decision about what to outsource can be a major undertaking, while highlighting the wisdom of extensive due diligence and analysis. The persistent message is that outsourcing is often the right choice, but brings many hidden costs and risks. Consequently, outsourcing might not reduce the amount of work, so much as change the nature of that work (thus requiring a different set of skills).

This monograph has been guided by a firm conviction that both practitioners and scholars would benefit from a treatment of this topic

that ties together ideas from theory and extensive industrial evidence. Hopefully the practitioners in the reading audience will find here some new insights that improve their business outcomes, and the scholars will use this piece as a basis for new research that is closely tied to real business practice.

Appendix

Offshoring and Offshore Outsourcing

This Appendix provides a brief primer on offshoring, which was defined in Section 1.2 as the positioning of work in a country other than the one containing the firm's headquarters. Rather than attempting to provide a complete analysis of how organizations decide where in the world to conduct their activities, the focus here is on dispelling the confusion between outsourcing and offshoring that was noted in Section 1.2. For actions that simultaneously reflect both offshoring and outsourcing ("offshore outsourcing"), this will clarify understanding of which impacts are due to the offshoring and which are due to the outsourcing. As the locus of so much offshoring activity in recent years, China will serve well as a unifying case study throughout this Appendix.

A.1 Motives for offshoring

This Appendix groups the motives for offshoring into the following categories:

- advantageous access to human, natural, and man-made resources;
- proximity to remote customers, which can reduce response times and logistics costs, improve the understanding of local needs, and

hedge financial risk by incurring operating costs in the same currency as collected from offshore customers;

- proximity to remote suppliers, which becomes critical when domestic alternatives are scarce; and
- restrictions such as local content requirements for goods and services sold in the offshore market, and incentives such as tax/duty benefits offered by the offshore government.

The first three factors emerge organically from economic fundamentals, while the last reflects governmental intervention. Flesling these out below will help the reader sharply differentiate between offshoring and outsourcing.

A.1.1 Advantageous access to human, natural, and man-made resources

Offshoring may seek to leverage an internationally based workforce that is low cost (considering both wages and benefits) and/or well suited for a task. Certain regions may be blessed with an abundance of natural resources such as land, forests, minerals, or energy reserves. And the local populations and their leaders may have taken actions over time that make their homeland friendly to business ventures, whether operated by residents or foreign entities (cf. [33, 62]). This includes investments in physical infrastructure such as roads, airports, seaports, power grids, and telecommunications networks, as well as social infrastructure such as financial and educational institutions. Restrictiveness of local laws governing business practices (e.g., related to environmental protection, labor practices, or ownership of intellectual property) also factors into whether a location is pro-business.

Anything that makes a location favorable for business ought to invite offshoring to that place, all else equal. But as offshoring implies a multinational footprint, ease of coordination with the rest of the enterprise also matters. This brings into play such elements as commonality of language. For instance, a firm that operates in Spanish or has many Spanish-speaking customers might be attracted to Latin America as a site for customer support call centers. Wrocław, Poland, with its highly

educated and multilingual young generation, is a natural fit for firms looking to serve Europe and nearby regions. HP has 2,300 employees there to support its European, African, and Middle Eastern operations. These workers originally provided basic financial and accounting assistance, and have moved up to marketing services and supply chain analysis. Ernst & Young's Polish service centers provide legal, real estate, and human resources services to European clients [189].

In recent years China has exerted a gravitational pull on the world's manufacturing activity, powered by many of the above factors. These include the country's seemingly limitless supply of cheap labor, a burgeoning pool of engineering and management talent, improving English skills, reliable physical infrastructure, various government incentives (also cf. Section A.1.4), and other desirable conditions that will be detailed below [137, 178, 321].

Location-based resource advantage is a moving target. As China's wages rise, cost-sensitive activity is migrating to alternatives such as other parts of Southeast Asia, South America, or Africa. China itself is showing interest in offshoring to Africa, likely drawn also by the continent's abundance of natural resources while harboring concerns about the weak infrastructure [68, 362].

A.1.2 Proximity to customers

Offshoring may be motivated by the benefits of proximity to remote customers. Consider US-based Corning, which produces glass for touch screens mounted on many electronic devices, including Apple's iPhone. According to James B. Flaws, Corning's vice chairman and chief financial officer,

“Our customers are in Taiwan, Korea, Japan and China. We could make the glass here, and then ship it by boat, but that takes 35 days. Or, we could ship it by air, but that's 10 times as expensive. So we build our glass factories next door to assembly factories, and those are overseas” (mainly in Japan and Taiwan) [113].

Research by McKinsey indicates that in excess of two-thirds of the world's manufacturing activity occurs in industries that tend to locate near to demand [157].

The vast population of Chinese consumers and business customers represents a massive and accelerating engine of spending. Rapid inflation in rates in China in recent years, which considered in isolation makes the country a less appealing place to operate, simultaneously puts more buying power into the hands of Chinese consumers. Brands from all over the world are courting China's growing segment of "super consumers," primarily young middle-class adults who were raised in single-child urban families and are more inclined to spend than their parents' generation [295]. In 2011 China overtook the US to become the world's largest food and grocery retail market, and is expected to widen the gap going forward [7]. Nike and Adidas sport shoes have experienced 20% annual growth in China. China is the fastest growing market for the iPhone, with a 250% annual increase in the second quarter of 2010, compared with 155% in the US [52]. China's market for automobiles is the largest by volume and fastest growing in the world [192]. Locating operations in or near China to serve those customers may not only be financially prudent (as Corning reasoned), but also has potential to be more socially responsible with respect to criteria such as carbon footprint.¹ This may be the only feasible option for products that are highly perishable (as often arises in the food and grocery segment just mentioned) or require shipping that is costly relative to product value.

Positioning design and marketing activities directly in the offshore target markets may facilitate superior localization of the product or service offering. In the past, GM took models designed for North America and tried to adapt them to Chinese needs. Now GM's Shanghai design center, which employs roughly 2000, cooperates with Michigan colleagues up to four years in advance on new and refreshed car designs [243]. According to Wulin Gaowa, Design Director of GM China

¹However, the electricity in China might actually be relatively "dirty" as long as the power generation there continues to rely heavily on the burning of coal [57, 336].

Advanced Studio, “Hiring locally is important for us as the designers’ Chinese cultural background will help us better understand how to design mobile products that meet the needs of our customers in China” [160]. In April 2012, Cisco Systems pledged to spend \$1 billion over the next four years for a new innovation center and other technology efforts in Brazil, aimed at developing technologies specifically addressing Brazil’s needs in such areas as urban development, public safety and security, education, health care, and sports and entertainment [71]. Michael Dell travelled to Shanghai in March 2007 to unveil the EC280, a PC that was compact, energy-efficient, and simplified for first-time buyers. This was designed by Dell’s Shanghai R&D center to suit the profile of a large segment of Chinese consumers [355].

Go-locating operations with offshore customers provides a hedge against currency risk. “We tend to manufacture where we sell our products,” says Glenn Eisenberg, chief financial officer at Timken Co. The Ohio-based maker of roller bearings, gear boxes, and other industrial goods has plants in 12 countries. As a result, currency swings “tend not to be a big issue” [176].

A.1.3 Proximity to suppliers

Proximity to suppliers and service providers also adds value. A former high-ranking Apple executive has this assessment of the electronics industry:

“The entire supply chain is in China now. You need a thousand rubber gaskets? That’s the factory next door. You need a million screws? That factory is a block away. You need that screw made a little bit different? It will take three hours” [112].

This describes China’s dominance in many other business segments as well.

How does the critical mass of a business sector come to consolidate in a particular region? This is addressed by the theory of the business/economic/industry/competitive cluster, which is usually attributed to Michael Porter’s *The Competitive Advantage of*

Nations [314]. Related concepts include geographical economics and Alfred Marshall's agglomeration economies. According to Porter [315]:

“Clusters are geographic concentrations of interconnected companies and institutions in a particular field. Clusters encompass an array of linked industries and other entities important to competition. They include, for example, suppliers of specialized inputs such as components, machinery, and services, and providers of specialized infrastructure. Clusters also often extend downstream to channels and customers and laterally to manufacturers of complementary products and to companies in industries related by skills, technologies, or common inputs... Being part of a cluster allows companies to operate more productively in sourcing inputs; accessing information, technology, and needed institutions; coordinating with related companies; and measuring and motivating improvement.”

The process of cluster formation starts with a foundational set of advantages, such as low labor costs, natural resources, access to transportation channels, or various others mentioned earlier. As these attract more economic activity, a network externality effect builds. Whenever a supplier like Corning moves to Asia to be close to its own customers (including Apple), more firms like Apple will be that much more inclined to locate production in Asia to be close to key suppliers.

This phenomenon is not limited to the provision of materials. It also plays out in the entire supporting ecosystem, what Pisano and Shih [310] term an “industrial commons.” In 2008 US-based shoe manufacturer Otabo LLC migrated the bulk of its operations to China for this reason. The labor cost difference mattered, but the final straw was the deterioration of the infrastructure needed to keep its US factories operating. Finding technicians to fly in on short notice to fix shoe machines was a constant and growing challenge because the number of US companies that make and service machines continued to dwindle. Domestic suppliers of shoelaces, leather, and other basic materials insisted on batch sizes far larger than a small-scale producer could justify [5]. The situation is similar in apparel, where more than 97% of

US consumption in 2011 was imported. Decades ago, a manufacturer in New York City could source thread, zippers, lining material, and other garment components from within a few city blocks. “Today it’s a three month delivery period because nobody’s here anymore,” says Bud Konheim, CEO of Nicole Miller. Likewise the pool of skilled tailors and seamstresses in New York has dropped in size from 400,000 to 20,000 [400]. Eventually, firms that wish to participate in a certain clustered industry, or need to conduct trade with that industry, will feel compelled to position some operations within or near the cluster.

Such a dynamic is consistent with the consolidation of industry segment after industry segment into very specific regions of China. By a 2007 assessment, one-quarter of all shoes bought in China come from Wenzhou, a city which also makes 70% of the world’s cigarette lighters. Qiaotou has only 64,000 inhabitants, but its 380 factories produce more than 70% of the buttons for China’s massive apparel industry. Wuyi manufactures more than a billion decks of playing cards annually. Datang makes one-third of the world’s socks. Every year Songxia produces 350 million umbrellas. Shangguan specializes in table tennis paddles, Fenshui in pens, and Xiexie in jungle gyms. 40% of the world’s neckties originate from Shengzhou. Other cities are dedicated entirely to zippers or very specific categories of toys [191, 282]. The support structure that surely exists in each region, highly adapted to that region’s specialty product, serves as a powerful competitive advantage or entry barrier against challengers located anywhere else. This is a virtuous cycle for the region that is acquiring more and more of the industry and its facilitating ecosystem, and a vicious cycle for the ones on the losing end. Offshoring incites apprehension at a national level because of this prospect: a snowball effect that kills entire domestic industries (cf. [310]). This fear may have basis, but we must reiterate that this is a consequence of offshoring and not outsourcing.

Section A.1.2 and this one together suggest that an ideal situation would be in one which the firm’s entire value chain could remain close to suppliers and end customers simultaneously. However, for firms of any meaningful scale and scope, their suppliers and end customers are likely to be geographically dispersed. So the firm must choose which parties to stay near to, and suffer the consequences of distance from the

others (cf. Section A.3). That decision will also consider the attributes that make locations attractive on their own merits, as described in Section A.1.1 already and in Section A.1.4 next.

A.1.4 Restrictions and incentives from offshore governments

To develop their own economies and perhaps to catalyze the clustering process, some governments implement policies designed to attract offshoring from foreign firms. These can take the form of either restrictions/penalties or rewards.

Some countries have made the use of a certain amount of local labor or materials (“local content”) a condition of selling there, or at least apply steep duties to imports. For instance, as recently as 2009 wind farms in China could only use wind turbines of at least 70% local content, with rules under consideration that would require those turbines to contain a certain amount of Chinese-owned intellectual property as well. Canada has also made local content a criterion in government selection and approval of wind-power projects [382]. Foreign automobiles sold in China are subject to a 25% tariff, and from December 2011 to December 2013 China tacked on as much as 22% on top of that for large cars and SUVs exported from the US [264, 331]. So setting up an offshore operation might simply be the price of admission into a desirable market. Indeed, most major auto brands have established a manufacturing presence in China (e.g., Renault in December 2013), although the China government’s requirement that foreign firms operate jointly with a local partner puts intellectual property at risk [25].

Favorable tax and duty structures are a more inviting approach to stimulating foreign business investment [204, 329, 366]. These enable multinational firms to perform “international tax arbitrage” by “base shifting” [391]. This works by realizing profits in the lower tax regions through an appropriate geographic partitioning of resources and responsibilities, coupled with a transfer pricing scheme that formalizes the transactions that cross national borders. For such tactics to be defensible to the tax authorities, the operations in those tax-friendly regions (such as Switzerland, Hong Kong, Singapore, Malaysia,

Ireland, Serbia, Bulgaria, and Cyprus) must have meaningful decision authority and take on nontrivial risk such as liability for unsold inventory [170, 188, 229, 399]. Profits not attached to physical goods, such as earnings on digital goods or royalties on intellectual property, can be moved around more easily since inventory is irrelevant [114].

Lemein [239] provides two examples of eligible structures:

- “(1) The multinational enterprise establishes a trading company in a low-tax country to own the enterprise’s valuable intangible property and to fund and bear the risk of functions that must be performed in high-tax countries. Thus, manufacturing operations conducted in high-tax countries are organized as contract manufacturers for the trading company. The trading company purchases all of the raw materials, consigns the raw materials to the manufacturer, owns the raw materials, work in process, and finished product inventories at the manufacturing plant, and bears the risk of loss for those materials. The trading company owns the intangible property related to the manufactured products and allows the contract manufacturer to use those intangibles solely to make products for the trading company. The trading company plans, manages, supervises, and controls the operations of the contract manufacturer. The contract manufacturer receives a routine cost plus return for its manufacturing activities.
- (2) Similarly, sales and marketing operations in high-tax countries are organized as limited-risk distributors, commission agents, or commissionaires for the trading company. The trading company guarantees the marketing affiliate a routine return (typically operating income equal to a percentage of sales) for its activities and assumes most of the risks of the marketing operations in the country. The trading company, rather than the local affiliate, may own

the inventories sold into the local market, hold the customer accounts receivable, bear all advertising and promotion expenses in the local market, and bear credit, foreign currency, and product liability risks.”

The multinational firm headquartered in a higher tax region would complete the strategy by allowing the entities in the lower tax regions to retain the earnings (“unrepatriated earnings”). A proactive firm would have the foresight to design its products from the beginning with tax-sensitive supply chain strategies in mind [59].

Apple has achieved notoriety (and scrutiny from the US Congress in May 2013) for being an innovator of such practices, including an accounting method known as the “Double Irish with a Dutch Sandwich.” This routes profits through Irish subsidiaries, then the Netherlands, and then the Caribbean [114, 161]. Apple’s tax strategy includes some entities that appear to have no tax residency anywhere in the world, hence zero tax liability [66].

The tax benefit is contingent on the transactions being at “arms length,” meaning they are as if between independent firms. Thus the strategy relies on the creation of value chains that give the appearance of outsourcing. However, spinning off a trading entity that remains largely captive is very different from doing business with a truly autonomous firm that existed prior to the relationship. Ultimately this sort of operating model should be seen mainly as an offshoring play to exploit geographical variations in tax rates, with the outsourcing aspect serving as an enabler. Of course, scale and expertise advantages may also accrue from the organizational centralization of previously distributed activities (outsourced to the entity with tax residency in the tax-friendly region), which is part of the value proposition of outsourcing.

A takeaway lesson is that taxation increasingly leads to convoluted corporate ownership structures, opacity in the geographic footprint of where the members of the extended enterprise are registered, and counterintuitive paths of material flow. Access to advanced expertise in international accounting and law is becoming critical to decoding the offshoring decisions of the modern multinational firm.

A.2 Combinations of offshoring and outsourcing

Offshoring and outsourcing are distinct decisions for any given activity. A firm can go offshore without outsourcing, outsource without offshoring, do neither, or do both. Many firms have all of these combinations somewhere in their portfolio. A firm might use domestic operations (some insourced and some outsourced) to serve local customers while maintaining international operations (some insourced and some outsourced) for its international customers.

GM outsources aspects of production to vendors in the US, as well as Canada and Mexico. Meanwhile, Toyota and BMW own production facilities in the US. Mercedes-Benz, Ford, General Motors, Suzuki, Daihatsu, Honda, Subaru, Citroen, and Toyota all have plants in China [52] (which might be joint ventures with Chinese partners). In the highly outsourced mobile phone sector [325, 349, 354], while changes are afoot, Nokia's longtime strategy has been to insource the majority of its production at the firm's own factories around the world [131, 318, 330].

Taiwan-headquartered Foxconn, the contract manufacturer that is a prime beneficiary of Western OEMs' outsourcing of electronics assembly, employs around 1,000 workers in a Houston plant and plans to increase its US-based workforce. Foxconn began offshoring early in its history. In 1998, when founder and CEO Terry Gou won his first order to make desktop computer chassis for Dell, Dell insisted that the production occur in the US, close to the final market. (This is reminiscent of Corning's move to China as described earlier.) "I bought a company in Kansas City. We quickly needed tooling shops and stamping," Gou has said of his expedient solution [38]. Over time Foxconn has also purchased factories from brand-owning manufacturers all over the world, including a Dell facility in Lodz, Poland, which up to 2009 was Dell's primary means of serving Europe, the Middle East, and Africa [232]. As of September 2010, Foxconn had 25 factories in 12 different countries [38].

In IT services, several leading India-based service providers continued to grow their operations in the US throughout 2011. Tata Consultancy Services planned to increase its 2,100-strong US staff by 1,200 in fiscal 2012, Infosys Technologies intended to hire 250 Americans every

quarter, and Wipro Technologies expected to expand its 8,500-plus US workforce by an additional 1,500 Americans [64]. In 2009 the US-based Dr. Pepper Snapple Group signed a five-year contract with HCL Technologies of Noida, India, for the management of Snapple's computer networks. Dr. Pepper Snapple would be HCL's anchor client in a new operation in Raleigh, North Carolina, that would eventually employ 500. Prior to this deal HCL already employed 3,000 workers in the US and also had operations in China, Ireland, and Poland [376].

These Indian firms are offshoring without outsourcing, while their American clients are outsourcing without offshoring. This kind of solution is politically expedient for both the client and the foreign-headquartered service provider (although, to be fair, the citizens of the foreign provider's home country could be upset by that company's offshoring).

When an activity is both outsourced and offshored, the precise label is "offshore outsourcing." Everything from low-end manual labor to high-end knowledge work is a candidate for offshore outsourcing these days [134, 299]. This strategy is motivated by a belief that the best path to the benefits offered by an offshore solution is to outsource to a service provider with expertise and resources in the appropriate geographies. Accenture, a leading global provider of professional services, has featured this value proposition in its sales pitch:

"Outsourcing enables a company to draw on approximately 120,000 skilled technology and business process outsourcing professionals from the Accenture Global Delivery Network. Having workforce flexibility enables a company to increase, reduce and/or redeploy personnel to address fluctuating needs. To meet local content development requirements, local Accenture people may be deployed" [3].

Using a service provider in this way kills two birds with one stone: offshoring addresses the problem of local content, while outsourcing gives cost flexibility to the client. 54% of the survey respondents in Deloitte [107] agreed that their organizations view outsourcing and offshoring decisions "as a single consideration."

A.3 Hazards of offshoring and offshore outsourcing

A recurring theme in this monograph is that proximity among adjacent parts of a value chain or supply chain is advantageous. For instance, Sections A.1.2 and A.1.3 identified the benefits of physical proximity to suppliers or customers and argued that firms with any meaningful geographic footprint are rarely able to stay close to both.

The hazards of both offshoring and outsourcing can be interpreted as the consequences of losing proximity, i.e., the creation of distance. In the case of outsourcing, the distance is organizational in nature. An intervening corporate boundary obstructs visibility and communication and causes divergence of incentives (cf. Section 3.3.1), which in turn necessitates increased rigor in monitoring (cf. Sections 3.3.3 and 4.7). With offshoring, the distance is geographic. This increases the difficulty of moving materials, funds, information, knowledge, and workers. The “long” supply chains created by offshoring have greater risk of disruption by acts of nature (e.g., earthquakes, tsunamis, volcanic eruptions) or man (e.g., terrorism, labor protests) [358]. In addition, and especially when national boundaries are crossed, correlated with the geographic distance are a proliferation of cultural or language barriers, differences in legal codes and enforcement practices (especially vis-à-vis the protection of intellectual property), or misalignment in attitudes toward environmental and human rights issues. Gray et al. [169] and Gray and Massimino [168] examined multiple types of distance (geographic, cultural, and language) between headquarters and production plants in the pharmaceutical industry. These researchers established that a difference in language between headquarters and plant consistently related to a higher quality risk at the plant, whereas cultural distance did so only inconsistently. National culture did not have a consistent first-order effect. Surprisingly, increased geographic distance correlated with reduced quality risk in both studies.

Offshore outsourcing simultaneously suffers the disadvantages of offshoring and the disadvantages of outsourcing. Some of these are amplified when appearing in combination. For instance, geographic distance due to offshoring only complicates the monitoring needed to assure that an outsource service provider's actions are true to its customer's

intentions. Such vigilance is particularly crucial when offshore outsourcing involves emerging economies [237, 320, 333, 338]. This was evident in Nike's and Apple's supplier labor problems (cf. Sections 2.3 and 2.4) and the adulteration of pet food raw materials sourced by Menu Foods (cf. Section 2.5).

For the individuals charged with coordinating and monitoring the relationship, this inevitably means making peace with business travel. Consider this recent job posting for a Director of Product Quality for Lab126, the Amazon subsidiary responsible for the Kindle tablet computer:

“The position will be based in Cupertino, CA (Silicon Valley), and will report remotely to the company's Vice President, Global Supply Chain, who is based in Hong Kong. All product design, development and support functions are performed in California, while manufacturing is currently done on a contract basis in Shenzhen, China.. .. Because even the best video communications technology has its limitations, the Director, Product Quality should expect to travel frequently, at times on very short notice, to China” [2].

Amazon's Kindle supply chain model is commonplace in the electronics industry, as noted in Section 2.3's discussion of Apple and Foxconn (which also has significant operations in Shenzhen).

This sort of lifestyle has a high human cost. In a personal communication, one supply manager in an electronics firm was only partially joking in conjecturing a positive correlation between his firm's degree of offshoring and the divorce rate in his team.

A.4 Alternatives to operating offshore

The amount of published advice on how to better manage offshored activities is truly vast (e.g., [18, 28, 136, 138]). Doing justice to the topic could easily take as much space as this monograph has devoted to the discussion of outsourcing. As offshoring is not the main focus of this monograph, here we will simply introduce some structural alternatives to offshoring.

“Nearshoring” puts activities close to not quite on domestic soil. This mitigates some of the challenges of physical separation, while still leveraging benefits found offshore. For US companies, Mexico provides a reasonable nearshoring solution for serving their North American customers. Goods can reach most of the US within a day or two by ground transport, duty-free courtesy of the North American Free Trade Agreement (NAFTA). While not low by global standards, wage rates in Mexico are far beneath US scales. This applies not just to low-skilled laborers, but also Mexico’s abundance of engineers. Mexico appears to be on its way to becoming a business cluster for manufacturing in the aerospace and automotive sectors, among others [348, 357].

Disillusionment with offshoring or its nearshoring variant entails yet another set of terms. Like outsourcing contrasts with insourcing, the opposite of offshoring is “onshoring,” or less frequently “home-shoring.” And as outsourcing begat “backsourcing” and “reinsourcing” to emphasize a reversal of strategy, offshoring sometimes is terminated by “backshoring,” “reshoring,” or “repatriating” (cf. [198] and the news aggregator at <http://reshoringmfg.com>).

The choice to backshore need not mean that the original offshore decision was a mistake. Strategies can and should adapt to changing circumstances. Global macroeconomic conditions are constantly in flux. Whatever one region does to attract businesses can be countered by other regions. Financial relationships with governments are not exogenous, but are often negotiable like any other terms of trade. Advances in automation or other process improvements can diminish the importance of wage rate differentials.

The NCR Corporation, an American maker of automated teller machines (ATMs), decided in 2009 to backshore its most sophisticated lines of ATMs from its own plants in China and India, and backsource work previously contracted out to a South Carolina facility of Flextronics. The machines are now manufactured in-house in Columbus, Georgia, not far from the NCR innovation center. This change addressed NCR’s concern that offshoring and outsourcing distanced its designers, engineers, IT experts, and customers from the manufacturing of the equipment, and caused confusion throughout the many remote handoffs

among separate organizations. These highly profitable, high-end ATMs have document-scanning capabilities that never would have been developed without being near enough to actively collaborate with large customers like JPMorgan Chase and Bank of America. According to Peter Dorsman, NCR's senior vice president in charge of global operations, "(Our customers) are heavily involved in the development process. And with this new approach we're taking, we can get innovative products to the market faster, no question" [198].

General Electric has revived its venerable Appliance Park in Louisville, Kentucky, bringing back manufacturing work that recently had been done in China and Mexico. Many of the reasons were operational in nature, including increased transportation costs, offshore wage inflation combined with lowered wage expectations among American workers, improved US labor productivity, and renewed appreciation of the benefits of proximity (between design and manufacturing, and between both of those functions and the end customers) [151]. However, GE was also influenced by tax incentives, such as discussed in Section A.1.4:

"GE was awarded \$37 million in state and local incentives related to its \$800 million investment in Appliance Park. The company said those incentives are largely dependent on hiring. The company also was awarded federal investment tax credits totaling \$24.8 million" [345].

Production in China would still have been 7-10% cheaper than at Appliance Park, but the tax incentives enabled cost parity [150].

A.5 Regarding the focus on national boundaries in the definition of offshoring

Embedded in the language of offshoring is a presumption that two entities within the same country are proximal with respect to every dimension that might impact the difficulty of collaboration (e.g., physical distance, language, culture, legal systems, and business practices), while the opposite must be true for entities located in different countries. But should Windsor, Ontario, be viewed as offshore

for a company based in Detroit? Is Puerto Rico, which is a commonwealth of the US, onshore or offshore for a company headquartered on the mainland? Gray et al. [169] treated Puerto Rico as offshore for American companies because it is “distant” from the mainland geographically, economically, culturally, and linguistically. However, by pairing each Puerto Rico factory with a US factory operated by the same company, this study was able to control for certain factors related to corporate culture and processes.

American firms do not need to leave the mainland to find actionable variance in the climate for doing business.² In the US some states are regarded as being more pro-business than others, which is generally a reputation that local governments try to cultivate. One recent survey defined this in terms of business costs (including labor, energy, and taxes), labor supply, regulatory environment, current economic climate, growth prospects, and quality of life [34]. These resemble the factors in Sections A.1.1 and A.1.4 that favor certain nations as offshoring destinations. Indeed, just as certain countries can be tax havens to the world, many US firms have funneled their domestic profits into subsidiaries in Nevada or Delaware to leverage the zero corporate tax rates in these two states [114]. To the extent that a company’s domestic location choices create dispersion among key stakeholders, variants of many of the hazards discussed in Section A.3 will apply.

Offshoring would not be the correct label for sending work to a different location within the same country, no matter how remote. Currently this action has no standard name.

²Relocating activities domestically would also be beneficial in other nations with significant in-country heterogeneity, such as China or Canada.

Acknowledgments

A number of practitioners have generously shared with me their insights about outsourcing in supply chains. They include Niti Agrawal, Jason Amaral, Stephen Beard, Corey Billington, Bill Boller, Alex Brown, Robert Carrillo, Bijan Dastmalchi, Laurie Fuller, Pamela Gordon, Pat Guerra, Paul Henderson, Mark Holman, Ted Jackson, Martin Juarez, and Colin Kessinger. Special thanks go to all the industry speakers and students of OMIS 388 (MBA elective course “Supply Chain Outsourcing” in Santa Clara University’s Leavey School of Business) over the years. All the individuals involved in the editorial review process for this monograph were tremendously thoughtful and attentive to detail. I learned a great deal from them.

References

- [1] AberdeenGroup. *You will outsource procurement: Here's why and how*: Aberdeen Group, 2002.
- [2] P. Abilla. Lean thinking and the Amazon Kindle. In *shmula*. 2009.
- [3] Accenture. *Accenture outsourcing services to the energy industry*, 2011.
- [4] T. Aeppel. Global scramble for goods gives corporate buyers a lift. *The Wall Street Journal*, page A1, October 2 2007.
- [5] T. Aeppel. US shoe factory finds supplies are Achilles' heel. *The Wall Street Journal*, Marell 3 2008.
- [6] J. Alam. Bangladesli factory collapse death toll hits 1,034. *The Associated Press*, May 10 2013.
- [7] K. Allen. China overtakes US as world's biggest grocery market. *The Guardian*, April 3 2012.
- [8] S. Allen and A. Chandrashekar. Outsourcing services: The contract is just the beginning. *Business Horizons*, 43(2):25-34, 2000.
- [9] J. Amaral, E. G. Anderson Jr., and G. G. Parker. Putting it together: How to succeed in distributed product development. *MIT Sloan Management Review*, 52(2), 2010.
- [10] J. Amaral, C. A. Billington, and A. A. Tsay. Outsourcing production without losing control. *Supply Chain Management Review*, 8(8):44-52, 2004.
- [11] J. Amaral, C. A. Billington, and A. A. Tsay. Safeguarding the promise of production outsourcing. *Interfaces*, 36(3):220-233, 2006.

- [12] J. Amaral and G. G. Parker. Prevent disasters in design outsourcing. *Harvard Business Review*, September 2008.
- [13] J. Amaral and A. A. Tsay. How to win 'spend' and influence partners: Lessons in behavioral operations from The Outsourcing Game. *Production and Operations Management*, 18(6):621—634, 2009.
- [14] Amazon.com. *Form 10-K For the Fiscal Year Ended December 31, 2000*. United States Securities and Exchange Commission, Washington, DC, 2001.
- [15] Amazon.com. *Form 10-K For the Fiscal Year Ended December 31, 2001*. United States Securities and Exchange Commission, Washington, DC, 2002.
- [16] T. Andel. Manufacturing and logistics join forces. *Material Handling Management*, October 2003.
- [17] E. G. Anderson and G. G. Parker. Integration of global knowledge networks. *Production and Operations Management*, 22(6):1446-1463, 2013.
- [18] E. G. Anderson Jr., A. Davis-Blake, S. S. Erzurumlu, N. R. Joglekar, and G. G. Parker. The effects of outsourcing, offshoring, and distributed product development organization on coordinating the NPD process. In C. Locli and S. Kavadias, editors, *Handbook On New Product Development Management*, pages 259-290. Elsevier, Burlington, MA, 2007.
- [19] E. G. Anderson Jr., A. Davis-Blake, and G. G. Parker. Managing outsourced product design: The effectiveness of alternative integration mechanisms. UT Austin Working Paper, 2007.
- [20] E. G. Anderson Jr. and G. G. Parker. The effect of learning on the make/buy decision. *Production and Operations Management*, 11(3):313-339, 2002.
- [21] E. G. Anderson Jr. and G. G. Parker. From buyer to integrator: The transformation of the supply-chain manager in the vertically disintegrating firm. *Production and Operations Management*, 11(1):75—91, 2002.
- [22] R. Anupindi and M. Lee. Boeing: The fight for fasteners. In *University of Michigan Case*. 2009.
- [23] AP. China closes firms over tainted products. *The Associated Press*, July 20 2007.
- [24] AP. Couple pleads guilty in toxic pet food case. *The Associated Press*, June 16 2009.

- [25] AP. Tesla announces China price for cars. *The Associated Press*, January 23 2014.
- [26] L. Argote. *Organizational Learning: Creating, Retaining, and Transferring Knowledge*. Kluwer Academic, Boston, 1999.
- [27] N. Argyres and L. Bigelow. Does transaction misalignment matter for firm survival at all stages of the industry life cycle? *Management Science*, 53(8):1332-1344, 2007.
- [28] R. Aron and J. V. Singh. Getting offshoring right. *Harvard Business Review*, 83(12):135-143, 2005.
- [29] B. Arrunada and X. H. Vazquez. When your contract manufacturer becomes your competitor. *Harvard Business Review*, September 2006.
- [30] A. Arya, B. Mittendorf, and D. E. M. Sappington. The make-or-buy decision in the presence of a rival: Strategic outsourcing to a common supplier. *Management Science*, 54(10):1747-1758, 2008.
- [31] W. J. Augello. The do's & don'ts of third-party contracts. *Logistics Management*, February 1 2005.
- [32] V. Babicli and C. S. Tang. Managing opportunistic supplier product adulteration: Deferred payments, inspection, and combined mechanisms. *Manufacturing & Service Operations Management*, 14(2): 301-314, 2012.
- [33] K. Badenhausen. Ireland leads Forbes' list of the best countries for business. *Forbes*, December 4 2013.
- [34] K. Badenhausen. Virginia tops 2013 list of the best states for business. *Forbes*, September 25 2013.
- [35] B. Bahli and S. Rivard. The information technology outsourcing risk: A transaction cost and agency theory-based perspective. *Journal of Information Technology*, 18(3):211-222, 2003.
- [36] V. Bajaj. Outsourcing giant finds it must be client, too. *The New York Times*, November 30 2011.
- [37] T. Bajarin. ODMs are helping to drive the PC market. *PC Magazine*, July 6 2009.
- [38] F. Balfour and T. Culpan. The man who makes your iPhone. *Bloomberg Businessweek*, September 9 2010.
- [39] J. Baljko. Third-party purchasing gains at smaller firms. *EBN*, March 31 2003.

- [40] I. Bardhan, S. Mithas, and S. Lin. Performance impacts of strategy, information technology applications, and business process outsourcing in US manufacturing plants. *Production and Operations Management*, 16(6):747-762, 2007.
- [41] J. Barney. Firm resources and sustained competitive advantage. *Journal of Management*, 17(1):99-120, 1991.
- [42] C. Barnhart. The fundamentals of pricing. *Electronics Supply & Manufacturing*, pages 20-23, April 1 2005.
- [43] S. Barragan, C. Cappellino, N. Dempsey, and S. Rothenberg. A framework for sourcing product development services. *Supply Chain Management: An International Journal*, 8(3):271-280, 2003.
- [44] L. Barrett. Cisco's \$2.25 billion mea culpa. *CNET News*, May 9 2001.
- [45] J. Barthelemy. The seven deadly sins of outsourcing. *Academy of Management Executive*, 17(2):87-100, 2003.
- [46] J. A. Barton, D. M. Love, and G. D. Taylor. Design determines 70% of cost? A review of implications for design evaluation. *Journal of Engineering Design*, 12(1):47-58, 2001.
- [47] S. Beatty. In fashion world, the anonymous catch the fabulous. *The Wall Street Journal*, page A1, September 17 2003.
- [48] C. Beaumont. Foxconn suicide rate is lower than in the US, says Apple's Steve Jobs. *The Telegraph*, June 2 2010.
- [49] S. Ben-Achour. The business strategy in plausible deniability. *Marketplace*, April 25 2013.
- [50] S. Berinato. What went wrong at Cisco. *CIO*, August 1 2001.
- [51] A. Bernstein. Nike's new game plan for sweatshops. *Business Week*, 2004.
- [52] J. Berthelsen. Will Chinese consumers come to the West's rescue? *Global Asia*, 6(4), 2011.
- [53] S. Beth, D. N. Burt, W. C. Copacino, C. Gopal, H. L. Lee, R. P. Lynch, and S. Morris. Supply chain challenges: Building relationships. *Harvard Business Review*, 81(7):64-75, 2003.
- [54] R. A. Bettis, S. P. Bradley, and G. Hamel. Outsourcing and industrial decline. *The Executive*, 6(1):7-22, 1992.
- [55] G. Blislo, P. Kumar, B. Griffin-Cryan, R. van Doesburg, M. Sparks, and A. Paton. *Global supply chain control towers: Achieving end-to-end supply chain visibility*. Capgemini Consulting White Paper, 2011.

- [56] M. J. Bidwell. Politics and firm boundaries: How organizational structure, group interests, and resources affect outsourcing. *Organization Science*, 23(6):1622-1642, 2012.
- [57] D. Biello. Clean cities and dirty coal power-China's energy paradox. *Scientific American Special Edition*, 18(5):34-41, 2008.
- [58] C. A. Billington and R. Davidson. Leveraging open innovation using intermediary networks. *Production and Operations Management*, 22(6):1464-1477, 2013.
- [59] C. A. Billington, F. Jager, and A. A. Tsay. Engineering a lower tax bill. *CPO Agenda*, pages 50-54, Winter 2008.
- [60] C. A. Billington and A. Kuper. Trends in procurement: A perspective. In *ASCET 5*, pages 102-105. Montgomery Research Inc. (Sponsored by Accenture), San Francisco, CA, 2003.
- [61] Bloomberg. [Toysrus.com](http://www.bloomberg.com/news/2000-01-19-toysrus-com-exec-admits-foul-up-in-holiday-orders.html) exec admits foul up in holiday orders. *Bloomberg*, January 19 2000.
- [62] Bloomberg. Best countries for business 2013. *Bloomberg*, January 22 2013.
- [63] B. L. Bot and C.-S. Neumann. The growing pains for logistics out-sourcers. *McKinsey Quarterly*, 2:68-, 2003.
- [64] J. Boudreau. Indian outsourcers now 'insourcing' jobs to Silicon Valley. *San Jose Mercury News*, August 6 2011.
- [65] W. Boulton and M. Kelly. *Electronics Manufacturing in the Pacific Rim*. WTEC, Baltimore, MD, 1997.
- [66] S. Bowers. How one Irish woman made \$22bn for Apple in a year. *The Guardian*, May 29 2013.
- [67] R. J. Bowman. At Cisco Systems, the Internet is both business and business model. *Supply ChainBrain*, May 1 2000.
- [68] T. Branigan. China 'wants to set up factories in Africa'. *The Guardian*, December 4 2009.
- [69] G. Brown. Global electronics industry: Poster child of 21st Century sweatshops and despoiler of the environment? *EHS Today*, September 1 2009.
- [70] J. Brown. Enabling product innovation: The roles of ERP and PLM in the product lifecycle: Aberdeen Group, 2005.
- [71] J. Burt. Cisco to invest \$1 billion in Brazil. [eWeek.com](http://www.eWeek.com), April 4 2012.

- [72] O. F. Bustinza, L. M. Molina, and L. J. Gutierrez-Gutierrez. Outsourcing as seen from the perspective of knowledge management. *Journal of Supply Chain Management*, 46(3):23-39, 2010.
- [73] P. Butler, T. W. Hall, A. M. Hanna, L. Mendonca, B. G. Auguste, J. Manyika, and A. Sahay. A revolution in interaction. *McKinsey Quarterly*, February 1997.
- [74] J. Carbone. ODMs offer design expertise, quicker time to market. *Purchasing*, January 16 2003.
- [75] J. Carbone. Hewlett-Packard wins for the 2nd time. *Purchasing*, pages 34-50, September 2 2004.
- [76] J. Carbone. Electronics outsourcing in defense rises. *Purchasing*, September 4 2008.
- [77] J. Carbone. More consolidation in EMS industry means fewer choices. *Purchasing*, October 2 2008.
- [78] J. Carbone. More consolidation means fewer choices. *Purchasing*, October 16 2008.
- [79] B. Cargille and C. Fry. Design for supply chain: Spreading the word across HP. *Supply Chain Management Review*, pages 34-41, July-August 2006.
- [80] J. R. Carter, W. J. Markham, and R. M. Monczka. Procurement outsourcing: Right for you? *Supply Chain Management Review*, May 1 2007.
- [81] CENS. Asustek set for smoother sailing after OEM-biz spinoff. *EMSNow*, 9/3, 2007.
- [82] Y.-J. Chen, S. Shum, and W. Xiao. Should an OEM retain component procurement when the CM produces competing products? *Production and Operations Management*, 21(5):907-922, 2012.
- [83] H. W. Chesbrough. The era of open innovation. *MIT Sloan Management Review*, 44(3):35-41, 2003.
- [84] J. P.-P. Cliien and A. Hwang. Flextronics to challenge leading Taiwan-based makers in ODM/OEM digital camera production. *Digitimes*, February 5 2008.
- [85] S. Chin. EMS, OEMs in procurement tug of war. *EBN*, August 25 2003.
- [86] China Daily. Lenovo challenges Apple, Samsung. *China Daily USA*, January 13, 15 2014.
- [87] S. Chopra and P. Meindl. *Supply Chain Management: Strategy, Planning, and Operation*. Pearson Prentice Hall, 3rd edition, 2007.

- [88] K. Chow and J. McElroy. Searching for the perfect BOM. *Circuits Assembly*, October, 26-28 2002.
- [89] C. M. Christensen and S. D. Anthony. Do you know what you do best? *Strategy & Innovation*, pages 3-5, September-October 2003.
- [90] C. M. Christensen, M. E. Raynor, and M. C. Verlinden. Skate to where the money will be. *Harvard Business Review*, 79(10):72-81, 2001.
- [91] S. Chuang. HTC's business development in China to pay off starting next year. *China Economic News Service*, 2011.
- [92] Cisco. *Networking the supply chain for competitive advantage: An overview of the Cisco networked supply chain management solution*. Cisco White Paper, 1999.
- [93] M. Clendenin. Comment: Asustek dinged by Dell. *Electronics Supply & Manufacturing*, April 3 2007.
- [94] R. H. Coase. The nature of the firm. *Economica*, 4(16):386-405, 1937.
- [95] P. Cohan. Is Boeing's fourth 787 delay its last? *BloggingStocks*, 2008.
- [96] B. Coker. The ODM threat to EMS. *Circuits Assembly*, February, 34-37 2004.
- [97] CompuTrade. Stan Shih, father of Taiwan branding: OEM and own-brand should be divided for better effectiveness. *Compu Trade*, July 2 2007.
- [98] J. A. Cooke. Virtual distribution: From 3PL to 3PI. *Logistics Management & Distribution Report*, April 2001.
- [99] A. Cort. Living the dream. *Assembly Magazine*, August 01 2006.
- [100] J. W. Cotchett, S. N. Williams, N. L. Fineman, and J. W. LiCalsi. Xilinx, inc. v. Flextronics International, Ltd., case no. 113cv257431: Superior Court of the state of California in and for the county of Santa Clara, 2013.
- [101] S. Crane. India's outsourcers gain traction. *Business Week*, October 29 2004.
- [102] J. H. Cushman, Jr. Nike Pledges to end child labor and apply US rules abroad. *The New York Times*, May 13 1998.
- [103] Daily-Mail. The stark reality of iPod's Chinese factories. *Daily Mail*, August 18 2006.
- [104] J. Dean. Taiwan firm seeks brand recognition. *The Wall Street Journal*, page A1, October 22 2003.

- [105] J. Dean and C. Piling. Taiwan makers may wring big profits from iPhone. *The Wall Street Journal*, page C1, January 11 2007.
- [106] J. Dean and J. Spencer. Acer seeks happiness in its ‘land of sorrow’. *The Wall Street Journal*, page B1, April 5 2007.
- [107] Deloitte. Outsourcing today and tomorrow: Insights from Deloitte’s 2012 Global Outsourcing and Insourcing Survey, 2012.
- [108] V. Deshpande, L. B. Schwarz, M. J. Atallah, M. Blanton, and K. B. Frikken. Outsourcing manufacturing: Secure price-masking mechanisms for purchasing component parts. *Production and Operations Management*, 20(2):165-180, 2011.
- [109] Digitimes. Samsung to lose its only ODM notebook client, Dell. *Digitimes*, August 10 2005.
- [110] S. J. Doig, R. C. Ritter, K. Speckhals, and D. Woolson. Has outsourcing gone too far? *McKinsey Quarterly*, 26(4):25-37, 2001.
- [111] B. Domke. Boeing 787 lessons learnt. In *Airbus Internal Presentation*. 2008.
- [112] C. Duhigg and D. Barboza. In China, human costs are built into an iPad. *The New York Times*, January 25 2012.
- [113] C. Duhigg and K. Bradsher. How the US lost out on iPhone work. *The New York Times*, 2012.
- [114] C. Duhigg and D. Kocieniewski. How Apple sidesteps billions in taxes. *The New York Times*, April 28 2012.
- [115] J. K. Dunne. Market is big enough for both EMS, ODMs. *EBN*, page 14, May 20 2002.
- [116] D. Durfee. The great inflatable service bill. *CFO Magazine*, April 22 2004.
- [117] D. Durfee and R. Harris. Satyam CFO quits as scandal’s scope widens. CFO.com, January 8 2009.
- [118] G. Dutton. The rise of the 4PL. *World Trade*, January, 20-23 2009.
- [119] J. H. Dyer, D. S. Clio, and W. Clio. Strategic supplier segmentation: The next “best practice” in supply chain management. *California Management Review*, 40(2):57-77, 1998.
- [120] R. G. Eccles and H. C. White. Price and authority in inter-profit-center transactions. *American Journal of Sociology* 9f (Supplement: Organizations and Institutions: Sociological and Economic Approaches to the Analysis of Social Structure), pages S17-S51, 1988.

- [121] Economist. Something old, something new. *The Economist*, February 24 2000.
- [122] J. Edwards. Go ahead... pile it on! *Inbound Logistics*, July 2007.
- [123] B. Einhorn. Quanta's new leap. *Business Week*, June 24 2002.
- [124] B. Einhorn. What's in a name? Fatter profits. *Business Week*, November 12 2007.
- [125] B. Einhorn. Li & Fung: A factory sourcer shines, May 14 2009.
- [126] K. M. Eisenhardt. Agency theory: An assessment and review. *Academy of Management Review*, 14(1):57-74, 1989.
- [127] E. Elahi and N. Lamba. Analyzing Boeing's supply chain design for B787 (Dreamliner). University of Massachusetts Boston Working Paper, 2010.
- [128] L. M. Ellram and C. A. Billington. Purchasing leverage considerations in the outsourcing decision. *European Journal of Purchasing and Supply Management*, 7(1):15-27, 2001.
- [129] L. M. Ellram, W. L. Tate, and C. A. Billington. Understanding and managing the services supply chain. *Journal of Supply Chain Management*, 40(Fall):17-32, 2004.
- [130] L. M. Ellram, W. L. Tate, and C. A. Billington. Offshore outsourcing of professional services: A transaction cost economics perspective. *Journal of Operations Management*, 26(2):148—163, 2008.
- [131] EMSNow. Nokia pulls more than \$5 billion in business from contract manufacturers. *EMSNow*, Marcir 30 2009.
- [132] P. Engardio. Why the supply chain broke down. *Business Week*, Marcir 19 2001.
- [133] P. Engardio. Design is a commodity. *Business Week*, Marcir 21 2005.
- [134] P. Engardio, A. Bernstein, and M. Kripalani. The new global job shift. *Business Week*, February 3 2003.
- [135] P. Engardio and B. Einhorn. Outsourcing innovation. *Business Week*, March 21 2005.
- [136] S. D. Eppinger and A. R. Chitkara. The new practice of global product development. *Sloan Management Review*, 47(4 (Summer)):22-30, 2006.
- [137] J. Fallows. China makes, the world takes. *The Atlantic Monthly*, pages 48-72, July/August 2007.
- [138] D. Farrell. Smarter offshoring. *Harvard Business Review*, 2006.

- [139] Q. Feng and L. X. Lu. Design outsourcing in a differentiated product market: The role of bargaining and scope economics. UT Austin Working Paper, 2010.
- [140] Q. Feng and L. X. Lu. Outsourcing design to Asia: ODM practices. In Q. Haksöz, A. V. Iyer, and S. Seshadri, editors, *Managing Supply Chains on the Silk Road: Strategy, Performance and Risk*, pages 169-184. CRC Press, 2011.
- [141] Q. Feng and L. X. Lu. The strategic perils of low cost outsourcing. *Management Science*, 58(6):1196-1210, 2012.
- [142] Q. Feng and L. X. Lu. The role of contract negotiation and industry structure in production outsourcing. *Production and Operations Management*, 22(5):1299-1319, 2013.
- [143] P. Fersht and J. Snowdon. KPMG state of the outsourcing industry 2013: Executive findings: HfS research, 2013.
- [144] A. Field. Build contractor relationships that are mutually beneficial. *Harvard Business Review — Supply Chain Strategy*, pages 3-5, February 2006.
- [145] C. H. Fine. *Clockspeed: Winning Industry Control in the Age of Temporary Advantage*. Perseus Books, Reading, Massachusetts, 1998.
- [146] C. H. Fine. Clockspeed-based strategies for supply chain design. *Production and Operations Management*, 9(3):213-221, 2000.
- [147] C. H. Fine. Are you modular or integral? Be sure your supply chain knows. *Strategy 4- Business*, 39, 2005.
- [148] C. H. Fine and D. E. Whitney. Is the make-buy decision process a core competence? In M. Muffatto and K. Pawar, editors, *Logistics in the Information Age*, pages 31-63. Servizi Grafici Editoriali, Padova, Italy, 1999.
- [149] Finfacts. Boeing delays launch of 787 Dreamliner: Raises questions on model where it is only responsible for 10% of manufacturing value. *Finfacts Ireland*, October 11 2007.
- [150] S. Fislier. GE revives Appliance Park. *Assembly Magazine*, June 2012.
- [151] C. Fishman. The insourcing boom. *The Atlantic*, December 2012.
- [152] A. L. Fites, D. L. Gooding, L. M. Hardwick, M. Kruszynski, E. H. Massey, E. Oslos, W. Saffell-Clemmer, D. A. Vaughn, and M. J. Akers. The synergy between contract manufacturing and pharmaceutical research and development. *Pharmaceutical Technology*, 27(7):68-79, 2003.

- [153] C. Franzetta. Is there a difference between an LLP and a 4PL? *Inbound Logistics*, January 2010.
- [154] D. Gates. Boeing buzzes about ‘source’ of work. *The Seattle Times*, March 9 2003.
- [155] D. Gates. Dreamliner’s woes pile up. *The Seattle Times*, December 18 2010.
- [156] D. Gates. A ‘prescient’ warning to Boeing on 787 trouble. *The Seattle Times*, February 5 2011.
- [157] K. George, S. Ramaswamy, and L. Rassey. Next-shoring: A CEO’s guide. *McKinsey Quarterly*, 2014.
- [158] L. Girion. Beckman Coulter agrees to a huge cut in judgment; A US Supreme Court case in April that limited punitive damages leads the firm to settle its suit. *Los Angeles Times*, page C1, November 27 2003.
- [159] L. C. Giunipero, R. B. Handheld, and D. L. Johansen. Beyond buying. *The Wall Street Journal*, page R8, March 10 2008.
- [160] GM. Advanced design studio aims tailored cars for China. *GM press release*, December 21 2011.
- [161] M. Gordon. Apple avoids billions in U.S. taxes through affiliates, Senate inquiry finds. *The Associated Press*, May 20 2013.
- [162] P. Gordon. Outsourcing smarter: Five outsourcing mistakes that could have a deadly impact on your company’s bottom line. *Circuits Assembly*, April 2002.
- [163] P. J. Gordon. Thanks, but I’ll build it myself. *Circuits Assembly*, October 2004.
- [164] M. Gottfredson, R. Puryear, and S. Phillips. Strategic sourcing: From periphery to the core. *Harvard Business Review*, 83(2):132-139, 2005.
- [165] G. Graff. Getting the most out of outsourcing. *Purchasing*, September 2 2004.
- [166] R. M. Grant. Toward a knowledge-based theory of the firm. *Strategic Management Journal*, L7(Winter special issue):109-122, 1996.
- [167] R. M. Grant. The knowledge-based view of the firm: Implications for management practice. *Long Range Planning*, 30(3):450-454, 1997.
- [168] J. V. Gray and B. Massimino. The effect of language differences and national culture on operational process compliance. *Production and Operations Management*, 2014. (forthcoming).

- [169] J. V. Gray, A. V. Roth, and M. J. Leiblein. Quality risk in offshore manufacturing: Evidence from the pharmaceutical industry. *Journal of Operations Management*, 29(7):737-752, 2011.
- [170] P. S. Green. Caterpillar accused of demoting executive discovering \$2 billion tax dodge. *Bloomberg*, July 8 2011.
- [171] S. Greengard. Design to go: PC makers lead a nascent trend toward outsourcing to contract design and manufacturing partners. *Industry Week*, May 15 2000.
- [172] W. H. Gregory. Life-cycle-cost concept pushed by AFSC. *Aviation Week & Space Technology*, 5:22-24, 1976.
- [173] S. Grobart. How Samsung became the world's no. 1 smartphone maker. *Bloomberg Businessweek*, March 28 2013.
- [174] F. Grosvenor and T. A. Austin. Cisco's cHub initiative. *Supply Chain Management Review*, 2001.
- [175] P. Guo, J.-S. Song, and Y. Wang. Outsourcing structures and information flow in a three-tier supply chain. *International Journal of Production Economics*, 128(1):175-187, 2010.
- [176] J. R. Hagerty. Dollar's swoon opens doors. *The Wall Street Journal*, page B1, October 18 2010.
- [177] T. Hamburger. President Obama using Bain Capital article on outsourcing against Mitt Romney. *The Washington Post*, June 27 2012.
- [178] R. B. Handheld and K. McCormack. What you need to know about sourcing from China. *Supply Chain Management Review*, 9(6):28-36, 2005.
- [179] D. Hannon. Line blurs between 3PLs and contract manufacturers. *Purchasing*, April 18 2002.
- [180] S. Hansell. Toys 'R' Us sues Amazon.com over exclusive sales agreement. *The New York Times*, May 25 2004.
- [181] T. Harbert. Operating in the dark. *Electronic Business*, November 1 2006.
- [182] A. Hargadon and R. I. Sutton. Building an innovation factory. *Harvard Business Review*, pages 157-166, May-June 2000.
- [183] L. H. Harps. Don't even think about outsourcing... until you read these success stories. *Inbound Logistics*, July 2003.
- [184] L. H. Harps. From tactical to strategic: The 3PL continuum. *Inbound Logistics*, July 2004.

- [185] L. H. Harps. Going global: 3PL or solo? *Inbound Logistics*, October 2004.
- [186] K. R. Harrigan and K. Rudie. Formulating vertical integration strategies. *The Academy of Management Review*, 9(9):638-652, 1984.
- [187] L. J. Hart-Smith. Out-sourced profits — the cornerstone of successful subcontracting. In *Boeing Third Annual Technical Excellence (TATE) Symposium*. Boeing, St. Louis, Missouri, 2001.
- [188] L. Helderman and P. Kraan. Tax efficient supply chain management in the chemical industry. *Reaction*, pages 16-23, June 13 2011.
- [189] J. Helyar. Outsourcing: A passage out of India. *Bloomberg Businessweek*, March 15 2012.
- [190] A. Hesseldalil. A liappy alliance. *Electronics Supply & Manufacturing*, May 1 2005.
- [191] P. Hessler. Boomtowns. *National Geographic*, June 2007.
- [192] J. Hirsch. Why Tesla's \$121,000 Model S price in China makes business sense. *Los Angeles Times*, January 23 2014.
- [193] P. Hise. The remarkable story of Boeing's 787. *Fortune Small Business*, July 9 2007.
- [194] M. Hobday. *Innovation in East Asia: The Challenge to Japan*. Edward Elgar Publishing, London, 1995.
- [195] D. Hofman, K. O'Marah, and C. Elvy. The Gartner supply chain top 25 for 2011. In Gartner, editor, *Gartner Research*. 2011.
- [196] C. A. Holloway. The international procurement operations at Hewlett-Packard (A/B). *GSB Case*, 2001.
- [197] C. A. Holloway, D. Farlow, G. Schlimdt, and A. A. Tsay. Supplier management at Sun Microsystems (A): Managing the supplier relationship. *GSB Case*, 1996.
- [198] W. J. Holstein. The case for backshoring. *Strategy + Business*, 2010.
- [199] HP. 2006 CSCMP supply chain innovation award, HP submission: Buy sell process, 2006.
- [200] J. Hsiung. Terry Gou joins the 'bandits'. *Common Wealth Magazine*, May 14 2009.
- [201] M.-H. Huang. Eliminate the middleman? *Harvard Business Review*, March 2006.
- [202] A. Hubbard. The project interview: Barnes storming. *Project*, November 1 2012.

- [203] L. Huston and N. Sakkab. Connect and Develop: Inside Procter & Gamble's new model for innovation. *Harvard Business Review*, Marcii 2006.
- [204] D. Irving, G. Kilponen, R. Markarian, and M. Klitgaard. A tax-aligned approach to SCM. *Supply Chain Management Review*, April 2005.
- [205] T. Y. Jones. In China, Apple faces its 'Nike moment'? *Reuters*, Marcii 6 2012.
- [206] B. Jorgensen. Back to the future. *Electronic Business*, page 42, December 1 2003.
- [207] B. Jorgensen. Motorola to hide pricing. *Electronic News*, November 3 2003.
- [208] B. Jorgensen. One step at a time. *Electronic Business*, page 38, April 1 2004.
- [209] B. Jorgensen. When outsourcing isn't the answer. *Electronic Business*, pages 39-40, September 1 2004.
- [210] B. Jorgensen. Uncharted territory. *Electronic Business*, September 1 2005.
- [211] M. Juarez. Supply chain outsourcing: Approach & project. *Presentation at Santa Clara University*, 2011.
- [212] G. Kahn. For New Balance, a surprise: China partner became rival. *The Wall Street Journal*, December 19 2002.
- [213] G. Kahn. After years behind the scenes, Chinese join the name game. *The Wall Street Journal*, page 1, December 26 2003.
- [214] Y. I. Kane. Sharp focuses on manufacturing. *The Wall Street Journal*, page B1, July 9 2008.
- [215] Y. I. Kane and D. Clark. In major shift, Apple builds its own team to design cliips. *The Wall Street Journal*, page B1, April 30 2009.
- [216] J. Kaplan. Backsourcing: Why, when, and how to do it. *CSO Magazine*, June 20 2005.
- [217] D. J. Karl. The Indian outsourcing issue is back. *Bloomberg Businessweek*, May 18 2012.
- [218] M. Kaya and "O." Ozer. Quality risk in outsourcing: Noncontractible product quality and private quality cost information. *Naval Research Logistics*, 56(7):669-685, 2009.

- [219] E. Kayış. F. Erhun, and E. L. Plambeck. Delegation vs. control of component procurement under asymmetric cost information and simple contracts. *Manufacturing & Service Operations Management*, 15(1):45-56, 2013.
- [220] T. Kelly. Hon Hai, Sharp may spend over \$1 billion on Japan plant. *Reuters*, August 30 2012.
- [221] J. Kerr. How to build a solid 3PL relationship. *Supply Chain Management Review*, December 2005.
- [222] S. Kessler. This is why your Kickstarter project is late. *Fast Company*, February 5 2013.
- [223] M. Kim. Samsung says to fix outsourcing issues, but keep most production inhouse. *Reuters*, November 30 2012.
- [224] S.-H. Kim, M. A. Cohen, and S. Netessine. Performance contracting in after-sales service supply chains. *Management Science*, 53(12):1843-1858, 2007.
- [225] S.-J. Kim. To brand or not to brand, that is question. *Korea Times*, August 26 2005.
- [226] Knowledge@Wharton. 'Power by the hour': Can paying only for performance redefine how products are sold and serviced? *Knowledge@Wharton*, February 21 2007.
- [227] B. Kogut and U. Zander. Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science*, 3(3):383-397, 1992.
- [228] KPMG. *Bringing services back in-house — happening or hype?* KPMG White Paper, 2011.
- [229] KPMG. *A World in Transition: Managing the Transfer Pricing Implications of Complex Supply Chains*. KPMG, 2011.
- [230] P. Kraljic. Purchasing must become supply management. *Harvard Business Review*, 61(5):109-117, 1983.
- [231] V. Krishnan and K. T. Ulrich. Product development decisions: A review of the literature. *Management Science*, 47(1):1-21, 2001.
- [232] K. Ladendorf. Dell gets leaner with sale of 2-year-old Polish plant. *Austin American-Statesman*, December 3 2009.
- [233] B. Lakenan, D. Boyd, and E. Frey. Why Cisco fell: Outsourcing and its perils. *Strategy + Business*, Q3:54-65, 2001.

- [234] N. Lamba and E. Elahi. When supply chain strategy does not match supply chain capabilities: Lessons that can be learnt from the supply chain of Boeing 787. In *Cases on Supply Chain and Distribution Management: Issues and Principles*. IGI Global, 2012.
- [235] R. Laub. Executive insights into the growing use of procurement outsourcing: 2003 procurement survey: Accenture, 2003.
- [236] A. Lee and A. Hwang. Compal lands notebook ODM orders from Samsung. *Digitimes*, May 23 2012.
- [237] H. L. Lee and C.-Y. Lee. *Building Supply Chain Excellence in Emerging Economies: International Series in Operations Research & Management Science*, vol. 98. Springer, 2007.
- [238] M. Lee. Foxconn profit misses estimate as Nokia cuts outsourcing. *Bloomberg Businessweek*, April 15 2010.
- [239] G. D. Lemein. Transfer pricing and related tax aspects of global supply chain restructurings. *Tax Notes International*, 37(8):715-724, 2005.
- [240] E. Levenson. Citizen Nike. *Fortune*, November 17 2008.
- [241] J. D. Lewis. *Trusted Partners: How Companies Build Mutual Trust and Win Together*. Free Press, New York, 1999.
- [242] W. Y. Lim. BenQ posts loss, unveils overhaul including spinoff. *The Wall Street Journal*, page B3, April 26 2007.
- [243] L. Lin. China dictates design as GM Sail big back seat goes global: Cars. *Bloomberg Businessweek*, January 18 2012.
- [244] J. C. Linder. Transformational outsourcing. *Sloan Management Review*, 45(2):52-58, 2004.
- [245] J. C. Linder, S. Jarvenpaa, and T. H. Davenport. Toward an innovation sourcing strategy. *Sloan Management Review*, 44(4):43-49, 2003.
- [246] R. M. Locke, F. Qin, and A. Brause. Does monitoring improve labor standards? Lessons from Nike. *Industrial & Labor Relations Review*, 61(1), 2007.
- [247] R. M. Locke and M. Romis. Improving work conditions in a global supply chain. *Sloan Management Review*, 48(2):54-62, 2007.
- [248] M. S. Logan. Using agency theory to design successful outsourcing relationships. *International Journal of Logistics Management*, 11(2):21-32, 2000.
- [249] S. Lott. The dream becomes reality. *Aerospace Manufacturing*, pages 24-25, March 8 2010.

- [250] J. L. Lunsford. Boeing scrambles to repair problems with new plane. *The Wall Street Journal*, page A1, December 7 2007.
- [251] C. F. Lynch. Name your terms. *DC Velocity*, July 2005.
- [252] A. MacDonald. How companies choose and manage 3PLs. *World Trade Magazine*, February 1 2007.
- [253] J. T. Macher. Technological development and the boundaries of the firm: A knowledge-based examination in semiconductor manufacturing. *Management Science*, 52(6):826-843, 2006.
- [254] J. T. Macher and B. D. Richman. Transaction cost economics: An assessment of empirical research in the social sciences. *Business and Politics*, 10(1), 2008.
- [255] A. Maclellan. From EMS to CDM: The contract manufacturing industry evolves again. *EBN*, September 22 2003.
- [256] J. Magretta. Fast, global, and entrepreneurial: Supply chain management Hong Kong style. *Harvard Business Review*, pages 103-114, September-October 1998.
- [257] K. Maher. Global goods jugglers. *The Wall Street Journal*, page A11, July 5 2005.
- [258] O. Malik. Is Toys 'R' Us rethinking its Web strategy? *Fortune*, August 13 1999.
- [259] K. Maney. Amazon's new direction: Point, click, make a product to sell to the world. *USAToday*, November 26 2006.
- [260] M. Mangalindan. How Amazon's alliance with Toys R Us went sour. *The Wall Street Journal*, January 23 2006.
- [261] S. P. Mantel, M. V. Tatikonda, and Y. Liao. A behavioral study of supply manager decision-making: Factors influencing make versus buy evaluation. *Journal of Operations Management*, 24(6):822-838, 2006.
- [262] J.-M. Mäntylä. Nokia: "Lumia 800 oli Compalin heiniä". *Talouselämä*, February 17 2012.
- [263] J. A. Martin. Core vs. Context. *iQ Magazine*, 2004. First Quarter.
- [264] M. Martina and D. Palmer. China says will hit U.S. auto imports with duties. *Reuters*, December 14 2011.
- [265] S. Mayerowitz. From the start, Dreamliner jet program was rushed. *The Associated Press*, January 25 2013.
- [266] J. McCafferty. The price of a cheap suit. *CFO Magazine*, August 1 2005.

- [267] A. McClain. Walmart plays nice (again). *Forbes*, August 2 2011.
- [268] D. McGrath. TSMC vaults into top 10 in R&D spending. *EETimes*, January 13 2011.
- [269] R. McIvor. How the transaction cost and resource-based theories of the firm inform outsourcing evaluation. *Journal of Operations Management*, 27(1):45-63, 2009.
- [270] M. M. McVeigh. RE: Toys R.U.s.Com.LLC vs. Amazon.com, Docket No.: C-96-04. Paterson, New Jersey 07505-2018: Superior Court of New Jersey, Passaic Vicinage, 2006.
- [271] J. T. Mentzer, T. P. Stank, and T. L. Esper. Are supply chain management and logistics the same thing? *Inbound Logistics*, January 2010.
- [272] R. Merritt. Private-label quest marginalizes OEMs. *EE Times*, April 18 2005.
- [273] T. Metty. How to outsource your way to competitive advantage. *Purchasing*, January 12 2006.
- [274] C. Metz. Exclusive: Google, Amazon, and Microsoft swarm China for network gear. *Wired*, March 30 2012.
- [275] H. Meyerson. Wal-Mart's strategy of deniability for workers' safety. *The Washington Post*, November 27 2012.
- [276] R. M. Monczka, J. R. Carter, J. D. Blascovich, W. J. Markham, and T. H. Slauglit. Outsourcing Strategically for Sustainable Competitive Advantage: CAPS Research & A.T. Kearney, 2005.
- [277] R. M. Monczka, R. B. Handfield, L. C. Giunipero, and J. L. Patterson. *Purchasing and Supply Chain Management*. South-Western College/West, Mason, OH, 4th edition, 2008.
- [278] G. A. Moore. *Living on the Fault Line: Managing for Shareholder Value in the Age of the Internet*. HarperBusiness, New York, 1st edition, 2000.
- [279] E. Morrison. Q&A with author Geoffrey Moore: Core focus. *iQ Magazine*, May/June 2003.
- [280] S. Mucha. EMS contracts: More than a handshake. *Circuits Assembly*, pages 42-46, August 2002.
- [281] S. Mucha. DFX — Facilitating EMS/OEM communication. *Circuits Assembly*, pages 36-38, September 2003.
- [282] D. Muir. Reporter's notebook: Inside a Chinese factory town. *AEC News*, November 15 2010.

- [283] K. Munsch. Outsourcing design and innovation. *Research — Technology Management*, 47(1):27-30, 2004.
- [284] V. G. Narayanan and A. Raman. Aligning incentives for supply chain efficiency. *HBS Case*, 9-600-110, 2000.
- [285] V. G. Narayanan and A. Raman. Aligning incentives in supply chains. *Harvard Business Review*, 82(11):94-102, 2004.
- [286] NEMI. *In search of the perfect bill of materials (BOM)*. White Paper, 2002.
- [287] A. A. Nieder. Hong Kong remains confident despite flagging economy. ApparelNews.net, February 2 2001.
- [288] C. Niezen and W. Weller. Procurement as strategy. *Harvard Business Review*, 84(9), 2006.
- [289] N. Nohria. Feed R&D — or farm it out? *Harvard Business Review*, July-August 2005.
- [290] I. Nonaka and H. Takeuchi. *The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation*. Oxford University Press, USA, 1995.
- [291] D. Normile. These slim margins are not by design. *Electronic Business*, September 1 2004.
- [292] S. Novak and S. D. Eppinger. Sourcing by design: Product complexity and the supply chain. *Management Science*, 47(1):189-204, 2001.
- [293] S. Novak and S. Stern. How does outsourcing affect performance dynamics? Evidence from the automobile industry. *Management Science*, 54(12):1963-1979, 2008.
- [294] B. Qjo. Boxed in. *Electronics Supply & Manufacturing*, pages 32-40, April 2005.
- [295] C. Oliver. China consumers spend, even as growth eases. *Marketwatch*, January 19 2012.
- [296] T. Ootsuki. EMS giant Hon Hai. *Tech-On!*, August 13 2008.
- [297] A. Ordanini, K. Kraemer, and J. Dedrick. *Medion: The Retail “Orchestrator” in the Computer Industry*. Personal Computer Industry Center, Paul Merage School of Business, UC Irvine, 2006.
- [298] J. O’Reilly. Switched on: Bringing the 3PL machine to life. *Inbound Logistics*, July 2009.
- [299] K. O’Sullivan. Offshoring spreads its wings. *CFO Magazine*, March 1 2008.

- [300] M. S. Ouchi. Toy story winds up leaving Amazon grim. *The Seattle Times*, March 3 2006.
- [301] A. Pande, R. Raman, and V. Srivatsan. Recapturing your supply chain data. *McKinsey Quarterly*, 7(Spring):16-21, 2006.
- [302] R. Parloff. Not exactly counterfeit. *Fortune*, May 1 2006.
- [303] A. Parmigiani. Why do firms both make and buy? An investigation of concurrent sourcing. *Strategic Management Journal*, 28:285-311, 2007.
- [304] R. Peisch. When outsourcing goes awry. *Harvard Business Review*, 73(3):24-37, 1995.
- [305] B. Peleg-Gillai. Esquel Group: Transforming into a vertically integrated, service-oriented, leading manufacturer of quality cotton apparel. *GSB Case*, 2007.
- [306] K. Peterson. A wing and a prayer: Outsourcing at Boeing. *Reuters*, January 20 2011.
- [307] A. Pick. The EMS and ODM monitor. In *iSuppli Research Report*. iSuppli Corporation, 2004.
- [308] A. Pick. ODMs face rising competitive challenges amid rapid growth. *EMSNow*, February 16 2005.
- [309] A. Pick. EMS/ODM transform by 2013. In *iSuppli Research Report*. iSuppli Corporation, 2008.
- [310] G. P. Pisano and W. C. Shih. Restoring American competitiveness. *Harvard Business Review*, July-August 2009.
- [311] G. P. Pisano and W. C. Shih. Does America really need manufacturing? *Harvard Business Review*, Marell 2012.
- [312] E. L. Plambeck and T. A. Taylor. Sell the plant? The impact of contract manufacturing on innovation, capacity, and profitability. *Management Science*, 51(1):133-150, 2005.
- [313] M. E. Porter. *Competitive Strategy: Techniques for Analyzing Industries and Competitors*. Free Press, New York, 1980.
- [314] M. E. Porter. *Competitive Advantage of Nations*. Free Press, New York, 1990.
- [315] M. E. Porter. Clusters and the new economics of competition. *Harvard Business Review*, pages 77-90, November-December 1998.
- [316] C. K. Prahalad and G. Hamel. The core competence of the corporation. *Harvard Business Review*, 68(3):79-90, 1990.

- [317] V. Preysman. Private supply chains. *Electronic News*, 52, February 26 2001.
- [318] D. Pringle. Nokia eschews factories in most low-cost regions. *The Wall Street Journal*, January 3 2003.
- [319] Purchasing. OEMs should outsource, but maintain control of sourcing. *Purchasing*, page 56, December 11 2003.
- [320] PWC. Redefining intellectual property value: The case of China, 2005.
- [321] D. F. Pyke. Shanghai or Charlotte? The decision to outsource to China and other low cost countries. In H. L. Lee and C.-Y. Lee, editors, *Building Supply Chain Excellence in Emerging Economies*, pages 67-92. Springer-Verlag, 2007.
- [322] J. B. Quinn. Outsourcing innovation: The new engine of growth. *Sloan Management Review*, 41(4):13-28, 2000.
- [323] J. B. Quinn and F. G. Hilmer. Strategic outsourcing. *Sloan Management Review*, 35(4):43-55, 1994.
- [324] N. Radjou. Tapping innovation networks. *Electronics Supply & Manufacturing*, May 1 2005.
- [325] E. Ramstad. China's secret: Contractors. *The Wall Street Journal*, page B3, March 29 2004.
- [326] B. Rayner. Some industry terms need to be changed. *EBN*, November 29 2000.
- [327] M. Rebeiro. *Outsourcing in a Brave New World: An International Survey of Current Outsourcing Practice and Trends*. The Norton Rose Group, 2011.
- [328] T. Reed. Boeing owns up to 787 woes. TheStreet.com, September 3 2009.
- [329] N. Reese. Transaction tax management: A seat at the supply chain table. *Financial Executive*, 20(7):48-49, 2004.
- [330] A. Reinhardt. Nokia's magnificent mobile-phone manufacturing machine. *Business Week*, August 3 2006.
- [331] Reuters. China to end anti-dumping duties on U.S. car imports. *Reuters*, December 12 2013.
- [332] B. Roberts. Managing products from cradle to grave. *Electronic Business*, August 1 2003.
- [333] B. Roberts. Protect your IP. *Electronic Business*, May 1 2006.

- [334] D. Roberts and P. Engardio. A lion for workers' rights. *Business Week*, November 26 2006.
- [335] D. Roberts and P. Engardio. Secrets, lies, and sweatshops. *Business Week*, November 26 2006.
- [336] E. Rosenthal. "Dirty" energy dwarfs clean in China and India. *The New York Times*, February 21 2011.
- [337] P. Rosenthal. Accretive Health and the true cost of outsourcing. *Chicago Tribune*, May 05 2012.
- [338] A. V. Roth, A. A. Tsay, M. E. Pullman, and J. V. Gray. Unraveling the food supply chain: Strategic insights from China and the 2007 recalls. *Journal of Supply Chain Management*, 44(1):22-39, 2008.
- [339] W. Safire. The way we live now: 3-21-04: On language; outsource. *The New York Times*, March 21 2004.
- [340] P. Sanders. Boeing brings in old liands, gets an earful. *The Wall Street Journal*, July 19 2010.
- [341] G. Sandoval. Amazon's sad toy story. *CNET News*, March 14 2002.
- [342] B. Schlender. Peter Drucker sets us straight. *Fortune*, pages 115-118, January 12 2003.
- [343] N. Schmidle. Inside the knockoff-tennis-shoe factory. *The New York Times*, page MM38, August 22 2010.
- [344] J. Schmit. Tainted pet food suit settled for \$24 million. *USA Today*, May 23 2008.
- [345] B. Schreiner. GE adds to work force at Louisville plant. *Bloomberg Businessweek*, 2012.
- [346] K. D. Scliwartz. Triumphi of a new design paradigm. *Electronic Business*, December 1 2002.
- [347] P. Seitz. Outsourcing tech manufacturing may hurt US firms' innovation. *Investor's Business Daily*, December 1 2008.
- [348] A. Seiko and T. Vinas. Nearshoring fuels Mexican manufacturing growth. *Industry Week*, March 14 2012.
- [349] C. Serant. EMS providers see \$10 billion windfall from cell phones. *EBN*, May 1 2001.
- [350] C. Serant. Quanta Computer moving into EMS territory. *EBN*, August 2 2002.
- [351] C. Serant and F. Hung. Taiwan's ODMs attractive to Japanese firms. *EBN*, April 8 2002.

- [352] D. Shen and S. Shen. FIH considering transforming into branded smart-phone provider, say sources. *Digitimes*, October 19 2012.
- [353] S. Shen. Dell aims to establish a new model for notebook procurement. *Digitimes*, December 1 2003.
- [354] S. Shen. Motorola to increase outsourcing of handsets in 2008, says paper. *Digitimes*, December 17 2007.
- [355] C. Simons and D. Zehr. Dell rolls out PC for Chinese market. *Austin American-Statesman*, March 21 2007.
- [356] A. Singh. There's a new supply chain sheriff in town. *Industry Week*, December 3 2008.
- [357] H. L. Sirkin, M. Zinser, and D. Hohner. *Made in America, again: Why manufacturing will return to the US*. Boston Consulting Group White Paper, 2011.
- [358] M. S. Sodili and C. S. Tang. *Managing Supply Chain Risk*. Springer US, 2012.
- [359] C. Souza. The design outsourcing dilemma. *Electronics Supply & Manufacturing*, November 1 2004.
- [360] C. Souza. Reinventing innovation. *Electronics Supply & Manufacturing*, January 1 2005.
- [361] J. Sprovieri. Forward thinking: Build or buy? When to outsource. *Assembly Magazine*, April 2001.
- [362] J. Sprovieri. Will Africa become the next China? *Assembly Magazine*, September 12 2008.
- [363] N. Stein. May we offer you our Net business? *Fortune*, March 5 2001.
- [364] P. Stoten. Interview with Michael Marks. *EMSNow*, October 23 2008.
- [365] L. Sullivan. Outsourcing's hidden costs. *EBN*, October 6 2003.
- [366] G. Sutton. The tax efficient supply chain. *Demand & Supply Chain Executive*, October 2005.
- [367] R. J. Symon and K. J. Dangerfield. Application of design to cost in engineering and manufacturing. Paper read at *NATO AGARD Lecture Series No. 107: The Application of Design To Cost And Life Cycle Cost To Aircraft Engines*, at Saint Louis, France, 12-13 May, London, UK, 15-16 May, 1980.
- [368] S. Tadelis. Innovative organization: Creating value through outsourcing. *California Management Review*, 50(1):261-277, 2007.

- [369] C. S. Tang and V. Babich. Using social and economic incentives to discourage Chinese suppliers from product adulteration. *Business Horizons*, 2014. forthcoming.
- [370] C. S. Tang and J. D. Zimmerman. Managing new product development and supply chain risks: The Boeing 787 case. *Supply Chain Forum*, 10(2):74-86, 2009.
- [371] R. Tate. In the Kickstarter future, hardware is the new software. *Wired*, June 6 2012.
- [372] E. Teach. The great inventory correction. *CFO Magazine*, September 01 2001.
- [373] P. E. Teague. PLM ensures BOMs don't bomb. *Purchasing*, September 15 2005.
- [374] S. Thurm. Flextronics must pay damages. *The Wall Street Journal*, September 25 2003.
- [375] S. Thurm. Behind outsourcing: Promise and pitfalls. *The Wall Street Journal*, page B3, February 26 2007.
- [376] H. Timmons. Snapple deal to outsource may add jobs in America. *The New York Times*, June 30 2009.
- [377] A. Tiwana and A. Bush. A comparison of transaction cost, agency, and knowledge-based predictors of IT outsourcing decisions: A U.S.-Japan cross-cultural field study. *Journal of Management Information Systems*, 24(1):259-300, 2007.
- [378] E. Toung. Building a supply chain control tower: What it takes and what it gets you. *E2open blog*, 2011.
- [379] H. Tsukayama. Apple Store protests taking place around the world Thursday. *The Washington Post*, February 8 2012.
- [380] S. Tully. How Cisco mastered the Net. *Fortune*, August 17 1998.
- [381] D. Twigg. Managing the design/manufacturing interface across firms. *Integrated Manufacturing Systems*, 13(4):212-221, 2002.
- [382] L. D. Tyson. Washington should get toughli with countries that force US companies to outsource. *HBR Blog Network*, November 12 2009.
- [383] D. Tzeng and S. Chang. ODM notebook strategy: Reuse the same design for as many customers as possible. *Digitimes*, Marcli 17 2003.
- [384] S. "Ulku, L. B. Toktay, and E. Yucesan. The impact of outsourced manufacturing on timing of entry in uncertain markets. *Production and Operations Management*, 14(3):301-314, 2005.

- [385] S. Ülku, L. B. Toktay, and E. Yucesan. Risk ownership in contract manufacturing. *Manufacturing & Service Operations Management*, 9(3):225-241, 2007.
- [386] K. Ulrich. The role of product architecture in the manufacturing firm. *Research Policy*, 24:419-440, 1995.
- [387] K. T. Ulrich and D. J. Ellison. Beyond make-buy: Internalization and integration of design and production. *Production and Operations Management*, 14(3):315-330, 2005.
- [388] R. Venkatesan. Strategic sourcing: To make or not to make. *Harvard Business Review*, November-December 1992.
- [389] VentureOutsource. Mobile phones: Troubled contract manufacturing? *Venture Outsource*, October 1 2009.
- [390] K. Vitasek. Supply chain management terms and glossary. Council of Supply Chain Management Professionals, 2008.
- [391] E. Vroemen. Supply chain management as a strategic tax planning tool. *Tax Notes International*, 26(7):883-890, 2002.
- [392] D. Wakabayashi and Y. Yamaguchi. NEC to outsource more cliips. *The Wall Street Journal*, July 15 2009.
- [393] L. Wang. BenQ corp thrives on its brand name. *Taipei Times*, page 11, December 27 2004.
- [394] L. Wang, G. Cai, A. A. Tsay, and A. J. Vakharia. Reverse channel design: Profitability and environmental considerations. University of Florida Working Paper, 2014.
- [395] Y. Wang, B. Niu, and P. Guo. On the advantage of quantity leadership when outsourcing production to a competitive contract manufacturer. *Production and Operations Management*, 22(1):104-119, 2013.
- [396] A. Weber. Outsourcing's alphabet soup. *Assembly Magazine*, February 2003.
- [397] A. Weber. The pros and cons of outsourcing. *Assembly Magazine*, February 2003.
- [398] B. Wernerfelt. A resource-based view of the firm. *Strategic Management Journal*, 5(2):171-180, 1984.
- [399] M. Wheatley. Wish you were here — why Switzerland may have the answer to tax efficiency and talent. *ProcurementLeaders*, 30:38-40, 2011.
- [400] M. C. Wliite. Clothing excluded from US manufacturing resurgence. *NBC News*, May 2 2013.

- [401] D. E. Whitney. Manufacturing by design. *Harvard Business Review*, 88:83-91, 1988.
- [402] M. J. Whitworth. Business owners plead guilty to distributing tainted ingredient used in pct food. In *News Release, Office of the US Attorney, Western District of Missouri*. 2009.
- [403] O. E. Williamson. *Markets and Hierarchies: Analysis and Antitrust Implications*. The Free Press, New York, NY, 1975.
- [404] O. E. Williamson. Outsourcing: Transaction cost economics and supply chain management. *Journal of Supply Chain Management*, 44(2):5-16, 2008.
- [405] C. Wolf, C. Burritt, and M. Boyle. Why Wal-Mart wants to take the driver's seat. *Bloomberg Businessweek*, May 27 2010.
- [406] P.-H. Wong. National innovation systems for rapid technological catch-up: An analytical framework and a comparative analysis of Korea, Taiwan and Singapore. In *Paper to be presented at the DRUID Summer Conference on National Innovation Systems, Industrial Dynamics and Innovation Policy*. Rebild, Denmark, June 9-12, 1999 1999.
- [407] J. F. Wood. Chinese, American business owners indicted for importing tainted ingredient used in pet food: Thousands of pets suffered illness, death throughout the United States. In *News Release, Office of the US Attorney, Western District of Missouri*. 2008.
- [408] S. Wright and N. Karmini. Nike admits foreign contractors abuse workers. *The Associated Press*, July 14 2011.
- [409] H. Wu and M. Chen. Taiwan ODMs and suppliers to feel impact as Dell to withdraw component purchasing rights. *Digitimes*, December 19 2008.
- [410] Y. Yamaguchi and D. Wakabayashi. Hitachi to outsource TV manufacture. *The Wall Street Journal*, July 10 2009.
- [411] D. Yin. Li and Fung falls out of favor. *Forbes Asia*, September 2 2013.
- [412] M. H. Zack and S. Singh. A knowledge-based view of outsourcing. *International Journal of Strategic Change Management*, 2(1):32—53, 2010.
- [413] Y. Zhao and R. J. Calantone. The trend toward outsourcing in new product development: Case studies in six firms. *International Journal of Innovation Management*, 7(1):51—66, 2003.
- [414] G. A. Zsidisin and L. M. Ellram. An agency theory investigation of supply risk management. *Journal of Supply Chain Management*, 39(3): 15-29, 2003.