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Divestment of Strategic Resources in a Hypercompetitive, Capital Intensive, Knowledge Based Industry

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by

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Capital Intensive, Knowledge Based Industry

The undersigned committee hereby approve the attached dissertation, "Divestment of Strategic Resources in a Hypercompetitive, Capital Intensive, Knowledge Based Industry," by Steven Robert Rivet.

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Abstract

Divestment of Strategic Resources in a Hypercompetitive,
Capital Intensive, Knowledge Based Industry
Steven Robert Rivet

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This dissertation creates a model explaining the factors that drive the decision by a semiconductor firm to divest a specific strategic resource. The dissertation is based on a case study of a medium size semiconductor firm that divested a competitively performing manufacturing facility in a low labor cost Asian country, and replaced the services it performed with contracted services. The study draws on competitive advantage, resource based view, transaction cost, divestment, international business, and asset-light model literature. The existing literature either fails to explain (or to explain completely) the reasons driving these type of divestiture decisions (resource based view, transaction cost economics, international business theory), or explains them only at a firm level (divestment and asset light theory). The contribution that this dissertation creates is a model that explains the decision at the specific strategic resource level, i.e. a theory of why one particular strategic resource would be divested by a firm, but not another.

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Key Words

Strategy, resource based view, knowledge based view, semiconductor, resource allocation, asset light, fab light, divestment, hypercompetitive, capital allocation

Note on Terms and Abbreviations

This dissertation is based on a case study in the semiconductor industry, and uses several terms that are well understood within that industry, but not necessarily in the wider business academic literature, or are common terms that have special meaning when used in the context of that industry. These terms and abbreviations are defined in Appendix A. Terms and acronyms common to strategic and other business academic literature that are used herein are also included in Appendix A for clarity.

List of Figures

Acknowledgements

This dissertation would not have been possible without the support of many people; while I cannot list them all, I would like to point out those who have been especially important and helpful to me. I will first thank my parents, Joan and the late Robert Rivet, who stressed the importance of education from the beginning; my earliest memories include discussions with them of the unlimited scope of knowledge that was available to me if I would pursue it. They stimulated and nurtured my love of knowledge and education. My wife, Dr. Semen Koksal, and my son Denis both provided moral and practical support, and tolerated my hours of study and the impact it had on the time I could spend with them. They are my fellow scholars. Their love and encouragement gave me the strength I needed to forge ahead.

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final dissertation, while providing insightful critiques and suggestions. Dr. Martinez-Vogt provided voluminous nuggets of advice and unending encouragement throughout the process, and made that process seem less daunting than it first appeared. All of my colleagues in the College of Business were universally supportive and encouraging, and many were role models for me to emulate.

I would like to thank my fellow students, the members of my cohort, for their understanding of shared frustrations, moral support, and willingness to be a sounding board for ideas and plans. Their empathy and support made the DBA process much more rewarding than if I was making the journey alone.

Finally, I want to express my gratitude to the executives who agreed to be interviewed for this study. Without their cooperation, their generosity with their time and memories, this dissertation would not exist. Their recollections of actions, arguments, justifications, and historical context form the basis of this study. I am forever indebted to them.

Dedication

I dedicate this dissertation to the memory of my father, Robert D. Rivet. He took great pride in the accomplishments of his children, and he will be greatly missed as we celebrate this milestone.

Chapter 1
Introduction

Overview

Firms seek competitive advantage by creating or obtaining strategic resources, i.e. resources that are valuable, rare, inimitable, and organizationally exploitable (Barney, 2002a; Knott, 2015). In recent decades, in the quest for competitive advantage, many firms have been pursuing an asset light strategy (Page, 2007; Liou, Tang, & Huang, 2008; Liou, 2011; Surdu, 2011; Sohn, 2013), attempting to apply limited financial resources into their most productive possible use (Maly & Palter, 2002), and eliminating those that are not creating competitive advantage. US semiconductor firms have been divesting some corporate owned production facilities in low labor cost countries (Muth, 2016) while retaining ownership of other production facilities and captive design groups, most of which

are located in the US or other developed, high labor cost countries. These facilities and design groups are all strategic resources; they are required in order to perform the semiconductor design and manufacturing process and can, at least in some firms, provide cost or differentiation advantages over competing firms (Barney, 1991; D'Aveni, 1994). If one or more of these resources are divested, the firm must subcontract or make other replacement arrangements with other firms to perform the services provided by the divested resource.

This trend to divest foreign production facilities is the opposite of what would be predicted by classical theory of internationalization; the theoretical progression of international operations (Johanson & Vahlne, 1977, 2009; Caves, 1982; Porter, 1990) predicts a domestic firm will progress from exporting to subcontracting to international joint ventures to foreign direct investment. International business theory suggests that firms will act to internalize market transactions that are generating profits for external companies, and capturing that profit for themselves, but semiconductor firms are doing just the opposite, sometimes increasing the cost of manufacturing in the process (Muth, 2016). Internationalization theory (Dunning, 1988) would also suggest high cost domestic design resources would be replaced with lower cost foreign resources either as subcontracted services or wholly owned design centers, but there is no obvious evidence of that trend occurring.

Divestiture theory offers several possible explanations, at the firm level, for divestment of foreign resources including economic or political distress, problems associated with the management of a facility in foreign cultures, and lack of strategic fit (Benito, 1997). This study will attempt to determine whether those firm level factors apply to the chosen case, to identify other factors not addressed by previous research driving those decisions, and to determine which factors drive decisions to divest specific strategic resources, and not others, in a semiconductor firm.

Background and Rationale of the Study

In an increasingly knowledge driven economy, technological innovations drive product value and demand, which drive economic activity. Many of the firms driving technological innovations operate in industries that can be described as hypercompetitive, capital intensive, and knowledge based. Semiconductor manufacturing is an example of such an industry, and the firm studied is a medium size semiconductor manufacturing firm. Semiconductor firms cannot perform their operations, the design and manufacture of their products, without access to design and production resources. Semiconductor firms must own these resources or have

contractual agreements with other firms to provide the services supplied by those resources.

Each of the three parts of the description of hypercompetitive, capital intensive, knowledge based industries is a unique characteristic of the semiconductor industry, although each part can also be used singly or in combination to describe other industries. By identifying descriptors of the value and cost of resources that directly address each of these three characteristics, it may be possible to predict the probability (of interest to academics) or the advisability (of interest to practitioners) of divestment of a strategic resource based on the value or state of the descriptor. This study assumes that a service that the resource that may be divested provides can be purchased from other suppliers of that service on the open market through subcontracting arrangements.

It can be convincingly argued that complex resources such as design groups or production facilities are in fact bundles of simpler resources that represent a strategic capability (Vahlne & Johanson, 2017; Winter, 1987). However, due to the symbiotic relationship of these simpler resources to form the whole greater than the sum of the parts (Levitt & March, 1988; Tsoukas, 2003; Johanson & Vahlne, 2009), divesting or retaining the individual component resources would not extract the maximum value from those resources. The complex capability's value is

maximized if it is retained or divested in whole. For the purpose of this study, the complex capability will be considered a single resource.

The value of a strategic resource in a hypercompetitive industry is driven by the ability of that resource to enable the generation of serial competitive advantages (D'Aveni, 1994), and that ability is proposed as one possible driver of this type of divestment decision. The cost of maintaining a competitively viable and sustainable strategic resource in a capital intensive industry may exceed the capability of small and medium enterprises to bear those costs; the cost of maintaining the resource is proposed as another potential driver of the divestment of strategic resource decision. In knowledge based industries, the ability to contain intellectual property within a strategic resource, to prevent its leakage to competitors is proposed as another potential driver of the strategic resource divestment decision. The control advantages associated with ownership of a resource is another proposed driver.

Contribution to sustained competitive advantage, capital requirements, ability to contain IP, and ownership and control advantages are therefore obvious candidates for the drivers of strategic resource divestment decisions but they are by no means the only ones that will be considered. These proposed drivers are therefore not intended to be an exhaustive list, but were a starting point for the search for an explanation of specific resource divestment decisions; others were

identified, and it is possible that the proposed drivers are not important. The case study approach has attempted to identify the drivers thought by the divestment decision participants to be important.

Early in the first decade of the 21st century, a medium size semiconductor firm decided to divest its wholly owned assembly and test manufacturing facility in a low labor cost Asian country The firm had been a subsidiary of a large electronics systems firm and had been spun off as a separate, independant entity a short time before the sale of the assembly and test facility. As an independent firm, and in preparation for its initial public offering, senior management, in consultation with the investment bankers that would execute the IPO, took the opportunity to review the firm's asset structure strategy (Muth, 2016). The company decided to divest the assembly and test production facility in Asia, and to subcontract with merchant suppliers of semiconductor assembly and test services for its manufacturing needs. The purchaser of the facility, a large merchant assembly and test firm, signed multi-year agreements to provide those services, continuing the majority of the assembly and test manufacturing operations in the same facilities that had been used before the divestiture (Muth, 2016). The semiconductor firm had used assembly and test subcontractors before the sale, and with the execution of the sales, the purchaser of the Asian assembly and test facility became the semiconductor firm's largest subcontractor (Muth, 2016).

The divestment of this strategically important production resource is not explained by the existing international business or divestment strategy literature. The divested facility had been operating at competitive parity, with quality, capability, and cost performance similar to the assembly and test manufacturing operations of other medium sized semiconductor firms (Muth, 2016); clearly something other than performance or strategic fit drove the divestment decision.

The divestiture by semiconductor firms of specific strategic resources that are critical to the firms' mission to design and manufacture integrated circuits, and not other strategic resources, is not adequately explained by existing business strategy theories. This study has identified the factors driving these divestment decisions, as well as other decisions not to divest other strategic resources. Asset light strategy does detail several firm level motivations for divestment of strategic resources, but does not address the specific decisions as to why some resources are divested, while others are not.

Statement of the Problem

The factors driving specific details of the implementation of the asset-light model and strategic resource divestment are not well explored in the literature;

there are no models that predict the probability and evaluate the desirability and wisdom of divestiture of a particular strategic resource. The decisions by semiconductor firms to divest foreign production facilities is the opposite of what would be predicted by classical theory of internationalization; the theoretical progression of international operations (Johanson & Vahlne, 1977, 2009; Caves, 1982; Porter, 1990) predicts a domestic firm will progress from exporting to subcontracting to international joint ventures to foreign direct investment. International business theory (Williamson, 1979; Dunning & Rugman, 1985; Buckley & Casson, 1998; Buckley, 2002) suggests that firms will act to internalize market transactions that are generating profits for external companies, and capturing that profit for themselves. Transaction cost economics (TCE) theory also suggests that firms will, especially when transaction costs are significant, vertically integrate to eliminate those costs (Williamson, 1971, 1979, 2003, 2008); however, many semiconductor firms are doing just the opposite, sometimes increasing the cost of manufacturing in the process.

Divestiture theory (Boddewyn, 1979) noted several drivers for divestiture of resources including lack of strategic fit, lack of cultural fit, and financial distress. Semiconductor firms have been divesting production resources that are necessary to perform their mission of semiconductor manufacturing; the services provided by those resources are strategically indispensable. When the resource is divested, the

firms have to replace the function provided by the resource with contracted services. In the case studied, it was necessary to determine whether the divested foreign facility had been performing well (whether cultural fit was a problem impacting the ability of the resource to fulfill its task, whether the resource was providing competitive parity with similar facilities at other semiconductor firms), and whether the firm was in financial distress that would force it to liquidate important resources to ensure survival, or not. If the case study had indicated performance or financial problems, divestiture theory would explain the decisions, but since there were no performance or financial problems, neither IB nor divestiture theory explains why these resources would be divested. Asset light theory does, at the firm level, offer an explanation and justification for resource divestiture when performance or financial problems are absent. The literature on the asset light model addresses the reasoning behind these divestment decisions as a reallocation of corporate financial resources to their most productive use (Maly & Palter, 2002), but does not address industry specific or non-financial drivers of those decisions. This study has attempted to fill that gap.

Purpose of the Study

This dissertation attempts to explain the apparent contradiction between transaction cost, international business, and divestiture theories and observed divestiture activity of assembly and test facilities by a semiconductor firm that implemented an asset light strategy, as well as the lack of significant divestment or transfer of design groups to lower cost locations and a mixed record of divesting wafer fab facilities. The study attempts to explain the drivers of divestment decisions for these resources at the level of the individual resource, i.e., why are some strategic assets divested, but others are not? Are semiconductor firms implementing an asset light strategy? The study has created a model of the drivers of divestment decisions that may both explain divestment decisions that have been made, as well as provide a decision making framework to guide practitioners considering strategic resource divestment.

Nature of the Study

This study has built a model to explain the decisions to divest (or not) semiconductor firms' strategic resources. The study employs a case study

approach based on the findings from a case of a medium size semiconductor firm's divestiture of strategically critical assembly and test manufacturing operation resource.

The data has been gathered through a series of interviews of persons with direct knowledge of the reasoning behind, and the effects of, the divestment decision. The interviewees include executives who made the decision to divest the resource, executives responsible for executing the divestment, and high level managers directly affected by the divestment. The people that drove the decision to divest have the greatest insight into the reasoning behind the decision, while those executing the divestment and those directly affected have the greatest insight into the wisdom and success of the divestment. Other interviews with current and former executives addressed the decisions not to divest wafer fab and design group resources. This triangulation, or multiple angle view of the various divestment decision making processes, as well as divestment impact will enrich the understanding of the factors driving the divestment decision, and the success of the chosen action.

The author has a network of connections within the semiconductor industry, and has utilized those connections to gain access to the executives and managers involved in the decision to divest, and with those affected by the divestment. The researcher took great effort to build a level of trust with those executives and

managers, and enabled access resulting in candid conversations regarding the reasoning behind the actions and the reality of the impacts. This access, and the need to dig deeply into a specific divestment decision, is the reasoning behind the decision to utilize the case study approach (Creswell, 2013). The model generated may be able to be generalized to the semiconductor, and other hypercompetitive, capital intensive, and/or knowledge based industries.

Research Questions

This study aims to identify the factors driving the decision to divest strategic resources in the hypercompetitive, capital intensive, knowledge based semiconductor industry. Specifically:

1) What are the drivers of specific strategic resource divestment decisions in the semiconductor industry?
2) Can the state of the drivers be used to predict the probability or advisability of strategic resource divestiture in the semiconductor industry?

These relationships have been addressed through the case study; the decision to divest an assembly and test facility in a low labor cost Asian country as well as decisions not to divest other strategic resources were probed. A model with inputs consisting of the drivers identified and their ability to predict and/or advise the divestment has been generated with the general form detailed in Figure 1.

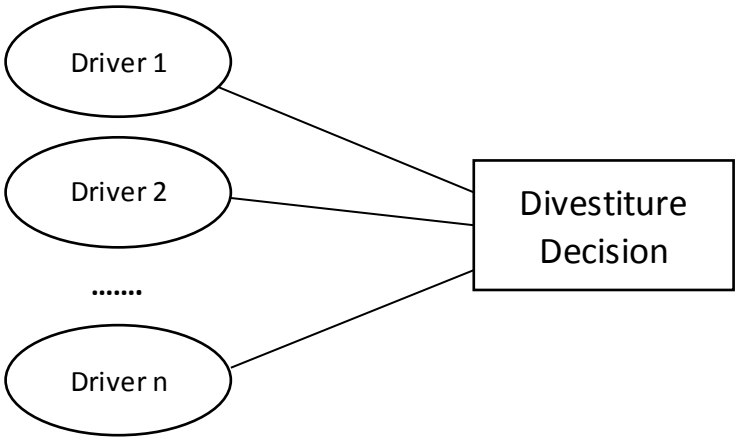

Figure 1. Strategic resource divestiture decision model structure

Significance of the Study

A model of semiconductor strategic resource divestment decisions that identifies the drivers of those decisions may contribute to the theoretical understanding of the asset light manufacturing model in the global semiconductor industry, and is therefore of interest to strategy and international business academics. That same model may also be used to provide guidance to semiconductor industry practitioners looking for a subjective evaluation technique

to evaluate the wisdom of specific semiconductor strategic resource divestment decisions.

While the context of this study is the semiconductor industry, the results may be generalizable to strategic resources of any hypercompetitive, capital intensive, knowledge based industries. "The problem of hypercompetitive markets has spread to the airline, pharmaceutical, financial services, health care, consumer electronics, telecommunications, broadcasting, auditing, automotive, and computer industries, among many others." (D'Aveni, 1998, p. 183). Each of these hypercompetitive industries can also be described as knowledge based, and most are also capital intensive. As technology progresses, more industries will fit in the category of knowledge based, and these industries will move toward hypercompetition (D'Aveni, 1994). These industries are the drivers of modern economies, representing an increasing share of the total world economy, suggesting the results of this study may be widely generalizable.

The study has built a model of the decision making process for divestment of strategic resources in the semiconductor industry. The model, if verified in that industry, and found to be generalizable to other hypercompetitive, capital intensive, and/or knowledge based industries by further empirical research, may contribute not only to the academic understanding of the divestment decision making process,

but also provide a useful tool to practitioners engaged in real world decision making in a large variety of industries other than semiconductor manufacturing.

Assumptions and Limitations

This dissertation is phenomenological study, and takes a case study approach and will employ the techniques utilized in approach; as such, it is subject to the typical limitations of those methods. The case chosen, a medium sized semiconductor firm, is intended to be an instrumental case (Cresswell, 2013; Stake, 1995). The chosen firm is assumed to be representative of the semiconductor industry, and that industry may be representative of other hypercompetitive, capital intensive, knowledge based industries; those assumptions that the specific firm studied is a representative case is important. The phenomenological and case study techniques applied here are qualitative, and do not include empirical analysis of statistically large data sets, but will attempt to create a model that can be empirically tested in future study.

Another key assumption is that the function of strategic resources divested can be replaced by subcontracting arrangements. This is the case in the

semiconductor industry, but an absence of this ability in other industries may limit the generalizability of the findings.

The researcher is a former employee of the firm studied, was aware of the divestment when it happened, has personal relationships with many of the interviewees, and may have preconceived notions or biases about the relevant drivers of the divestment decision. The researcher is aware of the possibility of this bias leaking into the interviews and data analysis; every attempt has been made to let the interviewees express unprompted opinions with very open ended questions comprising the first part of the interview protocol.

Organization of the Remainder of the Study

Chapter 2 is the literature review. This review describes the relevant literature providing a theoretical framework for the study in the areas of competitive advantage and the resource based view, with emphasis on the foundational works and their applicability to the strategic resource divestment problem. The literature for asset-light strategy will be reviewed, with emphasis on the reasoning behind the strategy and the gaps in explaining specific strategic resource divestment decisions. The internationalization and divestment literature

will be discussed, with emphasis on the lack of explanatory power for the adoption of the asset-light model.

Chapter 3, Methodology, addresses the choice of a phenomenological approach with the use of case study techniques. The reasons behind the choice of the particular case are discussed, as well as the generalizability of the specific case to the semiconductor industry as a whole, and the generalizability of the semiconductor industry to other hypercompetitive, capital intensive, and/or knowledge based industries. The interview technique is justified, and the format of the interviews (a mix of open ended "why?" questions, and inquiry into the importance of several possible explanatory factors that emerged from the pilot study) is discussed.

Chapter 4 presents the study's findings; details of relevant drivers and states of those drivers for each of the strategic resources identified are presented. Chapter 5 consists of discussion, conclusions, implications for practice, and suggestions for future research.

Chapter 2
Literature Review

Overview and Theoretical Framework – Relevant Models and Theories

The decision to divest (or not) strategic resources inherent in the implementation of the asset light strategy is an attempt by a firm to improve its competitive position. The study of the drivers of these decisions must build off of the literature in the area of competitive advantage, specifically the resource based view of competitive advantage. The works of Penrose (1959), Barney (1986, 1991, 2001, 2002a, 2002b), and Wernerfelt (1984) provide a solid competitive advantage and RBV foundation upon which to address the research questions in the particular case of the semiconductor industry.

In the semiconductor industry, the defining characteristics of the business are driven by the industry's hypercompetitive, capital intensive, knowledge based

nature. D'Aveni (1994), D'Aveni, Dagnino and Smith (2010) address the hypercompetitive aspect of the industry: the fleeting nature of competitive advantage and the requirement that successful firms continuously create new, short lived CA, in an emergent, dynamic manner (Mintzberg & Waters, 1985) in the face of fierce and dynamic competition. Grant (1996) introduced the knowledge based view, which informs the discussion of competitive advantage in a knowledge based industry and illustrates the importance of intellectual property generation and protection.

Transaction cost theory (Williamson, 1971, 1979, 2002, 2003, 2008, 2009, 2010) addresses the make or buy decision; Williamson discusses the reasoning and tradeoffs behind vertical integration decisions. The logic developed by Williamson can also be applied to divestment or vertical disintegration. Divestment theory (Boddewyn, 1979; Benito, 1997, 2005; McDermott, 2010) addresses the sell off of assets due to strategic fit or operational problems, but does not addresses selling assets that are performing well. The international business literature (Johanson &Vahlne, 1977, 2009; Dunning, 1988; Buckley & Casson, 1998: Agarwal & Ramaswani, 1992) provides insight into the building and acquisition of foreign resources such as the assembly and test facility referenced in the case studied, but do not provide much insight into the divestment process or the drivers behind divestment decisions. The asset light literature (Liu, Tang, & Huang, 2008; Surdu,

2011) specifically addresses the problem of how to most efficiently allocate limited financial capital resources to achieve the best returns by leveraging, rather than owning, some strategic resources, especially those with significant capital investment requirements.

A review of the areas of literature noted is needed to frame the research questions and provide a starting point for this study. The implementation of the asset light model is the strategy being studied; however, the drivers of the specific divestment decisions, why one strategic resource is divested, while other are not, is not addressed by the present literature. By recognizing the strong theoretical foundation represented by the literature in competitive advantage, the resource based view, divestment theory, international business theory, and asset light theory, we can begin to build a theory for the individual divestment decisions.

Hierarchy of Theories Addressed

Figure 2 illustrates the academic theories that are relevant to this dissertation, and the hierarchical relationship of those theories amongst themselves and to the central research questions.

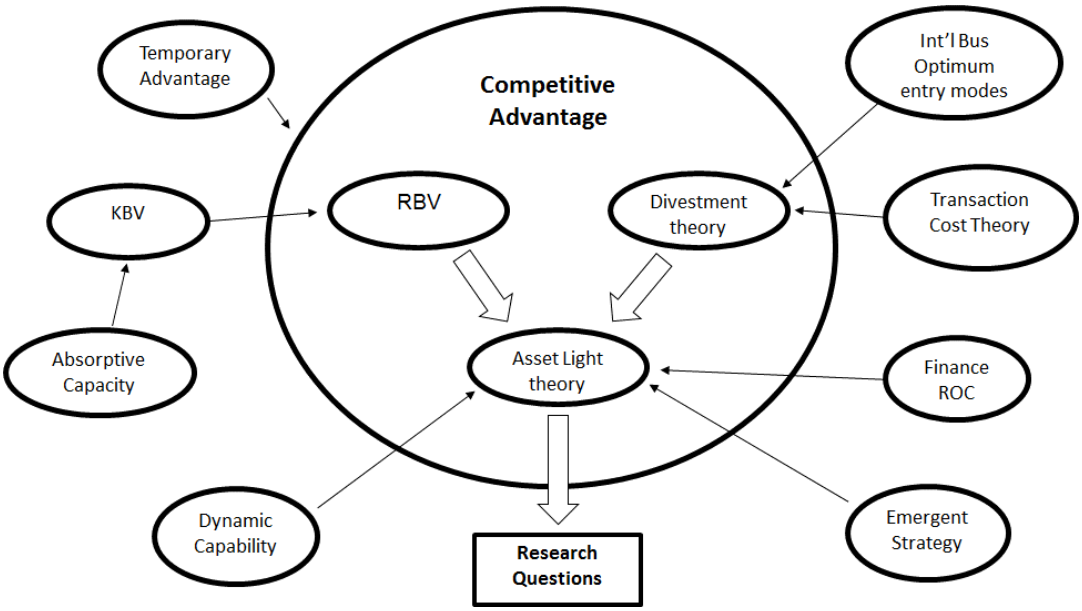

Figure 2. Theoretical Framework

The research questions seek to extend the understanding of the particulars of the implementation of asset light theory, which is an extension of the resource based view (RBV) and divestment theory. RBV, divestment, and asset light are all contained within the larger umbrella of the subject of competitive advantage. In a hypercompetitive industry, the ability to create multiple temporary advantages is a critical component of competitive advantage. Asset light theory also draws upon the study of dynamic capability and emergent strategy (fewer fixed assets enable more nimble strategic maneuvering as chaotic environments evolve or change abruptly), and of return on capital (ROC). ROC, the measure of the efficiency of

the firm's capital resource allocation, can be improved by increasing profitability, the numerator of the ROC equation, or by reducing capital assets, the denominator.

In a knowledge based industry, the knowledge based view (KBV) is an important component of the RBV, and must be addressed to adequately understand the RBV framework of analysis. Absorptive capacity, the ability to acquire and apply knowledge gained from outside the firm is an important component of the KBV. In a capital intensive industry, divestment theory yields important guidance on the firm's capital structure, and that theory is informed by the study of international/foreign optimum entry modes and by transaction cost theory.

Questions Guiding the Research

The study explores several questions, most importantly, why do firms in hypercompetitive, capital intensive, knowledge based industries choose to divest specific strategic resources, and not others? What are the factors that drive the divest or retain decision? Can an understanding of these drivers and how they influence the decision making process predict the probability that a specific strategic resource will be divested? Can that understanding be used to develop a framework that would give executives guidance on which strategic resources

should be divested in order to create competitive advantage or minimize/eliminate competitive disadvantage?

Competitive Advantage and the Resource Based View

Overview

Penrose (1959) introduced, and Wernerfelt (1984) and others expanded on, the resource based view (RBV) of the firm, in which all of a firm's success factors are considered resources; this view has proven a useful one for strategic analysis (Barney, 2001). However, the model makes the implicit assumption that these resources are sustainable, that they can be maintained over long periods of time, or at least over periods for which strategic analysis and planning are performed. D'Aveni (1994), D'Aveni, Dagnino and Smith (2010) contend that this is not a realistic assumption. The definition of resources has been broadened from the classical definition that includes tangible resources such as land, materials, equipment, and capital, to include intangible assets such as employee skills and capabilities and corporate processes, procedures, and traditions that contribute to

the firm's success. The intangible resource idea was further developed and formalized by Grant (1996) in his paper describing the knowledge based view of the firm.

Advancements in communication technology, increased mobility of people across international borders to seek employment, and the reduction and elimination of international trade barriers have resulted in freer and faster movement of personnel, ideas, and information within and across national borders. As these changes have accumulated and accelerated, the assumption that competitive advantages are stable, or sustainable over strategic planning timeframes, has become unrealistic. D'Aveni, Gagnino, and Smith (2010) have detailed the view that all competitive advantages are temporary, and that firms need to continually develop new advantages to replace the ones that are being replicated by competitors. This has major implications for modern business, who can no longer rest on their laurels, and need to continuously innovate to create new advantages if they expect to remain leaders in their industry, or even to remain profitable. A new set of competencies to enable continuous updating of advantages must be developed, nurtured, and strengthened to the point where it can become the source of a (relatively) sustainable advantage. Authors that have addressed the problem of defining these new competencies to create relatively sustainable advantages include Teece, Pisano, and Shuen (1997); their paper discussed the importance of dynamic

capabilities for wealth creation in environments of rapid technological change. Further work by Cohen and Levinthal (1990) focused on the absorptive capacity of a firm as the key capability enabling a firm to continuously develop new advantages and gain or retain competitive position. All of these views imply that firms with flexible resource bases will have an advantage over firms that do not, lending support to the implementation of the asset light model.

Dynamic capabilities, the ability of a firm to continuously innovate and outmaneuver competitors, to create multiple competitive advantages (Teece, Pisano, Shuen, 1997), is proposed as the most sustainable of advantages. Firms that are able to develop dynamic capabilities, and to embed those capabilities in corporate processes and cultures will be best positioned to be successful in modern global, hypercompetitive markets.

The RBV framework provides a robust intellectual platform upon which to analyze competitive advantage. Although early papers on RBV (Penrose, 1959; Wernerfelt, 1984) made the assumption that advantages are inherently sustainable; later works (D'Aveni, et al., 2010) relaxed that assumption and suggested just the opposite, that all advantages are, or soon will be, only temporarily sustainable as most industries move towards perfection and intense competition, i.e. hypercompetition (D'Aveni, 1994). The introduction of the knowledge based view or KBV (Grant, 1996), the view that most relevant resources are increasingly

knowledge based, explains in part the trend toward a reduction in the sustainability of advantages: information is much more mobile than physical, or other tangible, assets. There is a continuum of degree of sustainability of advantages both within and across industries, but all industries are experiencing declines in the sustainability of relevant advantages (D'Aveni, 1994).

In an era of diminished competitive advantage sustainability, firms that wish to remain profitable must learn to develop series of temporary advantages, creating new advantages as fast, or faster, than the old ones are being eroded. The ability to do this has been labeled a firm's dynamic capability (Teece, Pisano, Shuen, 1997). Dynamic capability, since it is a complex capability that is highly path dependent, idiosyncratic to particular firms, and exists at the organizational and not individual level (Teece, 2007; Eisenhardt & Martin, 2000), is difficult for other firms to appropriate; it can therefore be considered a relatively sustainable competitive advantage.

Since most modern competitive advantages are knowledge based (Grant, 1996), the firm must create or acquire large amounts of relevant knowledge to create fleeting advantages. In order for a firm to be successful creating these advantages, knowledge must be accumulated by the firm at a rate greater than internal invention can produce. A firm's knowledge absorption capacity must be developed to identify, assimilate, and convert into advantage knowledge that is

currently held external to the firm (Cohen & Levinthal, 1990). Additionally, as the time required for strategically significant market developments becomes shorter than strategic planning cycles, firms must increasingly rely on emergent strategic planning, to perform strategic maneuvers in real time that were not a planned in the last strategic planning cycle (Mintzberg and Waters, 1985).

Modern firms that can successfully create dynamic capabilities and use those capabilities to create disruptions that competitors must respond to, and for which the firm is uniquely positioned to exploit, enjoy a first mover advantage, and gain a head start on competitors. Those competitors will eventually be successful at imitating the advantage, developing a substitute advantage, or rendering the advantage irrelevant with disruptions of their own. By that time, the dynamically capable firm will have moved on to the next advantage; this dynamic capability represents the most sustainable competitive advantage possible in modern high velocity industries.

Resource based view.

In order to understand whether competitive advantage can be sustainable from the RBV standpoint, we must define exactly what is meant by the terms "competitive advantage". Barney (2002a, p. 9) argues that "a firm experiences

competitive advantages when its actions in an industry or market create economic value and when competing firms are engaging in similar actions". In an earlier paper, Barney (1991) argues that a sustained competitive advantage occurs when competitors are unable to duplicate the strategy or obtain similar results from other strategies. O'Shannassy (2008) points out that Barney does not consider the ability of existing competitors or new entrants to innovate and erode the strategy, implying that, by his definition, competitive advantages are sustainable. O'Shannassy further states that competitive advantage is not organizational performance, and that earlier authors (Porter, 1985) fail to make the distinction. Powell (2001) separates organizational performance from competitive advantage, and defines competitive advantage as an input affecting organizational performance, with organizational performance being the dependent variable. Powell's analysis attempts to rigorously define the concept of competitive advantage, but does not offer a pragmatic definition that can be utilized to help managers create rents and therefore achieve superior financial results. This study attempts to take an academic approach to the problem of determining the sustainability of competitive advantage, but to do so in a way that will summarize the academic literature so that it is useful to practitioners. Powell (2001) criticizes the pragmatic approach, and suggests that managers who are looking to identify advantages frequently see things that are not there. However, to achieve relevance to the modern firm's

practices and needs, this study will adopt the definition put forth by Barney (1991), with the relaxation of the assumption that advantages are sustainable.

Wernerfelt (1984) introduced RBV as a new way to look at the competitive capabilities of the firm. He expanded upon the classical definition of resources as things such as labor, capital, and land to include "brand names, in-house knowledge of technology, employment of skilled personnel, traded contacts, machinery, efficient procedures …. etc." (Wernerfelt, 1984, p. 172). These are the intangible resources described by Caves (1980).

Wernerfelt argued that profitability of a firm was dependent on resource strength vs. competitors' resource strengths, and that firms with significant resource advantages would extract rents in the markets where these resource advantages were important. He analyzed resource advantages from the viewpoint of Porter's five forces model (Porter, 1980), which had previously been applied to products. Bargaining power of suppliers and customer and threat of substitutes were lumped into a category labeled "general effects"; monopoly of supply of resources needed by the firm, or monopoly of demand for the firm's products are competitive disadvantages, as is substitutability of critical resources (Wernerfelt, 1984).

Attractive resources are those resources which are valuable, rare, inimitable, and nonsubstitutable as described in the VRIN framework (Barney, 1991).

Wernerfelt (1984) noted several VRIN resources that contribute to competitive advantage. Specialized machine capability, if developed internally by, or exclusively available only to, a firm would constitute such a resource. Customer loyalty is another VRIN resource that can function as a barrier to competitive entry and allow rent extraction. Production experience, remaining ahead of competitors on the learning curve, can result in a lower cost position, and technological leads can allow a firm to enjoy a product performance, cost, or quality advantage. Peteraf (1993) argued that these superior resource positions were the basis of any profitability a firm may enjoy; in the absence of a significant CA, firms would break even. Barney (2002b) states that competitive advantage results in any profitability in excess of the cost of capital. The ability to acquire VRIN resources through the merger and acquisition process can also result in competitive advantage (Wernerfelt, 1984) if the acquisition can be completed at bargain costs due to exploiting an imperfect resource market (Barney, 1986).

The VRIN framework was modified to VRIO (Barney, 2002a), where sustainable competitive advantages are deemed to be valuable, rare, inimitable, and organizationally exploitable. The VRIN framework implicitly assumes that the organization that owns a VRIN resource can effectively exploit that advantage to achieve CA; Barney's (2002a) modification specifically mandates that the organization understands the importance of the VRIN resource and is capable of

utilizing in a manner that creates competitive advantage. Knott (2015) contends that VRIO is a better tool for managers of firms to evaluate and create resources that contribute to competitive advantage.

Wernerfelt (1984) briefly examines the dynamic properties of competitive advantage, but only from the standpoint of being the first mover, and the creation of resource advantages in the form of barriers to entry. He does not address the erosion of entry barriers or competitive advantages that have been developed or acquired. His view of competitive advantage is that once it has been built, it is a static long lived advantage.

Barney (1991) examined and criticized precursors of RBV specifically because those frameworks did not address sustainability of competitive advantage; the models implied that any advantages a firm can develop or acquire would be short lived. Barney argues that pre RBV models implicitly assume that firms within a strategic group have equivalent strategically relevant resources and strategies. If heterogeneities develop, they will be short lived due to learning by rivals, organic development of equivalent resources by new entrants to the market, and trading of resources in the strategic factor markets (Barney 1986, Hirshleifer, 1980). Barney (1991) states that RBV eliminates the homogeneity assumptions of the earlier models, recognizing the firms possess different, sometimes unique resources, which may be not be perfectly mobile, and can be sustainable. This is an

important insight, as it adds to Wernerfelt's (1984) assumption of sustainability RBV by analyzing and describing the necessary conditions for advantages to be sustainable.

In order for a rigorous analysis of competitive sustainable advantage to be performed, a clear definition of "sustainable" must be agreed upon. A firm has a sustained advantage "… when it is implementing a value creating strategy not simultaneously being implemented by any current or potential competitors, and when these other firms are unable to duplicate the benefits of this strategy" (Barney, 1991, p. 102). Furthermore, Lippman and Rumelt (1982) contend that an advantage cannot be considered sustained until other firms try to duplicate the advantage and have failed; i.e. that the advantage for the firm still exists after competitors attempts. The fact that an advantage that has existed for a long period of time does not indicate sustainability; temporal persistence may be due to delays by competitors in recognizing and duplicating advantages and not due to the advantage being inimitable. A final note on the definition of sustainability is that even sustainable advantages do not last forever; structural changes in the firm's industry or other environmental factors can make a previously important advantage irrelevant, even if it cannot be duplicated by competitive efforts (Barney, 1991). This study will assume that all competitive advantages are temporary.

An outgrowth of RBV is the knowledge based view (KBV), a theory that looks at firms as a collection of knowledge about technology, markets, organizations, etc. It has been argued (Grant, 1996) that KBV is the most basic reduction of RBV; all resources, whether they are processes, procedures, machines, or relationships are all manifestations or applications of knowledge. This study will not take that extreme reductionist view, but does recognize the fundamental importance of knowledge as a resource base, and the special sustainability aspects of knowledge, especially as it is embodied at organizational (as opposed to individual) levels. The most important areas of a firm's knowledge base from a competitive advantage viewpoint are "organizational learning, the management of technology, and managerial cognition" (Grant, 1996, p. 110).

Clearly, many of the knowledge based resources that represent, or contribute to, competitive advantage are mobile, and therefore not sustainable. Technology, if not protected by patents, or if owned by third parties who license that technology to a firm, or incorporate it in products available to a firm's competitors, is very mobile. Individual skills (technical, management, market foresight, etc.) can be hired away by competitors. The firm's knowledge that resides at the organizational level, however, is not nearly as mobile. While organizational level knowledge can be duplicated at competing firms, it is not nearly as easy for a competitor to acquire that knowledge as it is to acquire

individual knowledge. Organizational knowledge is built up at firms largely via trial and error processes, which results in solutions (procedures, relationships, product development choices, etc.) that are highly path dependent; the knowledge applies to the unique present circumstances of the developing firm, as well as the historical circumstances during the knowledge development. The complexity of the knowledge at organizational levels, as well as the unique fit to the developing firm serve as (imperfect) barriers to competitors acquiring competitive advantage from the same knowledge. The barriers are imperfect because determined competitors can, through hiring of the firms key employees, observation of the firm's behavior, and adjustment of the knowledge acquired to their unique situations, eventually obtain the knowledge based resource of the targeted firm.

While the difficulty of transferring knowledge (resources) between firms is important to the sustainability of competitive advantage (Barney, 1986), the ease of transferring knowledge within the firm is even more critical in enabling that knowledge to become an advantage (Grant, 1996). In order for knowledge to create an advantage, it must be disseminated widely enough within the firm to allow it to make an impact. Grant also notes that the capacity for aggregation, and appropriability are also conditions that must be met for knowledge to confer competitive advantage. Capacity for aggregation is the ability of individuals and organizations to absorb knowledge and integrate it into existing knowledge bases,

while appropriability (the potential to be appropriated) is the ability of the possessor of knowledge to create a return equal to the value created by the resource (Teece, 1987; Levin. et al., 1987). Knowledge is a unique resource in that it can be transferred between parties without being lost by the original possessor. Knowledge can therefore be appropriated only if it can be held exclusively within the firm and not transferred to competitors. Protection of trade secrets and patent protections serve to raise barriers to the transfer of knowledge and make any advantages dependent upon that knowledge more sustainable.

A resource that represents a CA, that can enable the generation of economic rents, is defined by Amit and Shoemaker (1993) to be a strategic resource; that resource may be physical assets such as a manufacturing facility, but may also be an organizational capability. In a knowledge based industry, the assumption is made that closely held knowledge, and the organizational ability to apply that knowledge to create competitive advantage, are key components of even physical strategic assets. The ability to buy, sell, imitate, or substitute for a particular resource renders it much less likely to be a strategic asset (Amit & Shoemaker, 1993). Likewise, varying degrees of those abilities affect the importance of the strategic asset.

Temporary advantage.

As communications technology has relentlessly advanced, the cost of maintaining worldwide, instantaneous communication has dropped dramatically. This decrease in cost has had an equally dramatic effect on increasing information flow across the globe. Intra- and inter- continental travel has also become cheaper and faster, substantially increasing international personal and business travel. Simultaneously, new free trade agreements that discourage trade barriers have led to greatly expanded international trade and movement of labor intensive manufacturing to low labor cost countries. Deregulation of financial and other industries have enabled firms to compete in new industries, bringing substantial capital and relationships to bear in building positions in those new industries. These developments, deregulation, and the increase in global traffic of information, people, and goods have served to lower or eliminate many of the barriers that protect firms' strategic resources and competitive advantages. The flow of information (and people, acting as carriers of information/knowledge), has decreased the ability of firms to protect trade secrets. The international flow of goods means that most large firms now have to compete with other firms all across the globe, and not just their home countries. The international flow of people and capital have made the markets for labor and for firms' products more perfect, and

therefore reduced the ability of firms to maintain heterogeneity in resource based advantages. These developments are all pushing strategic factor markets closer to perfection, in which any advantages generated are quickly transferable to competitors, making it difficult or impossible for the firm to sustain the advantages it has developed.

In parallel to the increasing perfection of strategic factor markets, D'Aveni, Gagnino and Smith (2010) note that the instability in markets makes specific competitive advantages valuable only for short periods of time. Even if competitors cannot replicate specific advantages, market forces in unstable markets tend to make many (especially knowledge based) advantages irrelevant. D'Aveni, et al. (2010) contend that sustaining competitive advantage is increasingly difficult, or that at the very least, the volatile, or temporary, component of advantage is of increasing importance with respect to the nonvolatile, or sustainable, component (Thomas & D'Aveni, 2009). This change is most dramatic in disruptive or high velocity environments, i.e. industries characterized by fast change such as semiconductors, telecommunications, or other technology industries. In these industries, most competitive advantages that can be built or acquired cannot be sustained. In these disruptive environments D'Aveni, et al. (2010) and Christiansen (1997) argue that the continuous innovation, reinvention, and cannibalization prevent these industries from reaching maturity and equilibrium.

D'Aveni, et al. (2010) assert that in this environment, firms must continuously update their strategies and generate new temporary advantages continuously. Competition in those industries has become a red queen race. This view is consistent with the Austrian economics view that instability, disequilibrium, and the actions of entrepreneurs prevent the formation of long term sustainable advantages (Grimm, C. M., Lee, H., & Smith, K. G., 2005).

In these environments in which constant reinvention is necessary to retain leadership positions, firms must make decisions to continue to invest in innovation (new technologies, capabilities, personnel) or to squeeze as much profitability as possible out of their current positions, and cede leadership to the competition (D'Aveni, et al., 2010). The optimal allocation of limited financial resources is therefore both critical to maintaining competitive advantage, and represents a moving target. Firms that decide to give up market position free up investment resources for other potentially more profitable uses. Those firms may invest their resources in blue ocean opportunities (Abraham, 2006), or give themselves the opportunity to leapfrog the competition by skipping a product generation (with the resulting loss of revenue), and concentrating all resources on the next generation products. The downside of this strategy is that the inevitable loss of revenue from the skipped product generation, or gap in revenue before new markets can be profitably exploited, can cause consternation or even panic among investors; the

short term focus of the investment community is a strong deterrent to implementing this type of strategy. Firms that have fewer resources with long life, inability to be usefully applied to purposes other than their original purposes, and high capital investment/maintenance requirements, can be more nimble, responsive to environmental changes, and more capable of attaining first mover advantages. Capital that is not tied up in these relatively unproductive resources can be used to purchase, or contract for, more flexible or immediately relevant resources.

D'Aveni (1994) argues that all, or most, competitive advantages are temporary. He puts meat on the bones of Schumpeter's creative destruction concept (Schumpeter, 1942) by describing many of the mechanisms responsible for shortened competitive advantage sustainability, including, but not limited to, technological advancements. D'Aveni argues that environmental forces of globalization, reduced trade barriers, and international mobility of labor, capital, and materials, have moved markets towards perfection, lowered barriers to entry, and made competitors much more fierce and aggressive. In addition to these developments, technological advancement and aggressive competitors have resulted in shorter product life cycles (requiring faster development times), many new entrants to markets, and blurring of industry boundaries. D'Aveni, channeling Schumpeter, argues that many firms waste valuable resources in futile attempts to defend and sustain advantages, and that firms that are successful do not concentrate

on trying to prevent or mitigate disruption, but actively work to create it. By creating disruptive technologies, products, and alliances, the firm is creating new competitive advantages. If a firm can create the new advantages faster than the old advantages are imitated or neutralized, the firm can enjoy rent generating positions in its industry.

This shift in the timeframe of sustainability of advantages results in the replacement of a single (or small number of) long term advantages with a series of many short lived temporary advantages that can be strung together to create long term above normal profitability for a successful firm, even in a hypercompetitive environment. The hypercompetitive market favors nimble firms able to identify opportunities and execute exploitation strategies quickly before those opportunities expire; lack of financial investment in inflexible single purpose resources may be an advantage for these firms, even if that lack results in higher production costs than owning the facilities.

D'Aveni (1994) notes that industries differ in the degree to which hypercompetition has transformed their market environments, with technology industries being examples of those most affected. He argues, however, that industries that are relatively stable are also seeing the effects of hypercompetition. The hot sauce industry is recognized as being relatively stable and one company, the maker of Tabasco sauce, has held a leadership position for well over one

hundred years. However, even Tabasco's market dominance is being eroded by companies employing disruptive strategies. D'Aveni (1994) concludes that no industry is immune from hypercompetition, and that the only unanswered question is when, not if, hypercompetitive environments will be the norm in even low velocity industries.

As market environments change quickly in unpredictable, even chaotic fashion, it follows logically that strategic plans have a very short shelf life. Most companies in the semiconductor industry (a representative high velocity industry with which the author is intimately familiar) for example, make major changes to their strategic plan annually, many even going so far as to start from scratch each annual planning cycle. Even with annual refreshes, strategic plans are subject to frequent revision throughout the year as strategically significant changes in the environment unfold. It is obvious to strategic practitioners that strategic planning has two components: planning for the expected (or at least anticipated) and reacting to the unexpected. While some practitioners may argue that reacting to the unexpected is tactical, not strategic, this paper will consider any changes that impact the planned strategy to be a part of strategic planning, the convention used by Mintzberg & Waters (1985). They formalized descriptions of various methods of strategic planning, and detailed the difference between intended strategy, or the

strategy that came out of the planning process, and realized strategy, which is the strategy that the firm actually executed.

Mintzberg and Waters (1985) describe how firms generate a strategy which changes as the environment develops. The planning process yields the intended strategy. The parts of the intended strategy that are implemented are called the deliberate strategy; portions of the planned strategy that do not get implemented are labeled unrealized strategy. New strategic actions that arise after the strategic plan has been finalized, and implemented during the time frame addressed by the original plan, are labelled emergent strategies. The deliberate and emergent strategies comprise the realized strategy, the strategy that is executed.

In stable industries, the realized strategy is often the same or very close to the intended strategy. In high velocity industries (or in entrepreneurial firms, Mintzberg & Waters, 1985), the realized strategy can be significantly different than the intended strategy. Realized strategies across industries that exist in stagnant to hypercompetitive environments represent a continuum of a mix from completely deliberate to completely emergent. Decisions to build or acquire capital intensive resources with long lives (such as production facilities) are usually a result of intended strategies, while divestment decisions may be the result of emergent strategies. The relative importance of emergent strategies in high velocity

industries would suggest that divestments of resources (especially strategic resources) would be more common in those industries.

Dynamic Capability, a Relatively Sustainable Advantage

The traditional RBV contents that firms consist of a bundle of assets and capabilities that are idiosyncratic and difficult-to-trade, but recent analysis suggests that those advantages only exist for a short time (Teece, 2007). Firms operating in hypercompetitive or high velocity industries (and, at some point, firms in low velocity industries as well) must learn to build successive temporary advantages, or succumb to competition. Traditional RBV is based on organizational/process/knowledge assets that enable the firm to do things better than the competition, while the new temporary advantage assumptions stress the importance of doing the right things. The ability to build successive temporary advantages, to make continued choices to do the right thing, is a firm's dynamic capability (Teece, 2007; Eisenhardt & Martin, 2000). If a firm has the ability to develop its dynamic capabilitity, i.e. a meta-level advantage that enables continuous creation of temporary advantages, that capability can itself be considered a relatively sustainable competitive advantage.

Teece (2007) defines three components of dynamic capability to be the capability: "(1) to sense and shape opportunities and threats, (2) to seize opportunities, and (3) to maintain competitiveness through enhancing, combining, protecting, and when necessary, reconfiguring the business enterprise's intangible and tangible assets" (Teece, 2007, p. 1319). Asset light strategy implementation is the reconfiguring of tangible assets. A driving philosophy behind asset light is that high capital cost, inflexible, relatively nonfungible assets (such as wafer fabs and assembly and test facilities) limit a firm's ability to strategically pivot, to turn on a dime, and to be effectively dynamic.

The first component of dynamic capability, sensing and shaping opportunities and threats, requires a company to be close to customers, and even closer to competitors. The firm must develop the ability to look ahead of customers' current needs and competitors' current product offerings and plans. If a firm can be insightful enough to understand an industry's next generation needs and determine how to meet those needs outside the umbrella of current product and service offerings (from the firm and from competitors), it can see opportunities to provide customer value in the form of products and services that are outside the firm's and competitors' current capabilities. The firm can then seize these newly identified opportunities by acquiring or developing the needed capabilities to provide value in different forms than competitors provide. Of course, any

innovation the firm can make will eventually be understood by competitors, but the head start, or first mover, advantage will form a temporary advantage. The firm must then defend its advantage; although the defense is ultimately destined to fail (no advantage can be sustained forever), it can extend the lifetime of the advantage, and therefore the total rent extraction attributable to the advantage.

The salient question for strategic practitioners then becomes one of how to develop Teece (2007)'s three components of dynamic capabilities. In order to sense and shape new opportunities and threats, Teece contends that firms must become more entrepreneurial. Entrepreneurs can have access to different information (Kirzner, 1973), or view widely held information differently (Schumpeter, 1934) to see new opportunities where competitors do not. Many firms that held long term sustainable advantages become trapped by their physical assets, processes, outlook, and corporate culture, limiting their views of future solutions for future problems to extensions of existing capabilities, when they should be identifying how to develop new capabilities that better solve future problems, and are not possessed by their competitors. Firms need to replace the dictum "If it ain't broke, don't fix it" with "if it ain't broke, break it before our competitors do". Firms must learn to disrupt industries in the manner, and with the timing of their choosing, creating opportunities in addition to recognizing them.

The problem of quickly seizing opportunities also demands an entrepreneurial approach; bureaucratic management structures and long approval cycles to develop new products or enter new market segments gives competitors more time to react, or to create different disruptions and solutions that the firm is not prepared to counter. Creating small independent groups within large organizations that are responsible for identifying and creating disruptions is an organizational approach to improving the ability to seize opportunity. Funding research in technologies that are peripheral to, but not direct extensions of, the firm's current technology base can render the firm more able to pivot technology use towards previously unanticipated customer needs. A willingness to acquire firms, purchase technology licenses, or purchase products containing key technologies from outside the firm will also enable the firm to respond more quickly and seize the opportunities that it can identify and/or create. When it becomes apparent which research thread will be most fruitful, firms must act quickly to invest heavily in that thread, to create a gap between, and then keep ahead of, competitors (Teece, 2007).

In order to achieve Teece's third objective, "enhancing, combining, protecting, and when necessary, reconfiguring the business enterprise's intangible and tangible assets" (Teece, 2007, p. 1319), a firm must develop the ability to integrate knowledge and technology (from external and internal sources) into the

firm's processes, procedures, and organizational design. In fact, when new opportunities and technologies to exploit them are significantly different from those with which the firm has experience and a level of comfort, it may be necessary to form a completely new organizational structure (Teece, 2000) such as a new division of the firm, or an independent spin off firm. In the case studied, the semiconductor division of the parent company was indeed spun off as a separate firm, enabling strategy development suitable to a firm in a high velocity, or hypercompetitive, industry to be developed and implemented independently of the parent firm operating in much lower velocity markets. Asset light model implementation, the reconfiguration of assets, is an example of the firm adopting a strategy more appropriate for a high velocity market.

Absorptive Capacity

All of the knowledge a firm needs to innovate cannot be generated internally, much of it is gathered from observation of the market environment, especially customers and competitors, but also from suppliers of contracted services. March and Simon (1958) argue that most innovations are gathered from external sources, not created internally, although some may be internalized through acquisition of other firms (Ranucci & Souder, 2015). Firms must be able to gather

and assimilate external knowledge to regularly and repeatedly innovate. In order for a firm to continuously create new, fleeting competitive advantages in a high velocity market, to begin Teece's (2007) three step process, a firm must continuously gather new information about its customers, competitors, suppliers, and the market environment in general. Firms must "recognize the value of new, external information, assimilate it, and apply it to commercial ends" (Cohen & Levinthal, 1990, p. 128). The ability to perform these functions is a firm's absorptive capacity. Firms with a larger network of suppliers increase the opportunities to absorb supplier knowledge vs. firms with smaller supplier networks.

When the semiconductor industry was born, and through its early history, foundry manufacturing services were not available. By necessity, a standard model of the semiconductor firm emerged, which included design groups, and front end (wafer fabrication) and back end (assembly and test) manufacturing facilities. This ownership of assets structure became an iron cage (DiMaggio & Powell, 1983) that semiconductor firms adopted out of necessity (there were no merchant suppliers of semiconductor manufacturing services) early in the history of the industry, and maintained due to organizational inertia (Hannan & Freeman, 1977, 1984) even as contracted manufacturing services became available. Firms that have broken out of the iron cage by divesting manufacturing or other strategic resources and replace

them with subcontracted resources as they implement an asset light strategy, are creating new, wider networks of contacts that can be a source of new knowledge relevant to the semiconductor firm's competitive abilities. These firms have chosen an asset strategy that, due to loss of ownership, has resulted in loss of control and possible increases in costs, in exchange for casting the information gathering net over a wider number of firms, organizations, and people. In a knowledge based industry such as semiconductors, the increased knowledge that may be harvested from the wider networks formed by off-loading manufacturing or other services to subcontractors may be a profitable tradeoff.

The absorptive ability of a firm is dependent upon not only the ability of individuals in the firm to absorb external knowledge, but also on the organizational structure and processes that disseminate the knowledge throughout the organization (assimilate), and convert it into competitive advantage (exploit it for commercial purposes); therefore the absorptive capacity of the organization is not simply the sum of the absorptive capabilities of the firm's employees (Cohen & Levinthal, 1990). External knowledge can be gathered by a variety of sources such as the sales function, or manufacturing engineers working with subcontractors, but must be used to create temporary advantages by internal functions such as marketing and design engineering. If the absorptive capabilities of sales people are not assimilated by the firm's innovation generating functions, those skills are of no use

to the firm. If the marketing and R&D functions of the firm receive the absorbed knowledge, but are not able to convert it into competitive advantage (to exploit it), the absorbed knowledge is of little or no value.

Cohen and Leveinthal (1990) note that a firm's absorptive capabilities are highly path dependent, that especially the assimilation and exploitation of absorbed knowledge is influenced by the firm's R&D history. Absorbed knowledge that is closely related to the firm's prior knowledge will be much more effectively exploited; as the firm continues to add new relevant knowledge through invention and absorption, the amount and breadth of external knowledge that can be exploited continues to grow. Both effective invention and prior absorption increase a firm's absorptive capacity (Cohen & Levinthal, 1990).

Limits of Classical MNE Theoretical View

Early studies of internationalization (Caves, 1982; Porter, 1990) found that firms begin as purely domestic operation in their home countries, and expand internationally in a predictable manner, usually after saturating their home country markets. Johanson and Vahlne (1977) introduced the Uppsala model, which describes the process as beginning with export, progressing to selling through agents, then selling through the firm's subsidiaries (with varying degrees of

equity/ownership), and finally producing in the target country. A feedback path whereby foreign knowledge enables initial foreign entry through exporting, which creates new knowledge enabling foreign partnerships then foreign direct investment (FDI), is used to explain the sequential process. A firm proceeds to the next level of international operations as their knowledge of the target country increases, and the model implies that firms with international operations short of production were in the intermediate stages of internationalization. In the year of publication, this model was empirically supported for most multinational enterprises (MNEs), and is still an accurate generic history of many of today's MNEs. Johanson and Vahlne (2009) update their model to refine the concept of knowledge of the target country as a set of networks. This redefinition of the driver of internationalization essentially reiterates the possibility of subcontracting the acquisition and storage of local knowledge to foreign partners, but still models the internationalization process as sequential with the terminal stage being foreign production through wholly owned subsidiaries (WOS). Both works stress the increasing importance of knowledge as a key competitive advantage.

The sequential view of internationalization does not necessarily predict that every firm that conducts foreign operations will work through the entire process and reach the terminal, FDI in WOS, stage. Buckley and Casson (1998) propose a model for foreign market entry that takes into account "Location costs,

internalizations factors, financial variables, cultural factors, such as trust and psychic distance, market structure and competitive strategy, adaptation costs (to the local environment), and the cost of doing business abroad" (Buckley and Casson, 1998, p. 543). The model defines twelve entry strategies based on the quoted conditions, and treats production and distribution separately. Although the model addresses entry modes, changing environmental conditions may indicate different optimum operating modes for firms already internationally established. This view may be useful in predicting divestment (or indicating divestment as an optimal strategy) as changing conditions shift the optimum entry mode from, for example, direct FDI to subcontracting of production. However, the model does not appear to be intended to predict shifting strategy optimization in a dynamic environment, so caution is appropriate in justifying generalization to the dynamic case.

Agarwal and Rami (1992) also propose a model of foreign market entry choice that depends on three broad factors: ownership advantages, location advantages, and internalization advantages. The market and firm specific factors indicate the likelihood that the internationally expanding firm will choose enter foreign markets through exporting, licensing, IJV, or WOS. This model shares the same weakness in explaining divestment as the Buckley and Casson (1998) model, namely that it is an entry mode decision tool, and does not address changing strategies in a dynamic environment. These internationalization entry mode choice

models provide a theoretical basis upon which to begin to build theories to help us understand the dynamic case.

Other authors (Knight & Cavusgil, 2004; Oviatt & McDougal, 2005) also address forms of control over foreign based resources by means other than ownership. The work of these authors address firms that are born global, being founded as MNEs or becoming MNEs within three years of firm inception. While these studies do not specifically address divestment of existing manufacturing facilities, they do address controlling rather than owning these critical resources.

New ventures lack the financial resources to acquire or build foreign operations, but the increasingly global nature of business has resulted in the widespread availability of people with international business experience (Oviatt & McDougal, 2005). Similar relevant factors that determine the structure of international operations for new ventures (limitation of resources as compared to the established companies and the extensive international business experience of employees) also apply to medium sized semiconductor companies (limitation of resources as compared to the industry leaders, and extensive international experience) and may drive similar choices of international structures. The structures of choice for most international new ventures is the network; while networks do not internalize market transactions, cooperation and trust within the network can reduce opportunism, a major component of the cost of arm's length

relations (Aldrich & Zimmer, 1986; Larson, 1992). A close, long term, and mutually beneficial partnership is an example of a network relationship that can minimize the costs of opportunism.

Hypercompetitive industries are characterized by very short time periods over which competitive advantages can be exploited before being destroyed by competitors (D'aveni, 1994). In these industries, firms move very quickly to create differentiation, while their competitors move equally quickly to match or leapfrog the differentiation. Pricing for products with a base set of customer values declines quickly as higher value products are offered at price points similar to the products with the base value set. In this environment, the ability to be nimble, to understand customer wants and needs are critical (Drucker, 1985), especially if those wants and needs can be identified even before the target customers are aware of them. The entrepreneurial willingness to take risks can result in first mover advantages, but can also result in products that fail to correctly match market needs. In this situation, low investment, and the ability to quickly pivot to alternative products and strategies are can be an important competitive advantage (or in the case of industries where this pattern is the norm, can eliminate a competitive disadvantage). Firms that exhibit international marketing and international entrepreneurial orientations are able to leverage foreign distributor competencies to achieve superior business results (Knight & Cavusgil, 2004). This argument can be

generalized to include foreign production competencies. Leveraging, rather than owning, assets with high capital requirement dramatically reduces the impact of failing products or strategies, and allow firms to survive and continue to innovate. Firms that own capital intensive investments cannot easily shed those resources when their strategy fails, while firms that leverage those same resources can quickly pivot to alternative resources to support alternative strategies. This view also contains the seeds of a production facility divestment explanation.

The decision to divest is qualitatively different than greenfield investment decisions because FDI is somewhat sticky: the factors driving divestment must be significant enough to overcome the inertia of continuing to operate the foreign subsidiary as has been done in the past. Some of this stickiness is due to the fact that divestiture is seen as an admission of failure, and firms therefore are hesitant to divest and often do not publicize divestment actions (Benito, 1997). Asset specificity, the inability to find valuable alternate uses, can also render the resource non fungible and inhibit the ability of the firm to divest (Caves & Porter, 1976). Justification for divestment therefore generally must meet a higher standard than that for investment.

Transaction Cost Economics

It has long been thought that the understanding of the organization of the firm can best be achieved by viewing corporate governance as a series of contractual relations (Commons, 1932; Williamson, 2010). Building on the work of Arrow (1969), who analyzes contractual versus internal sources of supply, Williamson (1971) expanded that view by stating that there are three basic models for the procurement of supplies: a long term once-for-all contract, a series of short term contracts, and vertical integration. He introduces the concept of transaction cost as part of his justification of vertical integration and contends that there are costs associated with contractual transactions between firms that are not borne by firms who complete the same transactions entirely within the firm; firms that vertically integrate enjoy a cost advantage. Supplier/customer disagreements in vertically integrated firms are decided by executive decisions within the firm (Whinston, 1964), a much quicker and less expensive alternative than interfirm negotiation or litigation. Vertical integration provides, among other advantages, a cost savings over comparable nonintegrated firms. Vertically integrated firms eliminate the costs associated with negotiation, as well as capturing margins/profits of the integrated firm; his reasoning applies to purchases of physical goods as well

as purchases of services (Williamson, 1971, 1979, 1991).

Williamson (1971) goes on to describe the limitations of long term contracts, such as changing needs driven by technological developments, the inability of the contracting parties to accurately predict these changes, and the resultant inadequacy of the long term contract to provide a satisfactory deal for all parties bound by the contract as technologies or other circumstances change. The use of short term contracts can address this issue, but at the expense of agility – firms that must renegotiate supply of goods or services in a fast changing hypercompetitive market environment face delays that may limit or eliminate first mover advantages. Complex contracts, whether short or long term, are also incomplete, leading to the need for further negotiation to cover eventualities that were not accounted for in the contract (Williamson, 2002, 2010a). The proposed solution for these limitations of contractual arrangements is their elimination by internalizing the transaction through vertical integration (Williamson, 2002, 2008, 2009). Empirical studies by Geyskins, et al. (2006) and by Macher and Richman (2008) determined that TCE had the power to predict vertical integration activity, lending credence to the TCE view.

Transaction cost economics (TCE) theory suggests vertical integration is a viable method for reducing costs and minimizing the time required to change supply agreements previously governed by contract in imperfect (i.e. actual, real

world) markets (Williamson, 1975, 1985). Whinston (2001) proposes a property rights theory as an outgrowth of transaction cost economics to explain vertical integration; his key addition to TCE that is applicable to the decision to vertically integrate (or not) is the recognition that physical ownership of assets limits the ability of the firm to be opportunistic. In a hypercompetitive market, the ability to change course quickly as unforeseen opportunities arise can be a significant competitive advantage, which hints at a justification for asset light theory.

Divestment Theory View

In one of the early studies to analyze divestment of FDI for strategic reasons Boddewyn (1979), noted the increasing rate of divestment from the 1960's vs. late 1970's. (McDermott, 2010 pointed out that this may be, at least in part, due to the increasing rate of foreign investment during the same time period.) His study focused on divestiture due to financial performance or strategic fit issues; although strategic fit does not obviously apply directly to the case of semiconductor firms (wafer fab and packaging are core activities of a semiconductor manufacturing firm, and the facilities' financial performance was competitive), it does address firm strategy as being a driver of divestment, and more subtle strategic effects may be in play. He specifically states that one financial justification for divestment is

"…. lack of capital to finance the modernizations or expansion necessary to survive" (Boddewn, 1979, pg. 22), which directly addresses one of the proposed drivers of divestment in this study. Benito (1997, 2005) and McDermott (2010) also note that strategic fit, or lack thereof, can be a factor encouraging divestment, as can be economic/financial conditions and governance problems. The resources indentified as strategic assets in the study are wafer fab, assembly and test, circuit design and fab process design; all of these are core competencies of semiconductor firms and are central strategic capabilities. If a firm divests an internal ability to perform any of these functions, the function must be replaced by contractual relationships.

For semiconductor firms who chose to divest established, well run, efficient resources, the strategic and financial viewpoints will be most productive (Tan & Gershwin, 2004). Benito (2005) adopts this approach; he introduces an integration-responsiveness model that analyzes firm strategy in light of dynamic environments and presents divestment as an appropriate response in certain environments. He notes several environmental conditions under which divestment is appropriate including decline of the industry, obsolescence of production facilities, and increasing costs (especially labor costs) that are not necessarily relevant to the semiconductor firms being studied. However, the integration-response model includes economies of scale and scope (the integration part of the model) which

appear to be important factors. While the firm loses some economies of scope and other internalization advantages when divesting production facilities, if those facilities are integrated into a larger manufacturing firm, the resulting economies of scale may be enough to overcome the lost internalization advantages.

Boddewyn (1985) states that there are few real differences between foreign investment and divestment decisions, and that both are driven by capital requirements, strategic attractiveness, organizational or behavioral tendencies, and resource allocation priorities. He proposed a framework for understanding foreign divestment that required the divestment be "possible, beneficial, and triggered" (quoted in McDermott, 2010, p. 47). This approach is best suited to studying the semiconductor industry divestiture phenomenon. Boddewyn (1983) specifically noted that foreign divestiture would occur when the foreign facility no longer creates a net competitive advantage, it is no longer profitable to internalize the competitive advantage the foreign facility represents, or that the internalization is no longer profitable in the particular host country. For the semiconductor industry, the relevant characteristic is whether the foreign facility will provide a net competitive advantage over the depreciable life of the investment required, or conversely, whether the investment required to maintain the facility in a state which represents a competitive advantage is superior to other possible investments that can be made with the same funds.

The Asset-Light Model

In their investigation of the drivers of firms' sustained superior performance, Tang and Liou (2010) identify sustainable competitive advantage, configuration, dynamic capability, and sustainable superior performance as being interrelated variables. (While the inclusion of sustained superior performance in the list may appear tautological, the authors address past performance influencing future performance.) Porter (1985) notes that there are two broad categories of advantage, cost and differentiation; the firm's configuration of capital assets impact both factors. The asset light approach addresses the firm's capital asset configuration.

Asset light is a model of strategic resource configuration that emphasizes the firm's leverage, rather than ownership, of some strategic capital resources. Firms implementing an asset light strategy outsource activities in the value chain that are not core strengths of the firm (Surdu, 2011) to other firms that can perform those activities more efficiently, or in some other superior manner. The firm "aims at minimizing physical resources while making effective use of what remains to increase the profitability of the firm" (Liu, 2011, p. 953). This strategy can result in financial benefits, including improvement of financial ratios such as return on

assets, and reduction of credit expense (if assets are divested and the proceeds used for debt retirement) and improved corporate valuation (Padmanabhan, 1993). The strategy can also result in real operational benefits enabled by freeing up management attention spent on capital asset management and making more cash available for firms to apply to core competencies such as product development and marketing. Implementing an asset light or capital light approach can be good strategy. "Focusing the investment of capital on those assets where a company's expertise lets it earn the best return for investors is simply to be capital efficient." (Maly & Palter, 2002, pg. 1).

The asset light model, by reducing capital investment, can also reduce risk due to uncertainty (Wernerfelt & Karnani, 1987; Collis, 1990; Sohn, 2014). Business cycle fluctuations can cause reduction of demand that may result in underutilization of capital resources; a firm that contracts for the services provided by those resources will not be impacted by the financial penalties of underutilization, while a firm that owns the capital resource will. Industry disruptions may make some capital resources obsolete, or in other ways reduce their value. Clearly, firms adopting asset light capital strategies reduce their exposure to capital underutilization and obsolescence risks.

The asset light model has been successfully applied to several diverse industries successfully. Page (2007) and Sohn (2013) note the adoption of the asset

light approach in the sale and lease-back of hotel properties. Page (2007) identifies several factors such as the low cost of money, shortage of commercial investment real estate, and shareholder demands for reduction of capital from the balance sheets influencing this trend, but both authors contend that the major advantages of the approach are the reduction of risk, and the ability of the hotel operators to focus on hotel operations rather than ownership of real estate. Reduction of capital and risk are factors that apply across industries. Firms in the telecommunications, semiconductor, chemical, and hotel industries have adopted an asset light model with similar justifications. In each of the cases noted, firm financial performance benefitted (Liou, 2011; Surdu, 2011).

Liou, Tang, and Huang (2008) specifically address the asset light model in the semiconductor industry. They propose four generic dimensions of competitive advantage: customer relationships, supplier relationships, knowledge property, and fixed asset management. Utilizing the VRIN and VRIO definitions of competitive advantage (Barney, 1991, 2002a; Knott, 2015)), they suggest the linking of competitive advantage to sustained superior financial performance of firms is not a hard and fast causal relationship (Priem & Butler, 2001), but that competitive advantage merely increases the probability of superior financial performance (Powell, 2001). Heterogeneity among the quality, importance, and VRIN/VRIO properties of the firm's resources are the source of competitive advantage (or

competitive disadvantage) that makes superior (or inferior) financial performance probable (Tang & Liou, 2007). The du Pont identity (return on invested capital, or ROIC) is used as the measure of superior firm performance (Grant, 1991; Firer, 1999). The use of ROIC as the measure of firm performance (which is a proxy for competitive advantage and vice versa) strongly implies the importance of an asset light strategy; reducing invested capital lowers the denominator in the ROIC calculation, while reallocating capital investment to more productive uses increased the numerator. Both of these actions associated with implementation of an asset light strategy will improve calculated ROIC, and provide a firm level justification for the strategy. Using the ROIC performance metric, Liou, Tang, and Huang (2008) note that the top five performing semiconductor firms in their study's sample have very low levels of capital (they are predominantly design firms, and contract for production services), while the lowest performing firms own their production facilities, which results in very high capital investment levels. In the notoriously cyclical semiconductor industry, firms that expect to meet demand when the market is hot must overinvest in capital assets (especially production facilities) in order to take advantage of high demand, with the penalty of having underutilized capital assets when demand slows. These capital heavy firms are therefore periodically financially burdened by capacity underutilization.

A study of the fortunes of the Japanese semiconductor industry, and the loss of over half of its global market share by Wen, Huang, Cheng (2012) compares the strategies of firms with an integrated device manufacture (IDM) model that own their production facilities, and the pure manufacturing outsourcing (PMO) model, where the firm does not own any manufacturing capability. Some IDMs do all of their manufacturing in firm owned facilities, while the asset light firms do some manufacturing in firm owned facilities and also subcontract for a substantial portion of their manufacturing needs. The PMO and asset light model firms depend on wafer foundries to provide the wafer fabrication services and packaging subcontractors for their assembly and test services to meet all or some of their manufacturing needs. This arrangement allows the PMO and asset light firms to avoid the extremely high investment required to maintain modern, competitive wafer fabs (Vajpayee & Dhasmana, 2011; Taiwan Semiconductor Manufacturing Corp, 2010, 2016). The firms providing wafer foundry services, in part by consolidating demand from many different semiconductor firms, are able to enjoy economies of scale that would not be attainable by individual semiconductor firms.

The Japanese firms did not maintain cost competitive wafer fab facilities due to delayed investment, and were slow to adopt the asset light or PMO models being adopted in the US and the rest of Asia. These inactions resulted in a loss of cost competitiveness, lower margins, and global market share (Wen, Huang,

Cheng, 2012). A notable empirical study (Lin & Huang, 2011) evaluated a global sample of semiconductor firms and found that those firms employing the asset light strategy had superior return on book value, return on assets, and value of assets as compared to more asset heavy firms. Clearly the asset light capital allocation strategy can be successfully implemented in the semiconductor industry, and firms that continue with the traditional wholly owned manufacturing resources are, in many cases, penalized for failure to adopt an asset light strategy.

Asset light literature is firmly grounded in the competitive advantage and RBV literature, and explains, at the firm level, justifications for divestment of certain strategic resources that are not explained by the IB, transaction cost, or divestment literature. The asset light literature does not, however, currently address the drivers of the decisions of exactly which resources are divested. Understanding the impact of these drivers of the decisions should aid the understanding of why certain strategic resources in the semiconductor industry are divested, while others are not.

Chapter 3
Methodology

Overview and Description of the problem

Firms trying to create competitive advantage, especially those in hypercompetitive industries, are constantly evaluating their mix of resources to determine if those resources represent an optimum mix and do indeed create competitive advantage. The asset-light model is a firm capital structure that reduces major capital assets and has been adopted across several disparate industries including semiconductors, telecommunications, and hotels (Page, 2007; Liu, Tang, & Huang, 2008; Liu, 2011; Surdu, 2011; Sohn, 2013). By reducing capital assets, especially those that no longer generate significant competitive advantages, financial resources can be redirected to the firms' unique capabilities that do have the ability to generate competitive advantage (Maly & Palter, 2002).

The literature provides explanation for the reasoning behind implementation of an asset light capital model, but does not address the reasons why some strategic resources are divested, while others are not. This study aims to determine the specific drivers of strategic resource divestment decisions made while firms implement asset light capital models. Identification of these drivers, and understanding the impact of the state of the drivers on the divestment decisions will advance the understanding of the details of implementation of the asset light model.

Worldview – Interpretive Framework

The study of business strategy is, at its heart, the study of human behavior in the context of a firm attempting to maximize its profitability. Strategic decisions are made by groups of individuals with different backgrounds, knowledge, and biases. The impact of those decisions, the profitability of the firm, is heavily influenced by these strategic decisions, but macroeconomic factors, luck, chance encounters, and other random factors can also significantly impact firm profitability. The random events affecting profit outcomes and unique and diverse backgrounds of the individuals contributing to the strategic resource divestment decisions result in hazy cause and effect relationships between strategic decisions and profit outcomes. Various participants may see these relationships quite

differently; the worldview of an investment banker, a production planner, a business unit head, and a CEO are significantly different. If each of these individuals contribute to the divestment decision process, each brings unique assumptions and goals to that process. This suggest an ontological outlook that there is not one single objective reality to be discovered, but that multiple realities or worldviews must be considered (Creswell, 2013).

The epistemological questions regarding the nature of knowledge in this study reduce to identification of the factors that drive the divestment of strategic resource decisions, and the determination of the effect of the state of those drives on the decisions made. In order to determine these drivers and their states, it is necessary to get close to the participants in the study in order to create a deep understanding of their view of the drivers, their relative importance, and effect on divestment decisions (Cresswell, 2013).

The research conducted in this study will attempt to understand drivers of divestment decisions in order to predict the probability of divestment of a particular strategic resource, or the advisability of that divestment, i.e. whether executing the divestment will result in greater profitability for the firm. It will utilize an interpretive framework based in pragmatism, attempting to explain and predict divestment behavior while recognizing the limited explanatory power of existing theory (Creswell, 2013).

Research questions

This study aims to identify the factors driving the decision to divest strategic resources in the hypercompetitive, capital intensive, knowledge based semiconductor industry, and impact of the state of those drivers. Specifically:

1) What are the drivers of specific strategic resource divestment decisions in the semiconductor industry?
2) Can the state of the drivers and the characteristics of the resource be used to predict the probability or advisability of strategic resource divestiture in the semiconductor industry?

Qualitative vs. Quantitative approach

The goal of this study is to determine the factors driving the decisions to divest strategic resources in the semiconductor industry, and the effect of the state of those drivers on specific divestment decisions. This is an open ended question;

there is not a solid hypothesis that will be proven or disproven. There are not specific, identified factors whose effects will be measured. The nature of the study, the search for a model with explanatory power, requires a qualitative approach (Reswick, 1994).

Research Design - Discussion of Types of Qualitative Approaches

The five qualitative approaches as described by Creswell (2013) are narrative, phenomenology, grounded theory, ethnography, and case study. Each of these approaches are appropriate for various qualitative studies, and were considered for this study. A very brief discussion of the characteristics of each approach and its' applicability to the study of the divestment of strategic resources in the semiconductor industry follows.

The narrative approach concentrates on telling the story of one or two individuals (Creswell, 2013). The goal of this study is to understand the factors driving divestment, and the stories of one or two individuals may provide important insight. However, the variation in experience, biases, and viewpoints of the various

people involved in major strategic decisions in modern firms, and the need to understand those multiple viewpoints, would make the selection of only one or two viewpoints a risky approach. The narrative approach does not appear to be a productive path for this study, and it will not be utilized.

The ethnographic approach focusses on describing shared cultural experiences (Creswell, 2013). Although firms can be described as having a corporate culture that is shared by all or most employees of the firm, (Chaudry, et al. 2016; Schein, 2010), the diversity of backgrounds and viewpoints of the decision makers and those who are impacted by strategic resource divestment decisions is an important component of the study. The goal of the study is to understand the drivers of divestment decisions, not on the common meaning or experience of the firm's employees. Thus, the ethnographic approach is not well suited for this study.

The grounded theory approach attempts to build an understanding of a phenomenon that allows the generation of a theoretical framework that will explain the observed phenomenon and provide predictive power in the future (Corbin & Strauss, 2007; Creswell, 2013; Charmaz, 2014; Glaser & Strauss, 1967). This study is attempting to develop a model of the strategic resource divestment decision that includes identification of the drivers of the decision, and the effects of the states of those drivers on the decision made. The study attempts to expand or build

upon existing theory rather than develop completely new theory. Grounded theory is related to, and may inform the methodology used in this study, but it is not the best description of the methodology employed in the study.

The phenomenological approach "describes the common meaning of several individuals of their lived experiences of a concept or phenomenon" (Creswell, 2013, p. 76). This method has the advantage of accommodating the viewpoints of more individuals than the narrative approach, and thereby enabling the reduction of risk of bias associated with a sample of a very small number of individuals in an attempt to represent multiple viewpoints. The focus of the phenomenological approach is on the meaning of a phenomenon on those individuals; this study does indeed utilize the phenomenological approach, as we are investigating the thinking of several individuals making a major strategic resource decision. Even though the decision is made on behalf of the stockholders of a large corporation, there was a small group of decision makers that had to reach consensus for action and had a shared, lived experience.

Case study based research address a specific, contemporary example of a case that is illustrative and representative of the concept being studied (Stake, 1995; Yin, 2009). The decision to divest a major strategic asset is a complex one; many financial, technical, and organizational dynamics (social) issues influence the decision. The case study approach fits the research problem well, and appears to be

a fruitful avenue for gaining insight into the drivers of divestment decision study "…. the distinctive need for case studies arises out of the desire to understand complex social phenomena. In brief, the case study method allows investigators to retain the holistic and meaningful characteristics of real life events" (Yin, 2009, pg.4). A case that appears to be representative and illustrative, a medium size semiconductor firm that has divested a strategic resource (a manufacturing facility in a low labor cost Asian country) has been identified, and several current and former employees of the firm have been interviewed. Formal authorization from the firm to interview current and past employees regarding the divestment has been granted.

Population Studied and Sample

The population that is being studied is the semiconductor industry. This population is a significant target of study in itself, but it may also be representative of other hypercompetitive, capital intensive, and/or knowledge based industries. Although this study does not assume the results gathered from the semiconductor industry are generalizable to other, similar industries, further research may support generalizability.

The phenomenological approach utilizing case study techniques was executed, hence a single medium sized semiconductor firm comprises the firm level sample. Within the firm, a variety of individuals including senior executives responsible for major strategic decisions (including the divestiture of strategic resources such as foreign production facilities), and executives and manager impacted by those decisions were included in the sample.

The researcher interviewed a majority of the seven key decision makers responsible for the divestment decision (five top executives at the firm studied), and a small number of executives impacted by the decision. Due to such a small number of decision makers, the total sample size is necessarily small. For a phenomenological study, Polkinghorne (1989) recommends five to twenty five interviews, while the literature for case study sample sizes gives less specific guidance. For a case study (or other qualitative studies utilizing interviews), the concept driving sample size is that of saturation (Glaser & Strauss, 1967). A sample size should be large enough that the addition of new interviews does not add anything to the understanding of the concept being studied (Mason, 2010).

A total of seven interviews have been completed, meeting the requirements for phenomenological study recommended by Polkinghorne (1989). The responses for the drives of the decision to divest, and the condition or state of those drivers were remarkably consistent, both among the decision makers and by those

impacted by the decision. The interviewees stated that the decision team reached consensus to divest the assembly and test facility, and that the firm communicated the decision and its rationale openly to the executive and management staff, which explains the consistency. The saturation requirement for qualitative interviews appears to have been met as well.

Choice of participants

This dissertation details a phenomenological study utilizing a case study approach to understand the reasons for reaching a divest or retain decision for strategic resources in the semiconductor industry. The time available for the research is not unbounded. A tradeoff had to be made in the choice of participants between casting the net wide to gather the relevant information on many decisions from several firms, or drilling deeply into a small number of decisions at a single firm. The intent of the research is to generate a deep understanding of a phenomenon that has not been described in the literature, favoring the drill deep at a single firm strategy. By reaching a deeper understanding of the factors driving divest or retain decisions at a single firm, the parameters of future study can be narrowed, enabling the design of a survey instrument that can be disseminated to a

larger group than can be personally interviewed within reasonable time constraints. The drilling deep approach is a prelude to future, wider, quantitative study.

The study has gathered primary data through semi-structured interviews with executives at the studied firm with the intent to gather information on: interviewees' motivations - why the divest or retain decision was reached; awareness and knowledge - what is the state of the drivers of the decisions; and attitude and opinion - was the decision the correct one (Ghauri & Grønehaug, 2010). Study participants were chosen based on their participation in the resource divestment decisions, or on their exposure to the effects of those decisions, their responsibilities for strategic management of their product lines, and knowledge of the state of the drivers identified. The participants in the decision have provided valuable insight into the specific factors driving the decision, while those exposed to the effects have been able to provide insight into the wisdom or advisability of the decision. The inclusion of these two different groups providing both pre-divestment and post-divestment analysis of the decisions is intended to enable a more complete understanding of the decision. It is possible that that the inclusion of views by those affected by the decision may enable feedback to practitioners that can be used to modify evaluation of the drivers considered in the decision making process.

Decision participants interviewed consist of the top level management of the firm at the time of the decision. Those affected by the decision include senior business unit executives who depend on the capabilities of the resources to run their respective business, and are responsible for the management of captive and subcontracted resources. A total of nine executives targeted for interviews were contacted. Only two did not agree to participate in the study, each because he felt he did not have enough exposure to the decision or its impact to make useful contributions. One of those two left the firm shortly before the divestment decision was made, the other joined the firm after the divestment had been completed.

Instrumentation, Procedures, Data Collection

In order to fully understand the question being studied, Creswell (2013) recommends interviews with individuals with direct knowledge of the phenomenon being studied. The interviews were semi-structured and flexible (Charmaz, 2014); the initial questions are open ended, asking interview subjects for their thoughts on the important drivers of divestment decisions. After the interviewees gave their impression of the important drivers they were asked whether specific drivers proposed by the author of this study are also important. The order of these questions is critical; it is important to gather the unprompted responses regarding

the important drives before the interview subjects hear specific proposed drivers that may influence their thought process.

Interviews were conducted both in person and by telephone calls. While in person interviews were preferred, remote location of many of the interview subjects and logistical limitations on travel by the researcher necessitated the use of telecommunications. All of the initial interviews were audio recorded and transcribed, with the full knowledge and consent of the interview subjects. All of the interviewees agreed to be available for followup questions, and were contacted by phone or email to clarify points raised in the interviews, or to provide more information on the details of the strategic planning process that resulted in the divestment decision. . Specific resource allocation decisions, and details of the strategic planning process for the firm were investigated through these followup communications. While the followup phone calls were not recorded, important points from those discussions were manually noted by the researcher; most of the information requested in the followup calls was very specific, and easily recorded manually in table format. The interviewees were more relaxed and possibly more candid without the calls being recorded.

Data Analysis

Interviewees were asked to identify the firm's strategic resources, and the drivers of the decision to divest or retain those resources. Transcriptions of the interviews were analyzed and selectively coded to generate a list of strategic resources for the firm and propositions defining the drivers of divestment decisions (Creswell & Brown, 1992; Creswell, 2013). Examples of strategic resources that may be identified include production facilities, design groups, and patent portfolios.

The interviewees' answers to the drivers questions were coded by creating categories of drivers described in their responses. Examples of categories that were identified include the firm's financial distress/need for cash, resource's contribution to continuing competitive advantage, funding requirements to maintain competitive advantage, and ability to contain the firm's intellectual property within the resource.

The state of identified drivers for the identified strategic resources has been analyzed in light of the divestment decisions made (assembly and test facility divested, other strategic resources not divested). The most important drivers were identified based on whether they were identified by most decision makers, and whether the states of the drivers were consistent with the divest (or not) decision reached for the resource. A model detailing the advisability of divestment based on

the state of drivers for resources that may be generalizable to other semiconductor firms, or to firms in other hypercompetitive, capital intensive, knowledge based industries.

Ethical Considerations

The researcher has contacted the subject of the case study and received formal permission to interview its employees that agree to be interviewed. This permission has been documented via email. The person who has granted permission for the interviews is the Vice President/General manager responsible for the division of the firm that includes the current employees being interviewed. The firm that is the subject of the study will not be identified (other than the description of the firm as "a medium size semiconductor company", and the information that the firm divested a manufacturing facility in a low labor cost Asian country), and the employees will be identified only by a general description of their position or responsibility at the time of the divestment decisions. Employees, and former employees of the firm were asked to sign a consent letter that outlines the efforts made to protect their interests and protect them from harm (see Appendix B). Recordings of interviews were made only after the interview subject explicitly

consent and the recordings document their consent. Every effort has been made to protect the interview subjects from any adverse effect of participating in the study.

Population and sample

The population interviewed consists of senior executives at the target firm who participated in the divestment decision, and senior executives responsible for business operations that were significantly impacted by the divestment. Senior executives at the investment bank handling the firm's pending initial public stock offering who participated in, or influenced, the reconfiguration of the firm's strategic assets were not able to be contacted, and their viewpoints are represented by the senior executives who participated in the decision and worked closely with them to reach the divestment decision.

The sample consists of representatives from the management of the firm that is the subject of this study, with emphasis on including as many of the decision makers for the divestment decision as possible. Of the seven key decision makers identified by the firm's top managers, four were interviewed. All of the target firm's executives contacted agreed to be interviewed, and were enthusiastic about participating in the research.

Selection of participants

Participants were chosen to participate based on their membership in one of the groups comprising the studied population. Initial discussions with decision participants identified the decision makers; interviewees were also asked to identify members of the other population groups. Identified potential participants were approached informally to determine whether they were willing to be interviewed, and all who could be contacted agreed to participate and their consent documented.

Risks to participants and protections

There is little or no risk to the participants in the study; the only identified risk would be current employees inadvertently releasing proprietary or company secret information, which the firm would perceive negatively. This slight risk is specifically identified in the consent letter that interview participants are being asked to sign.

The participants were asked for their recollections of the process of a divestment decision that was made almost two decades ago. Many of the interview subjects are now retired, and the interviews are being conducted with the knowledge and consent not only of participants, but of the firm being studied. In a

hypercompetitive industry such as semiconductor manufacturing, sensitive data is almost always recent, and the temporal distance from the event being studied make it unlikely any sensitive information will be communicated. Transcripts of the interviews were furnished to the interview subjects, and they were given the opportunity to redact any sensitive information. The identity of specific interviewees has been protected through the use of generic population segment descriptors (e.g. senior executive/decision maker, manager/decision implementer, etc.); no personally identifying information will be reported. The firm being studied will not be identified.

Researcher Positionality

The researcher is a 30 year veteran of the semiconductor industry, employed by the semiconductor firm from which this case is drawn from 1983-2013, in engineering, management, and executive roles. He has extensive knowledge of semiconductor technology, and was responsible for strategic planning for a business unit of a semiconductor firm, and for that business unit's profitability performance. He is personally known to the interview subjects. He was not directly nor indirectly involved in the decision to divest that is being studied in this case.

Validity

The goal of this study is to understand and model the effect of the factors (ability to generate competitive advantage, capital investment requirements, ability to contain IP, and others that emerged during the study) on divestiture of strategic resources in a hypercompetitive, capital intensive, knowledge based industry. A case study of a semiconductor firm's divestiture decisions for the major strategic resources common to semiconductor manufacturing firms is used as evaluation vehicle. In order for the study to be valid, semiconductor manufacturing must indeed be a hypercompetitive, capital intensive, knowledge based industry; if the results are to be generalized, the semiconductor industry must also be representative of other hypercompetitive, capital intensive, knowledge based industries.

The semiconductor industry is specifically identified as an example of a hypercompetitive industry (D'Aveni, 1994), and modern wafer fabs cost well over $1 billion to build and equip (Vajpayee & Dhasmana, 2011; Taiwan Semiconductor Manufacturing Corp, 2010); clearly semiconductor manufacturing is a hypercompetitive, capital intensive industry. Competitive advantage is determined by the ability to design circuits and processes that enable superior product performance and/or cost structures. R&D spending in the industry is high, and

considered crucial to firm success (United Business Media, 2005) strongly supporting the classification of the industry as knowledge based. In the absence of any indication that semiconductor manufacturing is atypically hypercompetitive, capital intensive, or knowledge based, results may be generalizable to similar industries, providing an avenue for further study.

The research was conducted as a series of semistructured interviews; the instrument is a questionnaire (see appendix B) that was designed to elicit open ended responses from the interview subjects before asking whether specific items were drivers of the divestment decision. This was done in an attempt to gather the thoughts of the interviewees before they were exposed to any suggestions from the researcher, and eliminate (or at least minimize) any effects due to researcher bias. The questionnaire was reviewed by Dr. Emily Martinez-Vought, a research methods expert, and Dr. Enrique Perez, a subject matter (corporate strategy) expert, and modifications were made based on their feedback.

After the initial interviews were done, followup email and phone conversations were conducted to gather more info on the strategic decision making process for the corporation as a whole (and to determine the early interviewees' views on the state of drivers that were first identified by later interviewees). This provided useful context to understand the details of the divest or retain decisions for the identified strategic assets.

Chapter 4
Research Findings

Overview

The purpose of this study is to understand what factors were drivers of decisions to divestment decisions for strategic resources at a medium size semiconductor firm, and how the state of those drivers impacted the decision. Interviews with senior executives and product line executives at the studied firm were conducted. The senior executives directly participated in the divestment decision for the firm's assembly and test operation, and the product line executives were responsible for strategic planning, e.g. resource allocation decisions, for their product lines. All of the interviewees had first hand experience with the divest or retain decision and/or the impact of the decision.

The interviewees identified four strategic assets for firms in the semiconductor industry that were owned by the studied firm (see Figure 3). They

determined which drove the decisions to divest or retain each of these resources, and the state of those drivers. Those results are presented in detail in this chapter.

Divestment Decision Background – The Firm Level Strategic View

When we endeavor to drill down and understand a detailed process that is inextricably linked with a more complex whole, it is usually useful to step back and take a wider view of the big picture; to understand where the detail we are studying fits in the big picture. In order to understand the decision to divest a key manufacturing resource studied in this case, and the embrace of the asset light model (Page, 2007; Liou, Tang, & Huang, 2008; Liou, 2011; Surdu, 2011; Sohn, 2013) that decision represents, we can benefit from understanding the top level corporate resource allocation strategy. Most of the interviewees, in informal followup communication, gave similar descriptions of the top level strategic goals of the firm, with several of them adding a unique perspective or memory. Understanding the history of the semiconductor industry history of wholly owned assets creates greater understanding of the asset structure of most merchant semiconductor firms in the turn of the millennium timeframe. Follow-up conversations and emails after the semi-structured interviews with most of the

participants shed light on that history and of the top level firm strategy. Two of the interviewees with the longest tenure in the industry were instrumental in fleshing out the early history of the industry and of the asset structure common to all of the early semiconductor manufacturers. This historical standard of ownership of all of the identified strategic assets was the state of the studied firm before the asset light model was implemented, and the divestment decision made.

As the interviews progressed, it was as if each participant reinforced the descriptions of the other interviewees, yet added a few new pieces to the mosaic that is the understanding of the detailed strategy of the firm. The relations between the studied phenomenon, drivers of a particular strategic divestment decision, and the other pieces of the firm's strategy helped to clarify the importance of many of the proposed drivers. Drivers of other strategic decisions, not related to asset ownership were consistent with those for the divestment decision.

The firm studied faced some key strategic decisions to complete the transition from a division of its parent, a firm that depended heavily on defense and other stable businesses and was never comfortable with the highly volatile semiconductor industry, to an independent firm in the hypercompetitive semiconductor marketplace. It had just been spun off as an independent firm funded by the personal capital of top management (most put their retirement savings into the investment pot) and by a large venture capital firm. As the

majority investors, the venture firm had the final say on overall corporate strategies, but determined the strategic path through extensive collaboration with the semiconductor firm's managers. Their strategy was to maximize the worth of the company to prepare for an IPO; the IPO was later successfully executed.

From the birth (or birth of significant commercial relevance) of the semiconductor industry in the 1960's, through the 1990's the standard model for a semiconductor firm was to own its production resources, which consist primarily of wafer fabrication and assembly/test facilities, and it's key intellectual property or knowledge generating resources, primarily the wafer process design and circuit design groups (see Figure 3). These were the strategic resources identified by the interviewees.

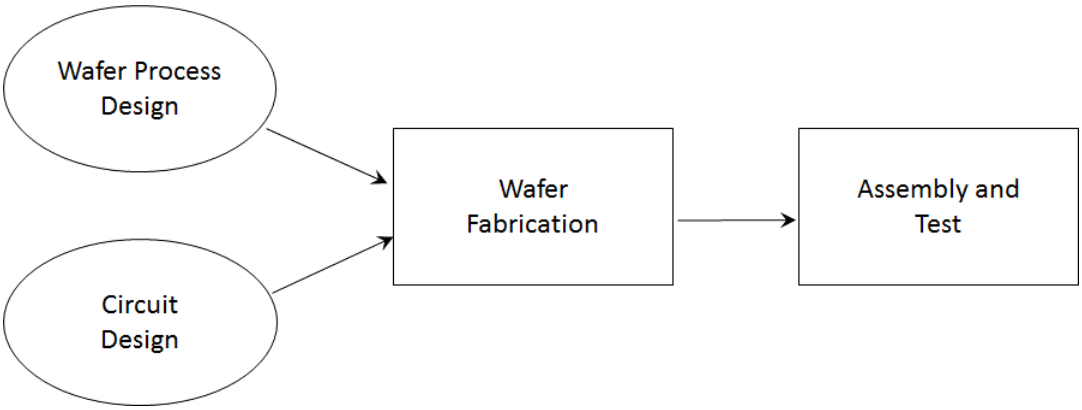

Figure 3. Simplified Semiconductor Design and Manufacturing Flow

Due to immaturity of semiconductor technologies in this timeframe, firms had manufacturing processes that were unique, even idiosyncratic, and had been developed from scratch by the firm. A firm that wanted to be in the semiconductor market would have to "roll your own" in terms of manufacturing facilities and process design. In the 1990's maturing technologies enabled an alternative model of production facilities providing technologically advanced, standardized wafer processing and assembly and test that were owned by firms specializing in manufacturing. As this resource began to become available, strategic options opened that would enable small semiconductor firms with, for example, circuit design or marketing expertise, but which lacked the extensive capital to build

competitive manufacturing facilities to compete with the larger firms in targeted segments.

In parallel with the shift in the manufacturing model, the booming electronics market demanded more semiconductors in a variety of product segments. The studied firm had the lead in the market for product in one segment, and the market was growing at a brisk pace. They also had a toehold in another market segment, which was also growing briskly, and a significant share in a third segment, which was growing slowly but steadily, but with much lower margins than the other segments.

The venture capital firm owning a majority share of the studied firm encouraged the firm's management team to scrutinize the manufacturing assets and determine whether the firm could sell any of them. The VC's viewpoint was primarily financial, as they were not semiconductor technology experts; however, their experience and expertise with financial markets, financial issues common to technology firms, and IPOs brought significant value to the strategic decision making process. The VC's aimed to improve the firm's return on assets (ROA). This measure is the ratio of profitability per dollar of invested capital in assets; the ratio can be improved by increasing the numerator in the equation, the firm's profitability, but also by decreasing the denominator, the value of assets. The VC's let the decision on market segments be led by the semiconductor management

team. The suggested divestment of manufacturing assets would lower asset value, while the choice of the fastest growing, highest margin segments would increase profitability. The studied firm's management and VCs had two major decisions to make: which of its product lines to fund heavily, which to draw down; and the capital structure of the firm, specifically the manufacturing capital.

The asset light manufacturing model is implemented by reducing ownership of key manufacturing resources, and to contract for their services (Page, 2007; Liou, Tang, & Huang, 2008; Liou, 2011; Surdu, 2011; Sohn, 2013); the decision to implement the asset light model was driven by the VCs. This was the first and highest level decision, at the bottom of the strategic decision influence chart (see figure 4; the chart is somewhat simplified, as many influencing factors that have an impact on the IPO valuation, but are not in the path of one of the strategic decisions have not been included.)

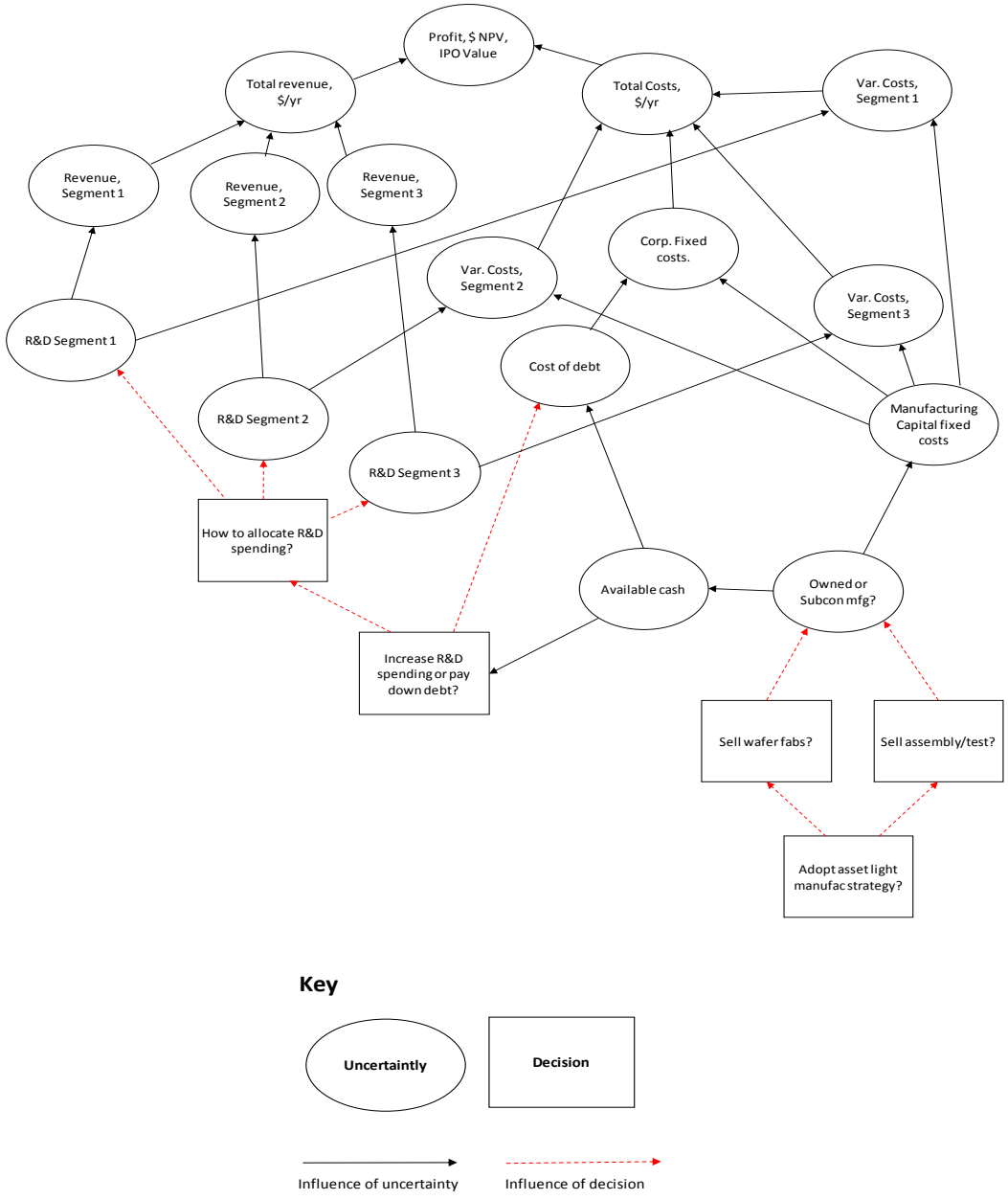

Figure 4 – Strategic Decision Influence Flow Diagram

Once the decision to reduce manufacturing capital was made, the specific decisions on which of the two key facilities, wafer fab or assembly/test (decisions at the lower right side of Figure 4), would then have to be made. The firm divested its Asian assembly and test facility, selling it to an assembly and test manufacturing firm that was also majority owned by the same VCs with majority ownership of the firm being studied, and was also being prepared for an IPO. The infusion of cash that resulted from the sale could be allocated to increased R&D spending (which would stimulate sales and reduce manufacturing variable costs), and/or to retirement of the firm's long term debt (which would reduce the fixed cost of debt service), or some combination of each.

The firm chose to retire almost all of its long term debt, and still had available to capital to increase already well funded R&D in two of the targeted product segments. Both of these steps made the company more financially attractive, increasing the potential IPO value. They decided to significantly increase funding for two of the most promising segments and to sell the third lower margin business, bringing further infusions of cash. The company was then essentially debt free, heavily funding R&D into growing, high margin businesses, and well positioned for its IPO.

At the time of decision to divest the assembly and test facility, and in the roughly eighteen years since that decision, the firm has not divested the wafer fab, circuit design groups, or wafer fab process design groups.

Coding the Interview Results

The interviewees (four senior executives who were part of the decision making team, and three product line general managers directly impacted by the decision and with strategic planning responsibilities for their product lines) were first asked what they considered to be a generic semiconductor firm's strategic resources, or which resources could be considered strategic for at least some semiconductor firms. There was agreement among all interviewees that, at an industry level, wafer fab and assembly/test manufacturing facilities, and fab process design and circuit design groups were the major strategic resources that enable at least some semiconductor firms to create competitive advantages. They were then asked open ended questions about what factors were the key drivers of the assembly and test facility divestment decision. They were then asked specifically asked whether the ability of the resource to generate competitive advantage, the level of capital investment required to maintain the resource, and the ability to retain IP generated in the resource within the firm were key drivers. New drivers

that were identified in responses to the open ended questions were added to the list of specific drivers listed in the interview protocol (whether the resource generates competitive advantage, capital spending required, and IP containment) in subsequent interviews, and in follow-up phone conversations and emails with previous interviewees. Each of the interviewees was therefore exposed to all of the drivers identified by all of the interviewees, and given the chance to decide whether it was indeed a driver of the decision. Each of the inteviewees was then asked the same questions about the other strategic resources identified (wafer fab, circuit design group, fab process design group). The list of drivers identified are listed in Figure 5:

1) Ability of the resource to generate competitive advantage
2) Capital investment required to maintain the resource
3) Ability to contain IP generated in the resource within the firm
4) Whether or not the firm was under financial stress/emergency
5) Financial metrics and/or investor pressure on financial metrics
6) Ownership and control advantages

Figure 5. List of Possible Divestiture Drivers

The interviewees were also asked the state of the driver identified, whether they personally considered it to be a driver of the divestment decision or not for

each of the four strategic resources. The responses were coded per figure 6, which lists the possible decision drivers and the possible states of those drivers.

Decision Driver	Coding of State Options				
Does the resource generate a competitive advantage for the firm?	Yes	No			
Level of capital investment required to maintain the resource	None	Low <$5M	Moderate $5M - $20M	High $20M - $100M	Very High >$100M
Ability to retain IP generated in the resource within the firm	None	Low	Moderate	High	Very High
Was the firm under financial stress/emergency?	Yes	No			
Importance of financial metrics, Investor pressure on financial metrics	None	Low - specific metric noted	Moderate - specific metric noted	High - specific metric noted	Very High - specific metric noted
Importance of ownership control	None	Low	Moderate	High	Very High

Figure 6. Coding of Driver States

The summary of interviews is contained in Appendix D. A lower case "x" under the "Decision Driver?" column indicates that the interviewee identified that factor as a key decision driver of the divest or retain decision, while a blank indicates the interviewee did not identify the factor as a key driver. The "Driver State/Value" listed is based on the coding described in Figure 6. Interviewees were asked for the state/value regardless of whether they considered the factor to be a

key driver of the divestment decision or not. A blank in the "Driver State/Value" column indicates that the interviewee did not know, or did not feel comfortable estimating, the state/value.

Ability of the resource to create competitive advantage was coded as "yes" if the resource enabled an important advantage with respect to competition, and as "no" if the resource was inferior in important competitive comparisons, or if the resource enabled competitive parity. The level of capital required was coded as "none" if zero investment was required, "low" if required investment was less than $5 million, "moderate" for $5 - $20 million, "high" for $20 - $100 million, and "very high" for greater than $100 million. The timeframe for the specified investment was the firm's five to seven year strategic planning horizon. Ability to contain IP was a qualitative assessment that was based on mobility of knowledge generating employees, relative share of important IP being patented or merely trade secrets, and the IP protection reputation of the country in which the resource is located. Firm financial stress was also a qualitative assessment and coded as a "yes" if the interviewee was aware of profitability or cash flow problems, and "no" if neither of those problems were present. Importance of financial metrics was a qualitative assessment of the importance of investor (VC's from the investment bank preparing the firm for its' IPO) concerns about financial metrics, specifically return on investment ratios. Return on capital, return on assets, return on

investment are used interchangeably in this study, as they are all impacted similarly by the divest or retain decisions for the identified strategic resources. Importance of ownership/control advantages was also a quantitative assessment as to the relative importance of this driver with respect to other key decision drivers.

Findings

The interviewees identified four basic strategic assets for the semiconductor industry, namely wafer fabs, assembly and test facilities, circuit design groups, and fab process design groups (see figure 3). At the time of the studied firm's decision to divest the assembly and test facility, the firm owned all four of these strategic assets. Each interviewee was asked whether the potential decision drivers (figure 5) were in fact drivers of the divest or retain decision for the facility that was divested, as well as the three resources that were not divested. Interviewees were also asked to describe the state of the driver (without regard to whether it was a decision driver) for each of the strategic resources, and the results coded per Figure 6.

Assembly and Test Facility

The studied firm's assembly and test facility is the resource that was divested, and inspired this study. The first proposed driver was the ability of the resource to provide competitive advantage. Interviewees noted that a competitive advantage for this particular resource could be either the ability to provide specialized capabilities not generally available in the industry, or a cost advantage for the capabilities that were not unique, that were widely available. There was unanimous agreement among all interviewees that the ability of the resource to provide a competitive advantage was a driver of the divestment decision, and that the resource did not provide an advantage in terms of capabilities or cost. The state of the driver was coded as "no" for all interviewees.

One of the decision makers, and one of the product line executives each identified capital investment requirements as a key driver of the decision, and all interviewees agreed that the amount of investment required (the state of the driver) was between five and twenty million dollars over the strategic planning period of the firm. This was coded as "moderate". All of the interviewees agreed that the firm was capable of providing the required capital investment if the resource was retained, that the investment required was not an unusual burden for the firm. All interviewees agreed that financial distress was not a driver of the divestment

decision, and that the firm was not experiencing financial distress (driver state coded "no").

All of the decision makers, and one of the product line executives identified financial metrics, or pressure from investors to improve financial metrics as being a key decision driver. The interviewees that identified this as a decision driver described the state as having an impact on ROI; four of the five listed it as a "large impact on ROI", and one as "an impact on ROI".

All interviewees agreed that the ability to contain IP was not a driver, and rated that ability (state of the driver) as "low" or "very low". This is consistent with the interviewees' views that the facility did not provide any unique capabilities, therefore there was little valuable IP to lose even if the facility was unable to prevent its loss.

All interviewees identified the impact or importance of ownership and control advantages as being an important driver of the decision, and rated the state of the driver as "very low" (one response), "low" (three responses), or "moderate" (three responses). The state ratings for this factor were heavily influenced by the expected seamlessness of the transition from a firm owned resource to a contracted one. The interviewees explained that the facility would be operated as a semiautonomous division of the purchasing firm, that the same management team would remain in place, and that attractive pricing similar to the firm's internal costs

would be offered. The loss of the ability to have complete control over prioritization of batches processed was partially mitigated by the granting of a limited number of batch expedite privileges. Each of the interviewees believed that these agreements were honored after the sale was completed, and the transition was smooth and seamless.

When asked whether they thought the decision to divest the facility was the correct one, six of the seven interviewees agreed that the decision was the correct one. The one product line executive that disagreed thought that the value of ownership/control was a big enough advantage to justify retaining the facility. This executive did not believe that financial metrics/investor pressure was a driver of the divestment decision, and did not provide a rating of the state of that driver.

Wafer Fab Facility

The firm operated one wafer fab facility that build product for the firm's core product lines, and has continued to retain ownership of and operate the facility. The interviewees stated that a wafer fab, like an assembly and test facility, can provide competitive advantage either by providing unique capabilities or by providing common capabilities at low cost. They unanimously identified the

ability to generate competitive advantage a driver of the decision not to divest the wafer fab, and noted unique capabilities as the specific advantage that the fab does provide (and one interviewee even identified cost as a disadvantage, although outweighed by capability advantages). The state was code as "yes" for all responses.

All interviewees identified capital investment requirements as a divestment decision driver, and rated the state of the driver as "high" or "very high". Corporate financial distress was not identified as a decision driver, all agreed that there was no distress, and the state was coded as "no" for all responses. Three of four decision makers and one of three product line executives identified financial metrics/investor pressure as a driver, and rated the state of the driver as "very large impact on ROI" (three responses) or "large impact on ROI" (one response).

The ability to contain IP was identified by all four decision makers, and two of three product line executives as a decision driver; the state of the driver was rated as high by all of those who believed it did drive the decision not to divest. The IP of importance was tied to the unique capabilities that the wafer fab was able to provide (which enabled a competitive advantage), and the interview subjects noted that much of this IP was protected by patents and the fab operated in the US, a country in which IP ownership was protected in practice. The interviewees

thought that the ability to protect IP would be low if the fab was located in a country with poor IP protection laws or enforcement.

All interviewees agree that importance of ownership and control advantages was a driver of the divest or retain decision for the wafer fab, and rated the state of the driver as "high" (five responses) or "very high" (two responses).

When asked whether they thought the decision to retain, not divest, the wafer fab was the correct one, all interviewees agree that the decision was the correct one. They saw the unique capabilities of the fab as a competitive advantage.

Circuit Design Group

All of those interviewed identified the ability to provide a competitive advantage as driver of the decision not to divest the circuit design groups. All agreed that the design groups do indeed provide a competitive advantage, and the state of the driver was coded as "yes" for all responses. Many of the interviewees stated that the design groups represented the firm's most important competitive advantage. The ability of the firm to contain IP generated or residing in the design groups was also identified as a divestment decision driver, and rated the state of the driver as "high" (four responses), or "very high" (three responses). The

interviewees stated that almost all of the competitive advantage generated by the design groups is in the form of IP. The location of the design groups in the US was noted as one of the reasons the ability to contain IP was high or very high.

Design groups were noted as predominantly a human, rather than physical, resource and capital investment required was rated as "low" (six responses) or "none" (one response). Capital investment requirements were not identified as a decision driver. Financial distress was not identified as a driver, nor was financial metrics/investor pressure.

All four of the decision makers, and two of three of the product line executives identified the importance of ownership and control of the design groups to be divestment decision driver. The state of the driver was rates as "high" (four responses) or "very high" (two responses).

When asked whether they thought the decision to retain, not divest, the circuit design group was the correct one, all interviewees agree that the decision was the correct one. They saw the IP that this group generated to be one of the key assets of the firm; this IP enabled superior product performance that constitutes a competitive advantage.

Fab Process Design Group

The ability to generate unique capabilities in the wafer fab facility is dependent upon the fab process design group. All interviewees agreed that this group was able to create IP that enabled the competitive advantages that the unique wafer fab facility capabilities represent, and that this ability was a key factor in the decision not to divest this group.

As in the case of circuit design groups, the fab process design group is a human, not capital, resource. All of the interviewees agreed that capital investment requirements were not a driver of the decision not to divest the fab design group, with state ratings for capital investment ranging from "none" to "low". None of the interviewees rated financial duress or financial metrics as a driver of the decision to not divest this group.

All of those interviewed identified the ability to contain IP as a driver of the decision to not divest the fab process design group, with four rating the state of the driver as "high", and three as "very high". The ability of the firm to maintain the unique wafer fab capabilities that this group enabled were dependent upon keeping the IP generated by the group within the firm. Divesting the group and depending upon contractual arrangements for its services would have negated the unique fab capability competitive advantage.

Six of seven of the interviewees indicated that impact/importance of ownership/control was a driver of the decision not to divest this resource (the one product line executive did not rate it as a driver, nor estimate its state). Four respondents rated the state of the driver as "high", two as "very high". Followup discussions with these six interviewees revealed that the importance of ownership control centered upon being able to contain the IP the group generated.

When asked whether they thought the decision to retain, not divest, the wafer fab design group was the correct one, all interviewees agree that the decision was the correct one. They saw the IP that this group generated to be one of the key assets of the firm; this IP enabled the unique capabilities in the wafer fab that constitute competitive advantages.

Summary

The interviewees identified four basic strategic assets for the semiconductor industry. They unanimously agreed that the ability of a resource to create competitive advantage was a driver of the decision to divest each of the four resources or not. There was strong consensus that impact of ownership/control was also a driver of divest or retain decisions for all identified strategic resources. There was strong consensus that for resources requiring moderate to high levels of

capital investment (see coding section below for specific meanings of described levels), that financial metrics/investor pressure, and the level of capital expenditure required were drivers of divest or retain decisions. For resources that were human, rather than capital, and generated IP that enabled competitive advantage, there was consensus that the ability to contain IP within the firm was a driver of the divest or retain decision. Figure 7 presents a summary of the important decision drivers for each resource's divest or retain decision; an "x" in the cell indicates consensus among inteviewees (at least six of seven agreed) that the factor identified in the column is a driver of divest/retain decisions for the resources in that row. Firm financial distress is not included, as none of the interview subjects identified it as a decision driver for any of the four resources.

	Resource provides a competitive advantage?	Capital investment requirements	Ability to contain intellectual property	Financial metrics/investor pressure	Impact/importance of ownership/control advantages
Assembly and Test Facility	x			x	x
Wafer Fab Facility	x	x	x	x	x
Circuit Design Group	x		x		x
Fab Process Design Group	x		x		x

Figure 7. Drivers of Divest or Retain Decision by Strategic Resource

Figure 8 presents a summary of the influence of driver states on the divest/retain decision. This data was gathered in followup conversations with interviewees; they were asked to rate the potential drivers independently, i.e. without any knowledge of the state of the other potential drivers or of the particular resource being addressed. Only potential drivers that were identified as actual drivers for at least on resource are included.

	Driver State Influence on Divest or Retain Advisability				
	None	**Low**	**Moderate**	**High**	**Very High**
Level of capital investment required to maintain the resource	Retain	Retain	Neutral	Divest	Divest
Ability to retain IP generated in the resource within the firm	Divest	Divest	Retain	Retain	Retain
Importance of financial metrics, Investor pressure on financial metrics	Retain	Retain	Divest	Divest	Divest
Importance of ownership control	Divest	Divest	Neutral	Retain	Retain
	Yes	**No**			
Does the resource generate a competitive advantage for the firm?	Retain	Divest			

Figure 8. Influence of Driver States on Divest or Retain Decision

Chapter 5
Discussion, Conclusions, Application, and Further Research

Discussion and Implications

As noted in the background discussion in Chapter 4, the history of the birth and growth of the semiconductor industry resulted in all, or at least most, firms in the sector owning all four of the identified strategic resources until the 1990s. As the industry matured, and alternatives for the supply of the services provided by the resources became available, new strategic resource allocation choices became available to managers of those firms. However, as several of the interview subjects pointed out, in the absence of outside pressure to realign capital resources in light of financial performance metrics, inertia ruled. Senior executives responsible for making strategic resource allocation decisions came predominantly from

engineering, rather than financial, backgrounds; those engineers loved to have big production facilities to manage, and were not necessarily attuned to the needs of stock markets. The attitudes of the leadership of most semiconductor firms in the 1990s was typified by the statement of Advanced Micro Devices (AMD) CEO Jerry Sanders who famously (or infamously) stated that "… real men have fabs" (Hoff, 1994). Whether Sanders was referring to the perceived ability of the wafer manufacturing facility to create competitive advantage, or to ownership/control advantages remains unclear, but his commitment to own this particular capital resource was unambiguous. His implication that a firm is not a "real" semiconductor player without a captive fab and by extension a captive assembly and test facility represented the zeitgeist of the industry in the very late 20th century.

The increasingly hypercompetitive nature of the semiconductor industry (Thomas & D'Aveni, 2009) and increasing investor pressure for continuously improving profitability and return on investment forced firms in the industry to re-evaluate their capital strategies. Even AMD CEO Jerry Sanders led AMD away from the wholly owned production facility model and transitioned to contracted wafer manufacturing (Sterling, 2008). Cypress, a semiconductor firm founded in 1982, divested its wafer fab in 2017, moving to the contracted wafer manufacturing

model (Cypress, 2017), indicating that this is not strictly a turn of the millennium phenomenon.

In the two instances noted above, as well as in the specific case addressed in this study, financial metrics and the lack of the ability of the resource to provide a competitive advantage were noted as drivers of the divestment decision. This supports the assumption that the studied case is representative, or at least not completely atypical, and that the results may be generalizable to the semiconductor industry or beyond. It may be argued that the studied case was atypical because financial pressure came from institutional investors preparing the firm for an IPO. However, prior to the leveraged buyout of the firm from its parent company, its detailed financial results including ROI and other measures of capital efficiency were aggregated with the rest of the parent firm, and were not scrutinized by investors as closely as other semiconductor firms' performance. The author contends that the process of becoming an independent semiconductor firm was actually a normalization process, as the firm was now being evaluated as a standalone semiconductor manufacturer and held to the same financial performance standards as most of its competitors, bolstering the argument that the case examines an instrumental, or representative firm (Cresswell, 2013; Stake, 1995).

The executives interviewed identified different decision drivers for the four strategic resources investigated, and the states of all of the possible decision drivers

were rated. Competitive advantage was unanimously agreed as being a driver of divest or retain decisions for all four resources regardless of the state of the driver (yes or no). For the other possible drivers, the states of the drivers corresponded to whether it was indeed a divest/retain decision driver or not. Capital investment requirements were not identified as a decision driver unless the value of the driver was above a threshold. If the level of capital investment required was "none" or "low", no interviewees identified it as a decision driver. When capital investment was rated "moderate", two of seven interviewees identified it as a decision driver, five did not. If the state was "high" or "very high", all interviewees agreed that it was a decision driver. Ability to contain IP was unanimously agreed to be a decision driver if that ability was rated as "high" or "very high", and there was also unanimous agreement that that it was not a decision driver if the state was "low" or "very low" (there were no "moderate" ratings for any resource). All interviewees agreed that financial distress was not a decision driver for any of the strategic resources, and all rated the state as "no". Financial metrics/investor pressure was agreed to be a decision driver if the impact of the possible divestment was "moderate", "high", or "very high", and to not be a decision driver if the impact was "low" or "none". All interviewees agree that the impact of ownership/control advantages was a decision driver regardless of the state of the driver. These results are summarized in figure 9. A "yes" in the table indicates that the potential

decision driver was an actual decision driver for the specified state of the driver, a "no" indicates it was not. "No consensus" indicates lack of agreement among the interviewees, and a blank cell means that none of the interviewees rated the potential driver with the corresponding state.

	Decision Driver? Vs. Potential Driver State				
	None	**Low**	**Moderate**	**High**	**Very High**
Level of capital investment required to maintain the resource	No	No	No consensus	Yes	Yes
Ability to retain IP generated in the resource within the firm	No	No		Yes	Yes
Impact on financial metrics, Investor pressure on financial metrics	No	No	Yes	Yes	Yes
Importance of ownership control		Yes	Yes	Yes	Yes
	Yes	**No**			
Does the resource generate a competitive advantage for the firm?	Yes	Yes			

Figure 9. Decision Drivers vs. Driver State

Interviewees were asked whether they thought the divestment of the Asian assembly and test facility was the right decision. With almost two decades of hindsight, six of seven interviewees felt the facility divestment was the correct

decision. Those who felt the divestment decision was correct noted the advantages of being able to use the proceeds of the sale to pay down corporate debt. fund increased R&D in strategically important product lines, and improve return on investment ratios. The lone dissenter on the wisdom of the divestment believed that the loss of ownership and control advantages outweighed the advantages of the sale.

The interviewees also observed that without the constraints of the particular capabilities available in the owned facility, the firm could utilize a much wider variety of packaging technologies available from merchant assembly and test firms. The firm had actually begun this process before the facility sale, but that process accelerated after the sale. This served to widen the product and market segments that were available for expansion, to enlarge the universe of strategic options. They believed that the divestment made the firm more nimble and capable of quickly pivoting as new opportunities appeared, of implementing emergent strategies (Mintzberg & Waters, 1985). In the age of temporary advantage (D'Aveni, Dagnino, & Smith, 2010), investment in expensive, inflexible capital assets limits a firm's ability to exploit changing market opportunities, and the sale of the assembly and test facility removed some of those limitations. It is also possible that interacting with an expanded supplier and technology base improved the firm's exposure to new knowledge and improved absorptive capacity (March and Simon,

1958) encouraging innovation and successive temporary advantages, although none of the interviewees mentioned this as a benefit of the divestment.

The interviewees were also asked whether the retain decisions (still standing as of this writing in early 2018) for the wafer fab and circuit and fab process design groups were the correct ones. There was unanimous agreement that the retain decisions were correct. For the circuit and fab process design groups, the executives noted that capital investment was nominal, and therefore financial metrics would not be positively impacted by divesting the resource. They felt that these groups did enable competitive advantages, almost exclusively in the form of IP that the company was able to protect and keep within the firm through both legal patent protections and trade secret management protocols.

The wafer fab manufacturing facility was significantly more capital intensive than the assembly and test facility, yet the executives interviewed believed that the unique capabilities the fab provided were rare, valuable, inimitable, and organizationally exploitable (Barney, 1991). Those capabilities represented a true competitive advantage that the firm could not match by other investments made with the proceeds of a sale of the facility. The executives also realized that the fab process design group was inextricably linked with the wafer fab itself, and they would have to be divested or retained as a group.

The firm had enhanced its dynamic capabilities (Teece, 2007; Eisenhardt & Martin, 2000) with the transition from wholly owned to subcontracted assembly and test services, yet remained invested in a captive wafer fab. The firm did modify its wafer fab manufacturing strategy to a fab-light strategy, utilizing contracted resources for the most cost sensitive and/or fast evolving technology needs, while refocusing the owned wafer fab on the unique process capabilities with high value. These technology niches were valued in markets small enough to not attract competition from the biggest competitors who could duplicate the capabilities given the will to invest the significant time and money necessary to equal or better the studied firm's capabilities. The firm had a defensible advantage in technology with extensive patent and trade secret protections that was highly valued by very specific market segments. It made sense to retain these IP based advantages in a facility in the US where legal protection of patented IP and practical protection of trade secrets were more manageable than in countries with less effective IP protection environments. Contracted wafer fab services were utilized for manufacture of products that did not value the unique capabilities that the captive wafer fab represented.

The information gathered during the initial interviews and through followup conversation provided insight into the factors driving the decision to divest the assembly and test facility in Asia. Insight can also be gained through noting which

factors are mentioned in the literature, but were not brought up in the initial interviews, nor deemed important when brought up in followup conversations. Buckley and Casson (1998) listed several factors that would inhibit the internationalization process, (or, by extension of their logic, encourage pullback or divestment) such as cultural differences including psychic distance and lack of trust. All of the executives interviewed noted that they had good, close, trusting, productive working relationships with the management of the facility both before and after the sale. Clearly these factors were not among those driving the divestment decision, although they may be for other resources in other firms and other hypercompetitive, capital intensive, knowledge based industries.

Similarly, the impact of transaction costs were not mentioned; Williamson (1971) noted that reduction of transaction costs was an incentive for vertical integration and, by extension of his logic a disincentive for divestment or disintegration. None of the interviewees thought that transaction costs were considered (or should have been considered) as an important factor in reaching the divest or retain decision. A significant portion of the transaction cost impact can be explained by the differential in cost of resolving conflicts in vertically integrated vs. indepentant firms (Whinston, 1964). In vertically integrated firms resolution is simply a matter of internal executive fiat, which is quick and efficient; for interfirm contractual arrangements, potentially protracted negotiations or legal action may be

necessary, which are slow, contentious, and costly processes. The positive relationships with the management of the facility, and the lack of conflicts and disagreements due in large part to these relationships, prevented dispute resolution efficiency to be a significant or driving factor in the divestment decision. In other firms or industries where these relationships do not exist, or did not create the same level of trust, dispute resolution efficiency may indeed be a driving factor discouraging divestment or encouraging retaining ownership control.

None of the interviewees was familiar with any of the academic literature referenced in this study, and were therefore not influenced (at least directly) by that literature. Each was driven by his or her direct personal experience and reasoning, and by the experiences and knowledge shared by their colleagues and mentors. They each had a very pragmatic view of their role in the management of the firm, including the divest/retain decisions referenced in this study. It is notable that the Asian facility divestment decision was considered in the 1999-2000 timeframe, before much of the relevant literature was on the asset light capital model was published. This suggests that in at least some cases, practitioners are leading the way in the development of several key pieces of strategic theory, while the academics follow, tying new these new developments into a larger, coherent and cohesive strategic framework.

Conclusions and Contribution to Applied Practice

The study research questions addressed by this study are:

1) What are the drivers of specific strategic resource divestment decisions in the semiconductor industry?
2) Can the state of the drivers be used to predict the probability or advisability of strategic resource divestiture in the semiconductor industry?

The interview subjects identified the drivers of the divest or retain decisions to be the ability to create competitive advantage, capital investment required to maintain the resource, ability to contain IP created by the resource within the firm, impact of the asset on financial ratios (and investor pressure to improve those ratios), and the importance of ownership and control advantages. The influence of those drivers on the divest/retain decision is summarized in figure 9.

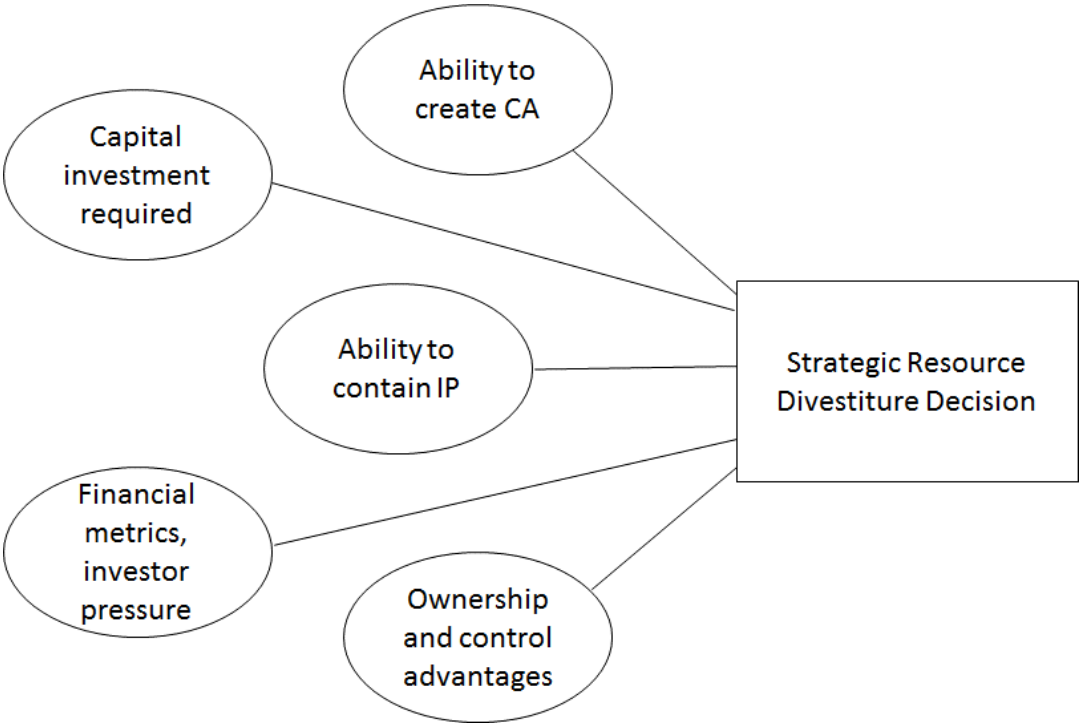

Figure 10. Strategic Resource Divestment Decision Model

The state of the drivers determines whether that driver is an important consideration in the divest/retain decision, and provides guidance as to the correct decision. A summary of the discussion of the effect of driver states follows, and is summarized in figure 8 in chapter 4.

A resource that has the ability to create a competitive advantage for the firm will encourage a retain decision for that resource, while the lack of that ability will encourage a divest decision. This is consistent with the asset contention in the

literature that firms will outsource activities in the value chain that are not core strengths of the firm to other firms that can perform those activities more efficiently, or in some other superior manner (Surdu, 2011). It can be argued that a resource that does not create significant competitive advantage is not a strategic resource.

The level of capital investment required to maintain a resource, and the impact of those requirements on financial metrics were each found to be drivers of the divest/retain decision. These factors can be important both because of the firm's ability to fund the required investment, the possible use of the same funds in other, higher return assets or activities, and because of investor expectations for return on investment. A higher level of required investment, and higher levels of importance of financial ratios each encourage divestment of the resource being evaluated.

The ability to retain IP created by a resource within the firm is a divest/retain decision driver if the IP is valuable to the firm. For resources where IP generation represents a large portion of the resource's value to the firm, increasing ability to protect that IP increasingly encourages retention of the resource. The importance of management control of owned resources was also identified as a decision driver, with increasing importance of control increasingly encouraging retention of the resource.

Although the literature specifically states that firm financial distress is a driver of divestment decisions (Boddewyn, 1979), none of the executives interviewed listed it as a decision driver, while noting that the firm was not experiencing any financial hardship. While it was not a driver of divest/retain decisions for the studied firm, it may be for other firms that are experiencing financial distress, and cannot be discounted as a possible driver in a more general model.

Determining the optimal capital asset structure of a semiconductor firm is one of the major tasks of executives responsible for firm strategic planning. The case studied was a firm that made divest or retain decisions for strategic assets in the same hypercompetitive environment as other semiconductor firms, with similar capital requirements for the identified strategic assets, and with similar investor expectations. Other semiconductor firms also made decisions to divest strategic resources (Cypress, 2017; Sterling, 2008) supporting the contention that the case is illustrative and representative (Stake, 1995), at least for other semiconductor firms. The case may also be more generally representative of firms operating in other hypercompetitive, capital intensive, knowledge based industries, but further research will be required to support that contention.

Practitioners in semiconductor firms that are making capital resource allocation decisions may find the divestment decision model in this study to be a

useful tool for deciding whether to divest or retain strategic (or formerly strategic) resources. It provides a framework for decision making, although it is not a rigorous, deterministic formula for the decision. By rating the state of the decision drivers, executives can move towards a holistic view of the decision and its impact on the performance of the firm. In a real world scenario, however, the factors must also be weighted for their importance, which may vary in individual circumstances. For instance, a firm that is privately owned may not assign the same level of importance to financial ratios than one that is publicly traded. A firm such as Apple, with $285 billion in cash reserves (Hunter & Balakrishnan, 2018), does not have much pressure to carefully allocate capital investments to only the highest return opportunities, and therefore the level of investment required for a strategic resource does not weigh heavily on its capital structure decisions. Regardless of the individual circumstances affecting the relative weighting of the identified divest/retain drivers, semiconductor firms (and perhaps other firms in hypercompetitive, capital intensive, knowledge based industries), can benefit from understanding the state of the drivers and the influence of those drivers on the divest/retain decision.

Further Research

The case study that forms the basis of this dissertation is that of a medium sized semiconductor firm that is typical of medium sized firms in that industry, in that it utilized similar technologies, and had similar capital asset structures as other semiconductor firms before the asset light model became prevalent in the industry. These similarities to other firms in the industry support the assumption that the firm is representative of that industry. However, there are unique circumstances in every case that can be studied, and claims that a case is representative must be made cautiously. The studied firm was not under financial distress, and while this lack of distress is a common situation in the industry, it is not a universal condition. The decision to divest the assembly and test facility was heavily influenced by the investment bank that was the firm's majority owner, and was preparing the firm for an IPO. Therefore, further study of other semiconductor firms' decision both to divest and to retain specific strategic resources represents an area of research that could either strengthen or qualify the conclusions reached in this study.

An at least partial list of divestment decision drivers has been identified, and a coding scheme for the state of the drivers that can be mapped to a five point Likert like scale or a binary choice has been devised. Gathering data from more divest or retain decisions will enable quantitative analysis of the relative

importance of each of the drivers and their states, and the usefulness of that data for making a divest or retain decision.

Given the possible limitations of the application of the results of this case study to other semiconductor firms, it may seem to be a bridge too far to extend the results even farther to other hypercompetitive, capital intensive, knowledge based industries, or industries that share only one of two of those descriptions. However, many firm level strategic concepts can apply across even very diverse industries. Nikolaou (2006) notes the common challenges of monitoring and control of manufacturing processes that drive success in industries as dissimilar as snack foods and semiconductors (potato chips and microchips); the existence of common theoretical frameworks in such disparate industries suggests the existence of strategic commonalities in much more similar industries. While it cannot be assumed that the results of this study are universally applicable to other similar industries, further research in other hypercompetitive, capital intensive, knowledge based industries may generalize the findings of this study. D'Aveni (1998, p. 183) specifically lists "airline, pharmaceutical, financial services, health care, consumer electronics, telecommunications, broadcasting, auditing, automotive, and computer industries, among many others…" as examples of other hypercompetitive industries, and many of them may be capital intensive and knowledge based. Further study of divestments in these industries appears warranted.

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Appendix A – Definition of Terms and Abbreviations

Assembly. The process of encapsulating a silicon chip in a package.

Asset light. A resource management strategy whereas capital assets are minimized in order to produce the best return on assets, and to allow a firm to be more nimble in its choice of capital assets employed.

Back end. Refers to semiconductor packaging and test manufacturing facilities, the last part, or "back end" of the integrated circuit manufacturing process.

CA. Competitive advantage. A strategically important advantage that a firm holds with respect to its' competitors. See "VRIN" and "VRIO".

Capital light. See asset light.

Chip. A single unpackaged copy of an integrate circuit; a piece of a processed silicon wafer. An intermediate product in the production of finished integrated circuits.

Fab. See wafer fab.

FDI. Foreign direct investment. Investments by a firm that result in partial or complete ownership of foreign resources.

Front end. Refers to semiconductor wafer fabrication facilities, the first part or "front end" of the integrated circuit manufacturing process.

Foundry, or wafer foundry. A semiconductor wafer manufacturing firm that does not design or market semiconductor products, but provides wafer fabrication services to semiconductor design and marketing firms.

Greenfield investment. A form of foreign direct investment whereby a firm builds new facilities in a foreign country, as opposed to purchasing existing facilities.

High velocity industry. An industry experiencing fast, frequent changes in technologies utilized, products offered, and competitive positions.

Hypercompetitive industry. A high velocity industry characterized by intense competition, eroding pricing, and disruptive products and technologies.

IC. Integrated circuit. A functional electronic circuit fabricated from silicon or other semiconductor material encased in a protective package.

IB. International business. The study of the MNE, firms with sales and/or operations in multiple countries.

IJV. International joint venture.

IDM. Integrated device manufacturer. A firm that owns all, or a significant portion of, the capital assets (especially manufacturing facilities) used in the design and manufacture of its products.

IP. Intellectual property.

IPO. Initial public offering.

KBV. Knowledge based view. The view that all (or most) competitive advantage is based on knowledge, not physical assets.

Knowledge based industry. An industry in which competitive advantage is based primarily on a firm's knowledge based assets such as intellectual property and trade secrets, not physical assets.

Low velocity industry. An industry experiencing slow, infrequent changes in technologies utilized, products offered, and competitive positions.

MNE. Multinational enterprise. A corporation with operations in multiple countries.

Package. An encapsulation of a silicon chip that protects the chip and provides electrical connections from the silicon to the system in which it is used.

Packaging. See assembly.

PMO. Pure manufacturing outsourcing. A production model where a firm contracts for all of its manufacturing requirements, and does not own manufacturing assets.

RBV. Resource based view.

Red queen race. A description of a competitive situation such that a firm must continually innovate and develop new products just to maintain an existing competitive position. The concept was introduced by Lewis Carroll in *Through the Looking-Glass and What Alice Found There*. According to the Red Queen, "Now, here, you see, it takes all the running you can do, to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that!" (Carroll, 1893, p. 52).

Rent. Abnormally high financial returns enabled by competitive advantages.

ROI. Return on investment; a blanket term for various profitability to capital or other investments ratios.

ROIC. Return on invested capital. Net income for a specified period of time divided by the average total capital for the same period.

Strategic asset/strategic resource. An asset consisting of physical resources or organizational capabilities that are necessary to perform a firm's stated mission, and that enable a firm to generate economic rents (Amit & Shoemaker, 1993). In the context of this study, a strategic resource is defined at the industry level; it enables competitive advantage and rent generation in at least some firms within an industry, but not necessarily in all firms in that industry.

TCE. Transaction cost economics. The theory that contractual governance for the supply of goods and services creates transaction costs that are not present if the goods and services are supplied from within the firm.

Test. Electrical testing of an integrated circuit to ensure its functionality and parametric performance.

VC. Venture capitalist; the managers of the venture capital firm with ownership of the majority of the studied firm.

VRIN. Valuable, rare, inimitable, nonsubstitutable; Barney's (1991) list of conditions that must be met for a resource to represent a competitive advantage.

VRIO. Valuable, rare, inimitable, and organizationally exploitable. Barney's (2002a) update to VRIN which includes the concept that a resource must be able to be effectively exploited by the organization in order to be a source of competitive advantage.

Wafer. A thin disk of single crystal silicon, or other semiconductor material, that is transformed into functional circuits in semiconductor wafer fab facilities. Wafer can refer to the raw starting silicon material, or to a processed product containing copies of a circuit. A processed wafer is an intermediate product in the manufacture of integrated circuits.

Wafer fab. Short for wafer fabrication facility. The wafer fab is a manufacturing facility that creates a finished semiconductor wafer containing hundreds to thousands of copies of an integrated circuit. Building modern wafer fabs require billions of dollars of investment.

WACC. Weighted average cost of capital.

WOS. Wholly owned subsidiary. A division, group, or separately named entity that is 100% owned and managed by a parent firm, and may be located in a country other than the parent firm's home country.

Appendix B – Interview Protocol

1. What assets would you define as a semiconductor firms' strategic resources?

2. Why did the company divest its assembly and test facility in Asia? What were the key drivers of the decision? What are the states or conditions of those drivers?

3. What would drive divestiture decisions for other strategic resources such as wafer fabs or design groups? Other strategic resources? What are the states or conditions of those drivers?

4. To what degree was the Asian assembly and test facility able to generate competitive advantage or parity? How much did the ability (or lack thereof) to generate competitive advantage a driver of the divestment decision?

5. How large were the capital investments required to maintain the facility's competitive advantages or parity? Was the company able to adequately fund the required capital investments?

6. How important was the level of capital investment required to the facility divestment decision? How important is the level of capital investment to the divestment for other strategic resources?

7. For intellectual property generated within the facility, to what degree could the IP be contained within the facility (not leaked to competitors)?

8. How much did the ability to contain IP within the company drive the divestiture decision for the facility? To what degree would this ability drive divestiture decisions for other strategic resources?

9. Were there any other factors (besides ability to generate competitive advantage, capital funding requirements, ability to contain IP) that contributed to the divestment decision for the KL facility? For other strategic resources?

10. Do you believe the divestment was a success? Why or why not?

Appendix C. Participant Consent Letter

Consent to Participate in Divestment Theory Research

I am performing research for my dissertation that attempts to explain the factors driving the decision to divest important corporate resources when firms implement an asset light strategy. The academic literature describes the reasoning behind implementing this strategy, but does not detail the specific drivers of decisions to divest a specific resource, and not others. I am performing a case study of (*firm name redacted*) decision to sell their assembly and test production facility in 2000 in order to develop theory that may be applicable to other divestment decisions.

I am asking people who were involved in the decision to sell (*firm name redacted*) assembly and test facility, and those who were impacted by the decision to participate in an interview and share their understanding of the decision making process and impact of the decisions. The interviews may be either in person or over the phone. I will audio record and transcribe the interviews. (*firm name redacted*) and the people who agree to be interviewed will not be identified in any published material. I will be the only person who has access to any personally identifying information, and your anonymity will be protected. (*firm name redacted*) will be referred to as "a medium size semiconductor firm", and the interviewees will be identified by a general description of their position at the time of the divestiture (for example, senior executive participating in the divestment decision, or manager affected by implementation of the decision). Audio recordings and transcripts will be stored on password protected computers and will only be accessible by me, the dissertation author. Transcripts that include no personally identifying information, only the general descriptions of the position of the interviewee, may be accessed by a research assistant. The research assistant will not know the interviewees personally, and will not be able to discern the specific individual interviewed.

Very little risk is anticipated for interviewees. The only risk that can be anticipated is that current employees may inadvertently mention proprietary or company confidential information. Transcripts of the interviews will be made available to the interviewees so that they can review them to make sure nothing inappropriate

has been said, and interviewees may redact, or eliminate, any portion of the interview that they are not comfortable with.

All interviewees will be offered a complete copy of the dissertation upon its completion; the results may be of use to executives considering further divestment decisions, or may be of interest to other interviewees with curiosity about the justification for specific decision to sell the assembly and test facility.

Participation is voluntary. Refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled. You may discontinue participation at any time without penalty or loss of benefits to which you are otherwise entitled.

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I hereby grant my informed consent to participate in the research program described above.

Name (Print) _____ Date: _____

Signature: _____

Appendix D – Interview Summaries/Coding Results

	Decision Driver?	Driver State/Value	Decision Driver?	Driver State/Value	Decision Driver?	Driver State/Value
Assembly and Test Facility	Resource provides a competitive advantage		Capital investment requirements		Ability to contain intellectual property	
Decision Maker 1	x	No		Moderate		Very low
Decision Maker 2	x	No		Moderate		Low
Decision Maker 3	x	No		Moderate		Low
Decision Maker 4	x	No	x	Moderate		Low
Product Line Exec 1	x	No		Moderate		Very low
Product Line Exec 2	x	No	x	Moderate		Very low
Product Line Exec 3	x	No		Moderate		Low

	Decision Driver?	Driver State/Value	Decision Driver?	Driver State/Value	Decision Driver?	Driver State/Value
Wafer Fab Facility	Resource provides a competitive advantage		Capital investment requirements		Ability to contain intellectual property	
Decision Maker 1	x	Yes	x	High	x	High
Decision Maker 2	x	Yes	x	Very high	x	High
Decision Maker 3	x	Yes	x	Very high	x	High
Decision Maker 4	x	Yes	x	Very high	x	High
Product Line Exec 1	x	Yes	x	High		
Product Line Exec 2	x	Yes	x	Very high	x	High
Product Line Exec 3	x	Yes	x	Very high	x	High

	Decision Driver?	Driver State/Value	Decision Driver?	Driver State/Value	Decision Driver?	Driver State/Value
Circuit Design Group	Does resource provide a competitive advantage?		Capital investment requirements		Ability to contain intellectual property	
Decision Maker 1	x	Yes		Low	x	Very high
Decision Maker 2	x	Yes		Low	x	Very high
Decision Maker 3	x	Yes		None	x	High
Decision Maker 4	x	Yes		Low	x	High
Product Line Exec 1	x	Yes		Low	x	Very high
Product Line Exec 2	x	Yes		Low	x	High
Product Line Exec 3	x	Yes		Low	x	High

	Decision Driver?	Driver State/Value	Decision Driver?	Driver State/Value	Decision Driver?	Driver State/Value
Fab Process Design Group	Resource provides a competitive advantage		Capital investment requirements		Ability to contain intellectual property	
Decision Maker 1	x	Yes		Low	x	Very high
Decision Maker 2	x	Yes		Very low	x	Very high
Decision Maker 3	x	Yes		None	x	High
Decision Maker 4	x	Yes		Low	x	High
Product Line Exec 1	x	Yes		Low	x	Very high
Product Line Exec 2	x	Yes		Low	x	High
Product Line Exec 3	x	Yes		Low	x	High

Appendix D – Interview Summaries/Coding Results – continued

	Decision Driver?	Driver State/Value	Decision Driver?	Driver State/Value	Decision Driver?	Driver State/Value
Assembly and Test Facility	Corporate financial distress		Financial metrics/investor pressure		Impact/importance of ownership/control advantages	
Decision Maker 1		No distress	x	Large impact on ROI	x	Low
Decision Maker 2		No distress	x	Large impact on ROI	x	Moderate
Decision Maker 3		No distress	x	Impact on ROI	x	Low
Decision Maker 4		No distress	x	Large impact on ROI	x	Low
Product Line Exec 1		No distress	x	Large impact on ROI	x	Very low
Product Line Exec 2		No distress			x	Moderate
Product Line Exec 3		No distress			x	Moderate
	Decision Driver?	**Driver State/Value**	**Decision Driver?**	**Driver State/Value**	**Decision Driver?**	**Driver State/Value**
Wafer Fab Facility	Corporate financial distress		Financial metrics/investor pressure		Impact/importance of ownership/control advantages	
Decision Maker 1		No distress		Very large impact on ROI	x	High
Decision Maker 2		No distress	x	Very large impact on ROI	x	High
Decision Maker 3		No distress	x	Very large impact on ROI	x	High
Decision Maker 4		No distress	x	Very large impact on ROI	x	High
Product Line Exec 1		No distress	x	Large impact on ROI	x	Very high
Product Line Exec 2		No distress			x	Very high
Product Line Exec 3		No distress			x	High
	Decision Driver?	**Driver State/Value**	**Decision Driver?**	**Driver State/Value**	**Decision Driver?**	**Driver State/Value**
Circuit Design Group	Corporate financial distress		Financial metrics/investor pressure		Impact/importance of ownership/control advantages	
Decision Maker 1		No distress		Low impact on ROI	x	Very high
Decision Maker 2		No distress		No impact on ROI	x	Very high
Decision Maker 3		No distress		Low impact on ROI	x	High
Decision Maker 4		No distress		Low impact on ROI	x	High
Product Line Exec 1		No distress		Low impact on ROI	x	High
Product Line Exec 2		No distress				
Product Line Exec 3		No distress			x	High
	Decision Driver?	**Driver State/Value**	**Decision Driver?**	**Driver State/Value**	**Decision Driver?**	**Driver State/Value**
Fab Process Design Group	Corporate financial distress		Financial metrics/investor pressure		Impact/importance of ownership/control advantages	
Decision Maker 1		No distress		Low impact on ROI	x	Very high
Decision Maker 2		No distress		No impact on ROI	x	Very high
Decision Maker 3		No distress		Low impact on ROI	x	High
Decision Maker 4		No distress		Low impact on ROI	x	High
Product Line Exec 1		No distress		Low impact on ROI	x	High
Product Line Exec 2		No distress				
Product Line Exec 3		No distress			x	High