STRATEGIC ANALYSIS OF ALPHA WIRELESS AND THE EMBEDDED MODULES INDUSTRY

by

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B.A.Sc., Simon Fraser University, 1999

Project Submitted In Partial Fulfillment of the

Requirements for the Degree of

Master of Business Administration

in the

Executive MBA Program

of the

Faculty

of

Business Administration

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SIMON FRASER UNIVERSITY

Spring 2013

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Abstract

This strategic analysis covers the embedded modules industry for M2M applications and Alpha Wireless' position within it. It includes an introduction of Alpha Wireless' current position and an overview of the embedded modules industry, including suppliers, competitors and customers and industry trends. Customer preferences, sources of advantage and a competitive analysis are reviewed. Overall strengths, weaknesses, opportunities and threats are identified for Alpha Wireless. Several distinct strategic options are identified, and considered for suitability on internal and external factors. A final recommendation is made for Alpha to pursue an acquisition that will add a complementary product offering, and also to find ways to streamline costs.

Keywords: embedded modules; strategic analysis

Dedication

To my husband, Terry.

Thank you for your support during this long journey.

Acknowledgements

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List of Acronyms

2G	Second Generation Wireless Networks – Refers to GSM, GPRS and EDGE technologies
3G	Third Generation Wireless Networks – Refers to WCDMA and CDMA-2000 technologies
4G	Fourth Generation Wireless Networks – Refers to LTE technologies
CDMA-2000	Code Division Multiple Access – Year 2000 version - 3G wireless network offering speeds up to 3.1Mbps
EDGE	Enhanced Data GSM Environment – 2G wireless network offering speeds up to 236kbps
GPRS	General Packet Radio Services – 2G wireless network offering data connections at speeds up to 64kbps
GSM	Global System for Mobile Communications – 2G wireless network offering voice connectivity
IP	Intellectual property
LTE	Long Term Evolution – 4G wireless network offering speeds up to 100Mbps
M2M	Machine to Machine
OEM	Original Equipment Manufacturer
R&D	Research and Development
RF	Radio Frequency
WCDMA	Wideband Code Division Multiple Access – wireless network offering speeds up to 21.1Mbps

Executive Summary

This strategic analysis covers the embedded modules industry for M2M applications and Alpha Wireless' position within it. This is a quickly growing industry, and Alpha is the top ranked vendor, yet faces some challenges to maintain that position.

This analysis includes an introduction to Alpha Wireless' current position and an industry overview, including suppliers, competitors and customers and industry trends. Customer preferences, sources of advantage and a competitive analysis are reviewed.

Overall strengths, weaknesses, opportunities and threats are identified for Alpha Wireless. Several distinct strategic options are identified, and considered for suitability on internal and external factors. A final recommendation is made for Alpha to pursue an acquisition that will add a complementary product offering, and also to find ways to streamline costs. The preliminary estimate for acquisition would be $25-50M plus $3-5M in integration costs. Identification of acquisition targets and valuation estimates are beyond the scope of this report.

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1. Introduction

Technology is connecting the world at an increasing pace. Personal connections are already enabled through ubiquitous presence of mobile phones. Additionally, machines are being connected to each other at an accelerating rate. Connected machines enable remote monitoring, control and information exchange. Embedded wireless communications modules ("embedded modules") create the link between the machines and the cellular network.

This strategic analysis considers the machine-to-machine ("M2M") embedded modules industry and Alpha Wireless' position within it. This industry has a fast evolution and a constantly shifting landscape. To better understand the current context, this evaluation follows the strategic analysis framework outlined by von Nordenflycht (2012).

Alpha Wireless' organization will be introduced, along with their current strategic position, performance and challenges. The embedded modules industry and its participants will be considered. A Five Forces analysis will identify powerful industry participants and sources of rivalry. Customer preferences and related sources of advantage will be examined. Module vendors will be evaluated to determine their competitive position. Specific strengths and weaknesses will be identified for Alpha Wireless. Areas of

opportunity or threat are identified by evaluating trends in the external environment.

Several strategic alternatives will be considered prior to making a recommendation. These options include creating a new differentiated product line, creating complementary products, focussing on marketing to a specific customer segment and reducing costs and executing on mainstream products.

The strategic options will be evaluated on impact on revenue, market share, margin and operating expenses and their ability to address the SWOT. Evaluation will consider management preferences to be an innovative technology leader with the highest market share.

The recommendation will be to acquire a new team which can offer services complementary to M2M modules. Increased emphasis on improving execution and reducing costs will also be recommended. A feasibility analysis will confirm Alpha Wireless' ability to follow the identified option, and identifies gaps in management preferences, organizational capability and resources. A final recommendation will be given, along with several gap-filling solutions.

If Alpha Wireless takes the recommended option, they will thrive in the M2M modules industry as it grows and changes in the coming years.

1.1. M2M Overview

"Machine-to-Machine" (M2M) refers to systems which allow devices to communicate with each other over a network. Information exchanged by the devices carries meaningful content, event descriptions or instructions for action. The proliferation of packet networks has enhanced the capability for connectivity between machines in M2M applications. The widespread deployment of M2M is also referred to as the "Internet of Things". In 2011, Ericsson predicted that 50 billion devices will be connected to the Internet of Things by 2020 (Ericsson, 2011).

M2M application examples include vehicle based systems that automatically notify emergency responders in case of a crash, or in-home electricity meters that remotely report usage patterns and outages. M2M is used in tracking applications (fleets, perishable goods, patient monitoring), and in retail settings for payment or advertising (payment terminals, vending machines, digital signs). M2M networks create opportunities to improve business operations efficiency and enhance convenience in daily life. Imagine the possibilities to stream movies to your vehicle, to remotely control your home's security system or to have your electric vehicle charging station automatically adapt to the lowest-cost method.

Figure 1 shows ways that M2M is used, devices which may be enabled with an embedded module, and the supporting services and applications.

M2M Ecosystem of Smart Devices

Services/Application Hosting			
Facilities Management	Supply Chain	End Users	Service Delivery Platforms

Hosted Services					
Asset Performance	Measurement / Verification	Energy Analysis	Fault Detection	Dashboards & Reports	Alarm/Security Management

Intelligent Devices						
Vehicle Tracking Devices	Cameras	Power Meter	Smoke/Fire Alarms	Humidity Sensor	Flow Meter	Temp Sensor

Use Models						
Vehicle Tracking	Smart Grid	General Equipment	Retail Kiosk	Fire Detection	Healthcare	Smart Building Automation

Figure 1. M2M Ecosystem of Smart Devices
Source: Adapted from King, 2011.

Most dedicated M2M connections use cellular networks. Other connection technologies include WiFi, Zigbee and various wired protocols. Cellular connections are favored due to range, mobility and security. Cellular connectivity costs for hardware and airtime have previously inhibited M2M deployment. Newer, more efficient technology is now making cellular technology more accessible. M2M applications enable "machines" (car, energy meter, vending machine and so on) with network connectivity. Connectivity is generally provided through the embedded module, which is a dedicated electronic sub-component.

2. Alpha Wireless' Current Position

2.1. Organization overview

2.1.1. *Product & Service Lines*

Alpha Wireless is a technology company providing cellular technology solutions that connect people and machines. Products include USB modems, personal hotspots, embedded radio modules for M2M applications and integrated solutions including management services. Alpha has three strategic business units aligned to these product and market segments. The industry varies substantially between the business units. This analysis considers only the customers and products served by the M2M Embedded Business Unit (M2MBU).

The products offered by M2MBU are embedded radio modules which customers integrate into automobiles, smart energy meters, payment terminals or network routers. Customers are original equipment manufacturers (OEMs) such as Cisco, Ingenico and Denso. Within the M2MBU, approximately seventy five different products are offered in combinations of regional coverage, data speeds, form factor and mounting style. All of the products allow the OEM customers to wirelessly enable their applications.

2.1.2. Corporate Scope

Alpha Wireless is a publically traded company, with 950 staff, and annual revenue of $644 million. Customers are found in most developed countries and are split evenly across North America, Asia and Europe. The company is organized into three business units plus a corporate group. Through a series of acquisitions and organic growth, Alpha has staff around the world. Primary locations are:

- Toronto, ON
- San Francisco, California
- Singapore
- Shanghai, China
- London, England
- Gatwick, England

Additional employees are based in France, Italy, USA (New York), Macau, China (Guangdong, Beijing & Shanghai), Korea and Japan.

2.1.3. History

Alpha Wireless was founded in 1997 by a group of experts who wrote the first standard for cellular digital packet data (CDPD). CDPD enabled wireless transmission of data packets compatible with the Internet. Through its 16 year history, the company has been an industry leading innovator. Alpha is frequently the first company to achieve technological milestones. Organic expansion and acquisitions have driven corporate growth. The most significant acquisitions were TechCo in 2003, CellCo in 2007 and Sigma in 2009.

The Sigma acquisition significantly changed Alpha, particularly the embedded modules portion. Sigma was an Australian company focussed on the embedded modules market. At the time of acquisition, Alpha had a similar headcount but greater revenue and a stronger financial position than Sigma.

Prior to 2009, Alpha's main offices were in Toronto and San Francisco. Through the Sigma acquisition, offices were added in Shanghai, London and Gatwick. The company is now globally dispersed. The organizational culture also shifted, driven by the staff member's different organizational backgrounds and the greater mix of nationalities.

Subsequent to the Sigma acquisition, Alpha Wireless was divided into business units in 2010. The three business units are: mobile computing (MCBU), machine-to-machine (M2MBU) and solutions & services (S&S). A corporate group is responsible for finance, administration, human resources and operations. Operations covers quality, customer support and manufacturing.

On January 28, 2013, Alpha Wireless announced the sale of substantially all of the assets and operations related to its "Theta" business for $138M, plus approximately $6.5M in assumed liabilities (Alpha, 2013). The "Theta" business is not part of the M2M embedded modules business considered in this strategic analysis.

After this transaction, the continuing operation of Alpha Wireless will have an increased emphasis on M2M lines of business, including embedded modules

and related solutions and services. M2M services allow customers to remotely manage their equipment, check status and manage subscriptions. M2M solutions are specialized end-market products, such as ruggedized routers for public safety agencies.

2.2. Current strategic position

Alpha Wireless' business units each participate in a different industry. The remaining sections of this strategic analysis focus on the M2M Embedded business unit and the embedded modules industry.

Alpha Wireless is the leading vendor of embedded modules. Alpha Wireless offers a wide portfolio of products serving all product and customer segments. Alpha Wireless avoids participating as a commodity vendor, instead working to differentiate their products.

Alpha's differentiated value proposition is created by offering technical expertise and product reliability that can get customers to market quickly for the lowest cost. The value proposition is supported by a broad portfolio with a particular emphasis on advanced and specialized products. With a broad selection, customers are able to select a product which closely matches their need, whether it is the newest generation of wireless technology, or specific feature customizations. For example, Alpha's automotive products include antenna detection which can verify the correct connection of an antenna. Antenna detection is valuable when the cable is long and difficult to access, such

as in the roof panel of a car. Without that feature in the embedded module, the OEM would have to design an alternative, or forgo it.

To deliver their value proposition, Alpha Wireless engages in:

- sharing a broad scope with mobile computing,

- developing strong carrier relationships,

- investing in new and emerging technologies

- maintaining a strong IP (Intellectual Property) position

- developing expertise in wireless, RF and protocols

New wireless technologies reach consumer products six to twelve months before M2M applications. Alpha leverages their position in the related mobile computing industry by sharing complementary technology between industries. For example, Alpha Wireless will use the same core technology development to create mobile hotspots, USB modems and M2M modules. By developing a greater number of products derived from a common development platform, Alpha Wireless is able to spread out the investment required for new technology development. Alpha also gains expertise to support that new technology prior to its deployment to M2M applications. This part of the value proposition could change after the sale of the mobile hotspot and USB modem assets.

Through the activities in each business unit, Alpha Wireless develops strong relationships with other key collaborators in the industry. These relationships also lend benefit to customers who purchase Alpha Wireless

products. The network operators (for example AT&T in the USA) are significant stakeholders, as they approve every device using their network. Alpha Wireless has a long history of creating products for the AT&T network, both as a customer (mobile computing products), and as a M2M embedded module supplier. As a result, OEM customers can count on a smooth launch of their own product when they apply to AT&T for approval.

Alpha invests heavily in developing new technologies, plus nurturing and sustaining deep expertise in research, development, quality and manufacturing. The caliber of the products reflects this expertise. OEMs will find robust feature implementations, and will experience fewer software bugs and manufacturing defects. OEMs value this expertise, as they can rely on support from Alpha's experts when they face difficulties in their own development. If the embedded module is a reliable product, the OEM's design efforts will go towards their own design, rather than troubleshooting issues linked back to the module vendor.

OEMs gain access to Alpha Wireless' expertise through advisory services offered to customers. Providing guidance on antenna design to a customer that is not a wireless expert will allow them to accelerate the launch of a better product.

Alpha Wireless takes a strong position with their intellectual property (IP) licensing portfolio, reducing the uncertainty for customers in a complex landscape. Wireless technologies evolve much faster than the legal system. The courts see a steady stream of IP claims with unclear precedents on assertions

and damages. Many of these claims have no merit, but can cause the OEM expense and risk. Alpha takes responsibility for correct licensing and addressing the claims. This activity can insulate the OEM from pursuit by claimants, which is of particular interest to larger customers such as laptop vendors and automakers.

2.3. Current Performance

Alpha Wireless is a public company and strives to return value to shareholders through strong operational performance, measured by revenue, gross margin and net earnings. Table 1 summarizes these key financial metrics for Alpha Wireless, based on Non-GAAP reporting. Non-GAAP reporting excludes one-time costs, primarily those related to acquiring other companies and the subsequent costs to integrate.

Table 1. Key Operational Metrics 2008-2012

	2008	2009	2010	2011	2012
Revenue	$567.3M	$526.4M	$650.3M	$578.2M	$644.2M
Gross Margin (non-GAAP)	27.7%	32.9%	29.3%	28.3%	30.3%
Net Earnings (non-GAAP)	$44.9M	$13.1M	$20.0M	$3.6M	$33.3M
Net Earnings (Loss) - (GAAP)	$62.6M	($39.9M)	($14.5M)	($29.3M)	$27.2M

Source: Company Financial Statements

Although Alpha Wireless is profitable when considering non-GAAP reporting, the GAAP reporting shows several years ending with a net loss. The

losses are related to stock based compensation, restructuring and other integration, and acquisition related amortization. Sigma is the most significant acquisition affecting this period.

Alpha Wireless strives to maintain a strong balance sheet to withstand economic uncertainty and risks inherent in operating a high technology company. Table 2 shows key metrics from the balance sheet.

Table 2. Key Balance Sheet Metrics 2008-2012

	2008	**2009**	**2010**	**2011**	2012 (Q3)
Cash incl ST investments	$81.3M	$134.4M	$118.8M	$110.7M	$59.5M
Working Capital	$297.5M	$135.9M	$145.1M	$135.9M	$87.1M
Long-Term Liabilities	$15.1M	$36.1M	$25.0M	$25.1M	$26.7M
Shareholder's Equity	$357.4M	$316.6M	$303.2M	$271.9M	$276.0M

Source: Company Financial Statements

Machine-to-Machine has been increasing in importance for Alpha Wireless. Figure 2 shows the total company revenue and the split between mobile computing products, embedded modules and other products.
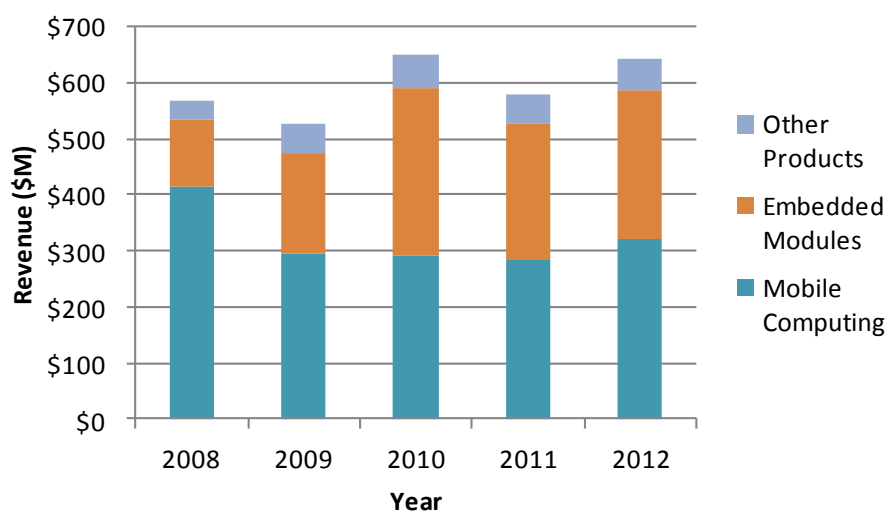
Figure 2. Annual Revenues (2008-2012)

Source: Company Financial Statements

Table 3 represents the geographic diversity of Alpha Wireless up to 2011, which is the most recent data available. Mobile Computing is dominated by sales to network operators in North America. Shipments of embedded modules are more evenly split between the regions. Data showing this breakdown is not publically available.

Table 3. Geographic split of revenue (2008-2011)

	2008	2009	2010	2011
Revenue	$567.3M	$526.4M	$650.3M	$578.2M
Americas	70%	59%	46%	44%
EMEA	9%	17%	14%	17%
APAC	21%	24%	40%	39%

Source: Company Financial Statements

2.3.1. Competitive Comparison

Table 4 compares Alpha Wireless M2M embedded modules revenue and gross margins with its nearest competitors for 2010 and 2011. Alpha Wireless commands the highest revenues but the lowest margins between these competitors.

Table 4. Revenue and Expenses for Embedded Modules Vendors (2010-2011)

	Alpha Wireless (M2M Embedded Modules)		Beta (M2M portion of NationalTech)		Gamma Communications	
Year	2010	2011	2010 (Aug-Dec)	2011	2010	2011
Revenue	$210.8M	$242.8M	€81.3M (~$108.4M)	€174.3M (~ $242.1M)	$131.7M	$177.4M
Gross Margin	n/a	32.4%	32.6%	34.7%	40.2%	38.2%
R&D Expenses	$28.5M	$37.4M	€2.9M (~$3.9M)	€12.7M (~$17.6M)	$17.6M	$21.1M
R&D as % of Revenue	13.5%	15.4%	3.5%	7.3%	13.4%	11.9%
Sales/Mktg Expense	$16.7M	$19.2M	€8.0M (~$10.7M)	€19.0M (~$26.4M)	$17.3M	$25.3M
Sales/Mktg as % of revenue	7.9%	7.9%	9.8%	10.9%	13.1%	14.3%
General, Admin, Amort	$15.8M	$19.2M	€8.6M (~$11.9M)	€15.1M (~$20.1M)	$11.5M	$18.0M
G&A&A as % of Revenue	7.5%	7.9%	10.6%	8.7%	8.7%	10.1%
Net Income	n/a	$2.9M	€7.1M (~$9.9M)	€13.7M (~$18.3M)	$6.5M	$3.5M
Net Margin	**n/a**	**1.2%**	**8.7%**	**7.9%**	**4.9%**	**2.0%**

Source: Company Financial Statements

Note 1: For Beta (NationalTech M2M), a small fraction of the revenues reported as M2M represent business other than embedded modules.

Note 2: For Alpha Wireless, M2M modules revenue excludes sales to PC OEM and e-Book customers. Expenses are extrapolated from full-company results.

Note 3: Average 2011 exchange rate for USD:Euro = 0.72. Aug to Dec 2010 average rate for USD:Euro = 0.75

Table 5 indicates the net cash position for the embedded modules vendors.

Table 5. Net Cash Position for Embedded Modules Vendors (2010-2011)

	Alpha Wireless		NationalTech		Gamma	
Year	2010	2011	2010	2011	2010	2011
Net cash at year end	$85.4M	$101.4M	€255M	€310M	($7.2M)	$0.5M

Source: Company Financial Statements

Alpha Wireless maintains a strong cash position with over $100M in cash and cash equivalents at the end of 2011. This position remained strong in 2012, with $64M available at year end. The reduction was due to an acquisition. Gamma's cash position is weak, with net cash remaining close to zero for several years. Gamma borrows against invoices and carries government and mortgage loans to meet working capital requirements. In the mid-year 2012 investors update, Gamma's net cash position was further reduced to ($0.8M). Beta was acquired by NationalTech in August 2010 and represents 9% of the larger

company. NationalTech maintains a strong cash position of over $430M (€310M).

Alpha's leadership position in the market is visible in the financial data showing R&D investments and a strong balance sheet. Yet, some weaknesses are revealed through this data. Alpha tends to command premium prices on their embedded modules, so the lower gross margin indicates that Alpha has higher unit costs. Alpha's focus on leading edge technology development is reflected in the high R&D spending, both in dollars and as percentage of revenue. While the R&D investment is key to Alpha's strategic position, the comparison brings into question R&D spending efficiency.

2.4. Current Challenges

Alpha Wireless is an established market leader in their industries, including embedded modules. Alpha Wireless has a lengthy reputation as a leading innovator which can execute swiftly to get new technologies to market first.

As the embedded modules industry has grown, commoditization has increased and competition between vendors has intensified. Alpha Wireless perceives that its primary challenge is how to continue to grow revenue and profitability in the face of rapidly changing technology, stiffening competition, increasing product commoditization and the resulting margin erosion. Financial

performance is of paramount importance to provide returns to the shareholders and to weather the volatile technology industry.

The next section analyses the embedded modules industry, and Alpha Wireless' position within it. By understanding the industry more clearly, the extent of Alpha Wireless' challenges will be clarified.

3. External Analysis

3.1. Industry Definition and Value Chain

Alpha Wireless participates in the Machine-to-Machine Embedded Modules industry. For this analysis, the industry is centered on the hardware vendors who design and sell the embedded modules. The extended industry of collaborators are considered only to the extent that they influence the embedded module vendors.

Table 6 outlines the key segments in the M2M embedded modules industry and their defining characteristics.

Table 6. Key Product Segments for M2M Embedded modules

Segment	Characterized by…
Essential connectivity	Low cost, low speed, low feature products
Integrated products	Greater functional integration of product features, such as microprocessors
High Speed products	Highest speed, emerging technologies
Automotive products	Long product lifetime, harsh environment, strict quality controls

Source: Author

These segments vary based on the type of products and the type of customers that purchase them. Several competitors only address one or two of

the industry segments. The embedded modules industry is global with suppliers, competitors and customers in all countries with developed economies and technology infrastructure.

Embedded modules are offered in various air interface technologies – older technologies offer slower data rates and lower costs where the newest technologies have the fastest data speeds and are the most expensive. The air interface technology chosen by each customer depends on their needs and the local cellular network requirements. Figure 3 shows unit shipments for different air interfaces, by region in 2013.
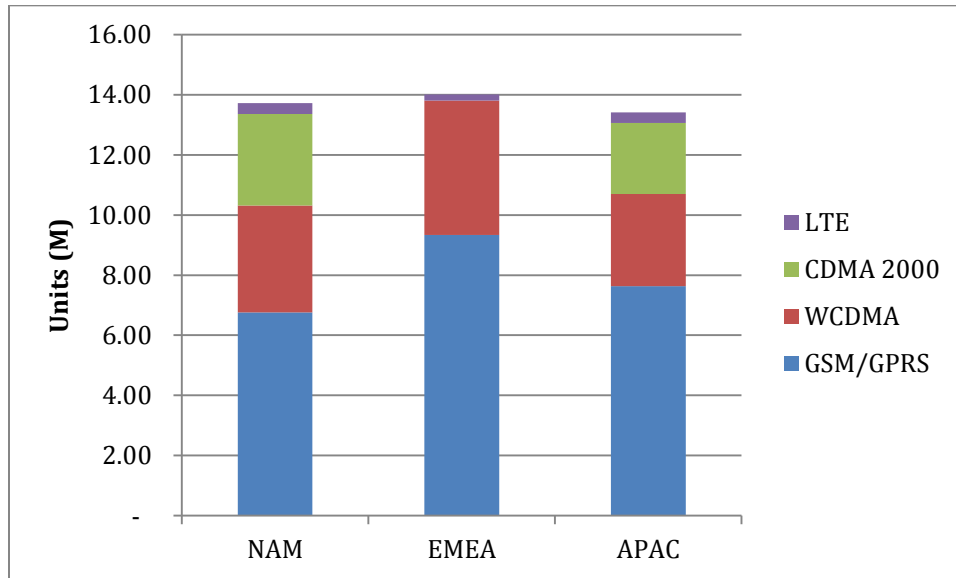
Figure 3. Air Interface Shipments by Region (2013)

Source: Anonymous (Jan 2013)
Note: Original data is from a proprietary source. Data presented is representative
            & source is fictionalized.

Network operators are retiring GSM/GPRS networks to free up wireless spectrum for LTE deployments. LTE networks are more cost-effective to operate and offer higher data rates to end users. In August 2012, AT&T announced that its GSM/GPRS network will be shut down by 2016 (Svensson, 2012).

Table 7 indicates current market prices various air interfaces andas the associated data rate for comparison.

Table 7. Selling Prices for Embedded Modules (2013)

Air Interface	Maximum Downlink Speed	ASP
EDGE (2G)	236kbps	$13
WCDMA (3G)	21Mbps	$24
CDMA2000 (3G)	3.1Mbps	$37
LTE (4G)	100Mbps	$67

Source: Anonymous (Jan 2013)

Prices for all embedded modules are dropping rapidly, as shown in Figure 4. Prices for EDGE (2G) modules will decline by 29% between 2011 and 2015. Prices for LTE (4G) modules will decline by 35% between 2012 and 2015.
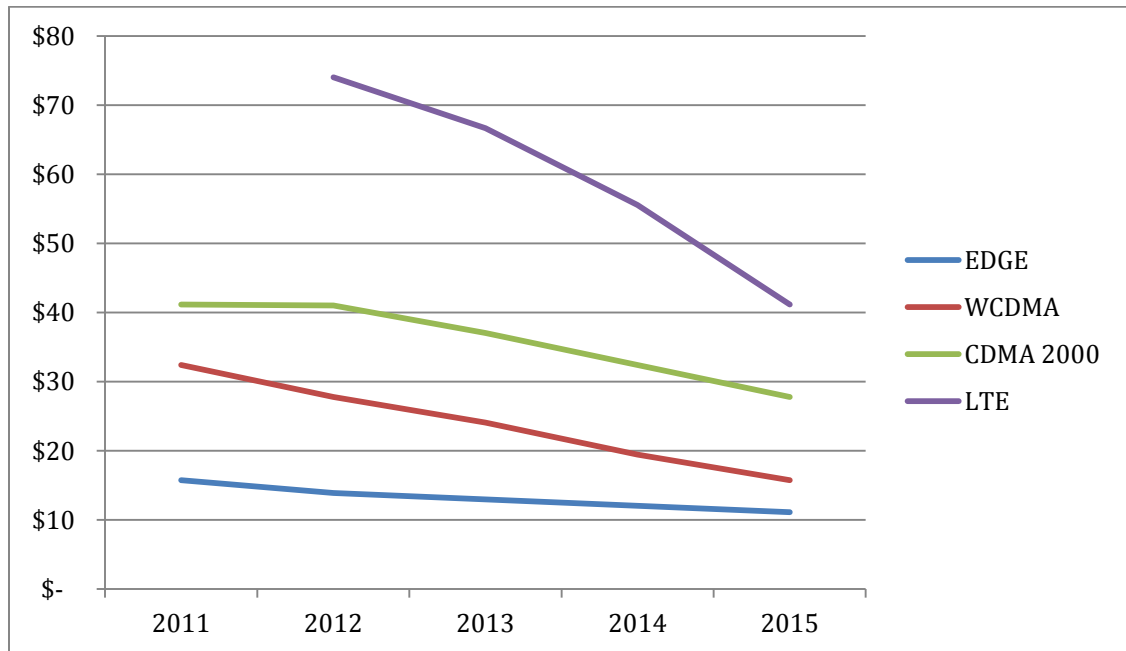
Figure 4. Embedded Module Prices by Air Interface (2011-2015)

Source: Anonymous (Jan 2013)

3.1.1. Industry Supply Chain

Figure 5 outlines the supply chain for the embedded modules industry, and shows the presence of collaborators. The collaborators are key industry participants and enablers.

Suppliers
- Chipset Suppliers
- Other component suppliers
- ODM Manuf. Services
- Manufacturing Equipment
- IP Holders
- Labour
- Lab Equipment

Competitors
- Alpha Wireless
- Beta
- Gamma
- Delta
- Kappa
- Iota
- etc

Customers
- Networking Equip (Cisco etc)
- Auto Industry Tier 1's
- Fleet Managment
- Smart Energy
- Point of Sale Terminals
- Distributors

Collaborators
- Carriers
- M2M Network Operators
- M2M Management Services Providers

Figure 5. Industry Supply Chain

Source: Author

3.2. Suppliers

Embedded module vendors incur costs to suppliers as they develop, manufacture and sell their products. Aside from the direct labour force and lab equipment vendors, costs for these suppliers are reflected in the unit cost. Important suppliers provide the chipset (one third of the total cost) and provide IP licenses (one quarter of the cost) The direct labour force is primarily comprised of engineers with specialized skills in RF design, firmware development and other types of electronics design.

3.3. Competitors

The primary competitors in the M2M embedded modules industry are Alpha Wireless, Gamma Communications and Beta Wireless. According to Anonymous (Mar 2012), these three companies represent 76% of industry revenue. Other participants in this industry tend to participate only in one or two segments. For example, KAPPA and Omega have emerged with a focus on essential connectivity. Specialist competitors create products specifically targeted at the automotive segment.

The competitive dynamic in this industry has been evolving. The current level of concentration amongst the top competitors is the result of a wave of vendor entrances, exits and acquisitions in the past five years.

Alpha Wireless took top position in the industry in 2009 when Sigma's portfolio was added to Alpha's established position. With the acquisition of SmallCo M2M in 2012, Alpha's position was further advanced.

Gamma Communications is an Italian public company with several dominant owner-shareholders (quasi-private). Like most companies in this industry, Gamma is global with development sites in Korea, Israel and several other countries.

Beta Wireless was a 2008 spin off from BigCo. Beta is a Polish company, with developers also located in other Eastern European countries, such as

Hungary. Beta Wireless, was acquired by NationalTech Systems in August 2010, but has since been operated as a standalone division.

Ericsson Wireless was a strong competitor in 2010, but they have since exited the market. Iota Wireless has also recently indicated that they are withdrawing focus on certain types of customers, such as computer makers. Delta is a large, powerful competitor which entered the European market in August 2012.

3.4. Collaborators

Several types of collaborators are fundamental to the industry operation, although they do not directly sell or consume products in the supply chain. The most significant collaborators are the wireless carriers such as AT&T and Vodafone. These carriers own and operate the wireless networks. Carriers have strict requirements which must be met prior to embedded modules being activated on their network. Carriers have the same customer base as embedded module vendors, as they sell airtime plans to the OEMs. M2M network operators and M2M Management services providers who offer complementary products can also be important collaborators. Their products require some feature integration to be performed within the embedded module. Therefore, integration between the M2M module network operators or service providers can create a point of differentiation between embedded module vendors.

3.5. Customers

Embedded modules are purchased by equipment integrators that serve a variety of different applications. Customers can range from small integrators, purchasing only a few hundred units per year via a distribution channel, to large top tier integrators which consume hundreds of thousands of units annually. The largest customers tend to be integrators who sell to automakers. Customers who develop systems for smart energy are also growing in size. Networking equipment customers represent significant revenue, as they use high-priced products in the high-speed category.

3.5.1. Market size and growth

The embedded modules industry is in a period of strong revenue growth. Industry analysts Anonymous predict that the total market will quadruple, from $700M in 2011 to $$2.8BM in 2018. During this time, some air interface technologies will decline (GSM/GPRS), while others will face explosive growth (LTE at 73% CAGR).
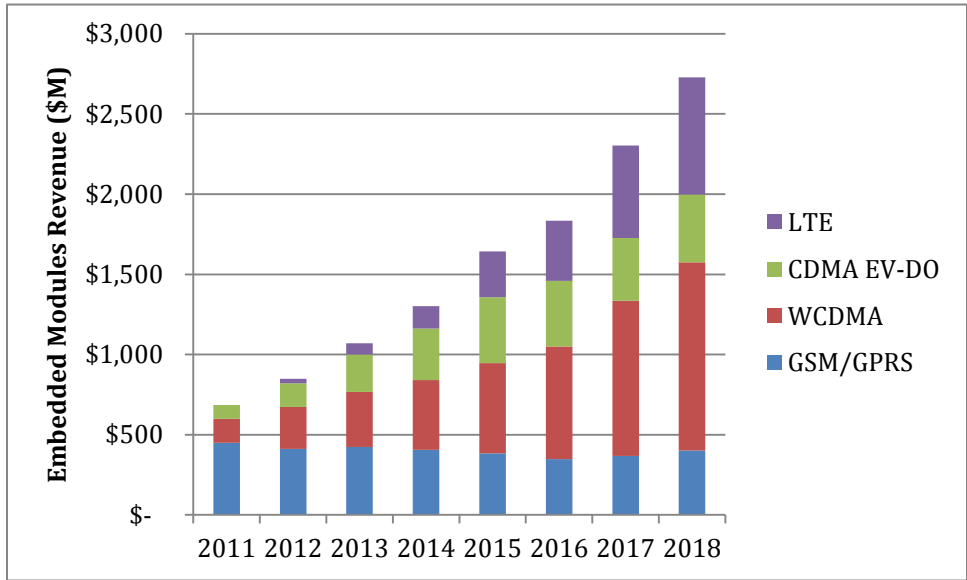
Figure 6. Total Embedded Modules Revenue (2011-2018)

Source: Anonymous (Jan 2013)

3.5.2. *Key customer segments*

Embedded modules are purchased by customers that serve a wide variety of end-industry applications. Figure 7 illustrates embedded modules revenue by end-industry. Embedded modules revenue is increasing to all types of customers. The three largest end-industries are vehicle telematics (34% annual growth), intelligent buildings (15% annual growth) and smart metering (9% annual growth).
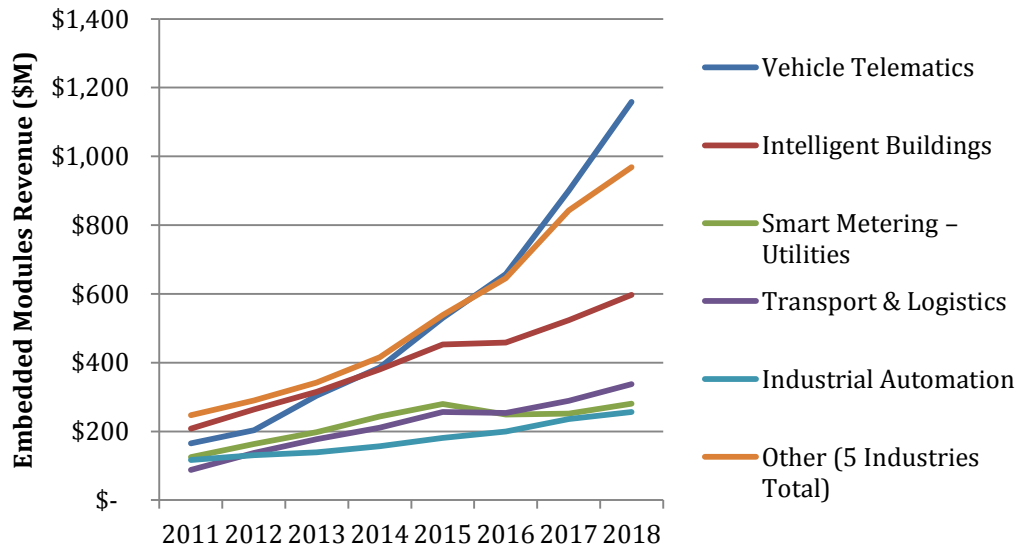
Figure 7. Embedded Modules Revenue by End-Industry Use (2011-2018)
Source: Anonymous (Jan 2013).

Table 8 shows the product categories used by the end-industry segments.

Table 8. Product Categories use by End-Industry

	Essential	Integrated	High Speed	Automotive
Vehicle Telematics				X
Intelligent Buildings	X	X	X	
Smart Metering-Utilities	X	X		
Transport & Logistics	X	X		X
Industrial Automation	X	X		
Consumer Electronics			X	
Public Sector Infrastructure	X	X	X	
Retail and Commerce	X	X	X	

Source: Author

Automotive products are used by customers in the Vehicle telematics industry. Essential connectivity products and integrated products serve all industry segments except vehicle telematics and consumer electronics. High Speed products are used in consumer electronics, as well as intelligent buildings, public sector infrastructure and retail and commerce.

Concentration of the customer base varies across each of these end-industries. For example, vehicle telematics has a small number of very large customers (automakers) whereas hundreds of small to medium customers serve the intelligent building industry, with security, monitoring and automation solutions. The end market for smart-energy/utilities is concentrated as the utility companies who introduce these solutions are generally a natural monopoly in their local area, although there is diversity in the OEMs which sell to those utilities.

3.5.3. *Customer preferences*

Customers of embedded modules are equipment integrators (OEMs) of finished goods such as point-of-sale terminals, smart energy meters, fleet tracking equipment and vehicles. In addition to an attractive price, these customers value several other important needs. These needs are related to the overall cost and effort required by the OEM to launch their finished product and the costs required to support that platform during production. Customers also consider the future time horizon when their product may need to be updated or redesigned. While all types of customers have these preferences, the relative importance varies depending on the OEMs end-industry. These variations are identified as they apply to each of the preferences.

The integration phase occurs when the OEM is completes their design which includes the M2M module. During this phase customer needs include:

- Minimizing integration costs
- Minimizing time-to-market
- Minimizing cost of the complete OEM platform
- Minimizing costs related to launching in various global regions

The production phase occurs while the OEM ships the product to their end customers. In this phase customer needs include:

- Stable product software
- Minimizing unrepairable field failures
- Long product lifetime
- Intellectual property indemnification

When an OEM is integrating an M2M module, they incur their own design costs and will prefer an embedded module vendor which can minimize those costs.

The overall length of the OEMs design cycle is important. Some OEMs have strict product launch windows to get retail products to the market in time for holiday shopping. A timely launch for the OEM can be significant enough to determine the overall success that product. This preference is particularly strong for OEMs creating consumer products such as laptops, tablets and e-books.

The third need that can be met during the OEM design phase is to minimize overall unit cost of the OEM's platform. Aside from the embedded module, other electronic components in an OEM's platform include a microprocessor, memory, connectors, display and housing. Once an OEM completes their design, they will incur costs related to launching in each target country. The most significant of these costs, as it relates to the embedded module, are certification costs. In order to activate on the local wireless network, most network operators will require product certification. Certification verifies radio performance and ensures that the product does not cause adverse effects such as flooding the network with data. Costs for certification testing can range from $10,000 to $500,000 for an OEM, and OEMs will prefer that these costs be minimized.

After the OEM product launch, their needs shift to production support. During mass production, it is extremely expensive to service products in the field. There may be tens of thousands to millions of units deployed for a large customer. If a severe product defect (software bug) is uncovered after product launch, the remedy cost could be disastrous. OEMs will seek to work with a vendor with proven, stable products. This preference is extremely strong for automotive customers, as the defect containment cost is extremely high once a vehicle is sold.

OEMs seek to procure embedded modules which will have a long in-service product lifetime without failure. Product failure can occur by memory corruption after many read/write cycles, if the product does not withstand many years of harsh environmental conditions. This preference is particularly important for OEMs in markets such as utilities or automobiles. In these markets, end-customers expect products to be working for ten or more years.

Product lifetime also is related to length of time that an OEM can purchase the same product without changes. Technology for embedded modules is based on cellular chipsets primarily used for the handset market, which changes rapidly. New product generations are launched every year. Despite this pace, the investment by an OEM to develop their platform creates a desire to keep selling the same product for many years. In addition to industrial and automotive customers, this preference applies to customers in the networking industry who sell to Fortune-500 firms which are resistant to change.

There are many strong patent-holders in the cellular wireless technology field. The OEMs who purchase embedded modules seek to be protected from infringement claims by those patent-holders. This protection is generally requested because OEMs are not wireless technology experts, and they prefer that the embedded module vendor to carry the risk of handling litigation related to technology in the module.

3.5.4. *Summary of opportunities and threats with respect to customer segments*

To serve the customers of embedded modules, the complexity of the cellular wireless technology and its pace of evolution create both opportunities and threats. LTE and the next generation, LTE Advanced, are examples of this continuing evolution. Opportunities are created by this change, as it creates an opening where new products are constantly requested by the market. Yet, that pace can become a threat for any vendor which does not keep up with new technologies while older technologies are becoming obsolete.

Revenue from all types of customer end-industries is growing, and there is the opportunity to focus specifically on one or more of those end-industries.

3.6. Five forces

Figure 8 shows the key forces on the embedded modules industry in terms of rivalry between competitors, threats from new entrants, threats from substitutes, strength of suppliers and strength of buyers.

New entrants

               (moderate threat)

- Products moving to commodity
- Specialized knowledge requirements are dropping
- Economies of scope with complementary technologies

Suppliers

               (high strength)

- Highly concentrated supplier base (few alternatives)
- Single suppliers representing high fractions of cost
- Suppliers are much larger than M2M module vendors

Rivalry

               (intense)

- Industry prices dropping rapidly
- Competitors engaging in price wars
- Short timeframes to secure a design win

Buyers

               (high strength)

- Massive companies, purchasing large volumes.
- Strict quality & procurement requirements
- Smaller/distributed customers

Substitutes

               (low threat)

- Alternate wireless technologies
- Chip on board designs for higher volumes

Figure 8. Five Forces Analysis for M2M Modules Industry

Source: Adapted from Porter, 1979.

3.6.1. *Rivalry*

The embedded modules industry has intense rivalry between the competitors. The industry is growing quickly, with a predicted CAGR of 32%

from 2012 to 2017 (M2M Magazine, 2012). Currently, three vendors account for 76% of the market. This high concentration resulted from several significant acquisitions and exits in recent years. In some industries, high growth and high concentration could indicate low rivalry, yet rivalry is an intense force in the embedded modules industry.

The most observable indicator of high rivalry is rapidly declining prices, despite increasing technological complexity. Industry prices are projected to drop by 18 percent in the next 3 years (TMCnet, 2012), which is quicker than input cost declines. These price declines are driven by bidding wars from competitors with a low market share, or new entrants seeking to 'buy' part of the market. Price wars are partially offset through product differentiation and vendor's value propositions, but all competitors must stay close to industry price trends.

Embedded modules are designed in to an OEM's platform. The fiercest competition occurs during the one or two months of the bidding phase at the start of an OEM project. Once a vendor is chosen for a specific OEM design, displacement is rare, and the winning vendor secures three to five years of revenue from that design.

External forces which entice competitors to engage in price wars include powerful, price-focussed buyers and the constant threat of new entrants.

3.6.2. Suppliers

Suppliers exert high bargaining power over the embedded module vendors. This power is especially clear for chipset vendors who account for a significant fraction of product costs. There is one dominant chipset vendor and few alternative choices. Once a chipset is selected for an embedded module design, it cannot be substituted without redesign. In relation to the chipset supplier's other customers, embedded module vendors are tiny. Handset and smart-phone vendors purchase similar chipsets from the same vendor, and are several orders of magnitude larger. With a large, powerful supplier, it is difficult for embedded module vendors to negotiate preferential prices from the chipset vendor.

A similar dynamic exists with the holders of intellectual property. Several companies own intellectual property which is fundamental to cellular communication. This IP must be licensed either by the M2M module vendor or by the end OEM. Given the strong position of the major IP holders, and the threat of expensive legal proceedings from opportunistic claimants, IP holders represent suppliers with strong bargaining power over M2M embedded module vendors. As a result, they command a significant fraction of the product costs.

Other industry suppliers represent a small fraction of costs and do not exert significant bargaining power.

3.6.3. Buyers

In the embedded modules industry, customers may range from very small to extremely large. For the five forces analysis, it is most relevant to consider the impact of the largest customers. Large customers drive the majority of the revenue and have the highest bargaining power.

Automotive customers are a prime example of a large customer with significant bargaining power. These customers tend to be huge multi-national organizations with teams dedicated to procurement, process control, and supplier monitoring. Although an OEM integrator is usually the direct customer, they act as an extension of the automaker. Strict demands for compliance from customers results in strong bargaining power over the embedded module vendor. For this type of customer, the module vendor faces a choice between accepting the customer requirements (price, quality commitment) and losing the business. Module vendors continue to seek relationships with this type of customer, as they represent the largest opportunities. The relatively slow pace of the automotive industry and resistance to redesign result in lucrative multi-year contracts for an embedded module vendor that wins the business.

3.6.4. Substitutes

There are few direct substitutes for embedded modules. The strongest substitute is an alternate wireless technology such as WiFi or ZigBee. Technical aspects limit these technologies to certain types of applications that are non-mobile or short range. The wireless technology is chosen during the design

stage of an OEM's project. Once a particular OEM has selected a wireless technology and an embedded module vendor, the threat of substitute is removed until the platform enters a new redesign phase. The redesign phase may occur annually or as infrequently as once per three to five years. During these phases, both substitutes and competitive rivalry will come back into play.

The second substitute threat to embedded modules "chip-on-board" designs where the embedded module is no longer used, and instead the chipsets are integrated directly into the OEM applications. This is a type of backward integration by the OEM. This substitute is more significant as the industry grows, and individual projects grow in scale. Chip-on-board designs become cost effective when volumes exceed 1 million units per year.

3.6.5.   New Entrants

Since 2009, there have been a number of high profile exits and acquisitions in the industry. The largest vendors are highly concentrated, yet there continues to be an ongoing wave of new entrants. In general, new entrants attempt to compete by lowering prices with little regard to economic viability.

The most significant entry threat is from companies with scope economies. These competitors are in from similar businesses such as smart-phones and may be able to sustain lower prices than existing vendors. Increasing commoditization has reduced the amount of specialized knowledge required to produce embedded modules and has made it more difficult to

differentiate products. This is particularly the case for the essential connectivity market segment.

3.6.6. *Opportunities with respect to industry structure*

Despite the intense rivalry in this market, Alpha Wireless enjoys a strong reputation as the leading provider of embedded modules. Alpha Wireless has the highest market share in the embedded modules industry.

Upcoming legislative changes related to automobiles represent an opportunity with those customers. The automotive projects are amongst the largest projects in the industry. Mandatory installation of emergency calling systems in vehicles will create a significant opportunity for any embedded module vendor who can secure the business. Alpha Wireless already has a significant presence in the automotive market, and should ensure they are well placed to capture this opportunity.

Alpha Wireless has long been the leader with many technology 'firsts'. After initial deployment only in the USA, LTE networks are being deployed more widely throughout the world. Alpha Wireless already has a deep portfolio of LTE-capable products, a unique position amongst embedded module vendors.. Alpha Wireless must monitor the rollout of more networks with this technology, and track trends related to the next generation technology, LTE Advanced.

3.6.7. Threats with respect to industry structure

As outlined in the Five Forces analysis, the embedded modules industry faces threats and strong bargaining power from outside sources. Two threats which could impact Alpha Wireless are excessive supplier power and entry by low-cost competitors. Alpha Wireless purchases their chipsets from the dominant supplier, which also owns the largest IP portfolio. Alpha Wireless will need to increase their power in the relationship so that they can gain greater control over their input costs. This will become increasingly important as prices continue to fall.

The prices and margins are being driven down by existing participants and the threat of massive low-cost entrants from China. The concentration of the industry means that a price move by one or two vendors can reset the benchmark of market pricing. It is tempting to dismiss price wars from one or two vendors as indicators of desperation or misunderstanding the costs to maintain a long-term presence in the industry. Some evidence of that was exhibited when two vendors engaged in aggressive price wars and subsequently exited in 2010 and 2011. There is still a genuine threat from any competitor which can reduce their costs enough to profitably compete at a lower price point. In addition to supplier costs, internal costs such as salaries paid to engineers, certification costs and the skill of those teams can generate a cost advantage to an embedded modules vendor. In such a highly concentrated industry, the internal

efficiency of the competitors must be considered as a threat. Alpha may need to continue to focus their efficiency to mitigate this threat.

Vendors with economies of scope or that are vertically integrated potentially have a cost advantage over a specialist like Alpha Wireless. To sidestep this threat, Alpha Wireless can develop products which are differentiated on advanced product features rather than simply being price driven.

3.7. Sources of Advantage

3.7.1. Cost

Costs of embedded modules are incurred in two ways: the operating expenses incurred during the development phase and the costs related to manufacturing each unit. Each of these cost categories will be explored in turn.

Low unit costs allow the gross margin generated during the production phase to be high enough to cover operating expenses and still generate net income. Conversely, operating expense efficiency can become a source of advantage. If operating expenses are reduced, profitability can be achieved at lower gross margins.

The R&D team incurs operating expenses during the development phase. R&D expenses are primarily related to the salaries of the engineers and other related overhead (non-salary benefits, IT infrastructure, facilities). Salaries and personnel overheads are most strongly influenced by the development location.

The cost for an engineer in China is one third of the cost of a similarly qualified engineer in North America.

Personnel costs are also affected by the skill and efficiency of the team, and the amount of management overhead required. Since each company's design methodologies are different, an engineer will become more productive over time as they gain experience in the precise practises of a company. It is advantageous for an R&D department to develop team expertise and minimize staff turnover.

R&D costs are also incurred through manufacturing runs used to verify the design, and through fees paid to test facilities for network and regulatory approvals. With a skilled design team, fewer verification builds and fewer rounds of submission to external test labs will lead to lower costs in this category.

The second category of personnel expenses is from the Systems Engineering team that works with customers to accelerate the launch of their finished products. This team is distributed globally to be in close proximity to customers. The size of the team depends on the number of customers they are serving and the support level provided, rather than the quantity of units shipped to each customer. Therefore, this team is most efficient when they focus on a few large customers rather than many small ones.

Other operating expenses related to the ongoing business (Sales, Marketing, General, Administration, Amortization), are smaller in magnitude compared to the R&D expense and not directly connected to a specific product.

Embedded modules are manufactured electronic components, so production costs are reported as "Cost of Goods Sold" on the income statement. To gain a cost advantage, a vendor would need to procure the sub-components at a preferential price, to attain lower manufacturing labour costs, to apply lower indirect costs or some combination thereof. The total production cost is represented by the sum of the following line items:

- Bill of Materials
- Manufacturer's Value Add
- Royalty Costs
- Indirect Costs
- Allocated Overheads

The Bill of Materials represents the cost of the individual sub-components. The most significant of these sub-components is the modem chipset. Other sub-components include memory, RF components, printed circuit boards, resistor, capacitors, packaging, connectors and labelling.

Alpha Wireless engages with a contract manufacturer (CM) for the production of the modules. The Manufacturer's Value Add (MVA) is the costs paid to the CM to cover their labour, overhead and margin.

Wireless technologies have numerous strong holders of intellectual property. Licensing and associated royalty costs are a significant fraction of the cost of an embedded module. Indirect costs include the reserves for inventory carrying cost and warranty programs. Depreciation for production line equipment and overhead expenses for Operations staff are allocated to each unit.

The dollar value of manufacturing a unit can vary significantly, as there are many products in the market addressing different data speeds and regional requirements. However, the cost line items which are most significant are consistent from one product to the next. The diagram below shows example costs for an M2M module which is sold inside of North America, and produced by Alpha Wireless.

Example Costs for an M2M module
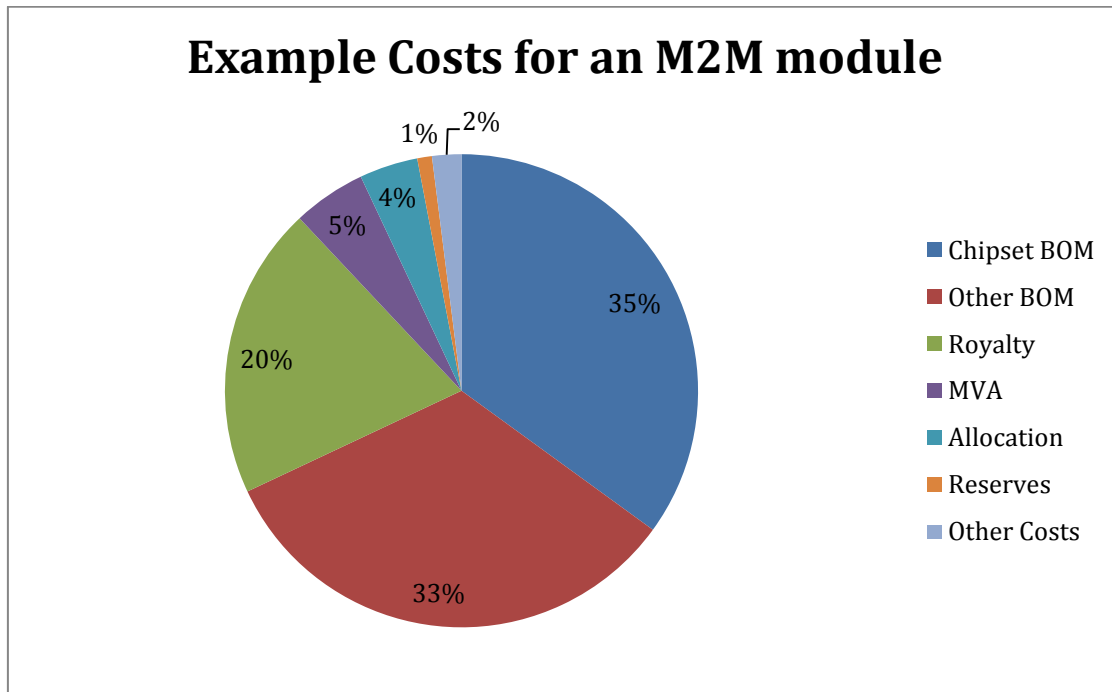
Figure 9. Example costs for an M2M module
Source: Author

From Figure 9, the dominant areas of cost are the modem chipset cost, and the royalty cost. The cost for other BOM components is also high but represents a collection of smaller line items which are not individually meaningful. In tightly competitive situations, the magnitude of the MVA and Allocations can also become important.

An embedded module vendor can gain a cost advantage through one of the following avenues, in descending order:

- Negotiating a lower modem chipset price
- Achieving lower royalty/licensing costs
- Negotiating lower costs on non-chipset components

- Reduced manufacturing fees
- Reduced overhead allocations

In terms of the modem chipset price, there is a strongly dominant supplier and most embedded module companies purchase the same chipsets. Some competitors gain economies of scope, particularly those also in the smart-phone business, purchasing high volumes from the same chipset supplier.

Royalty and licensing costs can be lowered if a company holds a strong IP position (thus needs to pay fewer licensees or can cross-license some of their patents for a reduction in payment), or can negotiate a special exception for certain applications (fees for laptop applications differ from automotive applications).

Costs for non-chipset components will depend on the sourcing agreements negotiated with multiple suppliers. Scale advantages can be attained by consolidating purchases from one supplier (i.e. purchasing all memories from the same supplier) or through purchasing similar components for other electronic devices.

The fees paid to contract manufacturers are related to the type, complexity and volume of products being manufactured. If a company is able to reduce these costs, overall production costs will be reduced. These fees may be lowered through greater scale (higher total production), greater scope (production of other similar specialized electronics) or manufacturing in a region

with a low labour cost. All significant vendors in this industry use contract manufacturers based in Asia.

Overhead costs related to production are also found internally. These costs represent personnel costs, and depreciation of the specialized production equipment. By streamlining these two categories, production costs may be reduced.

3.7.2. *Customer Utility (Differentiation / Willingness to Pay)*

By addressing the needs of embedded modules customers, an embedded module vendor can increase their product differentiation and command higher prices. Advantages related to differentiation can be generated by:

- Skilled product development teams
- Availability of customer support (experts and resources)
- Requirements expertise (regional and network operators)
- Manufacturing expertise
- Product features
- Strong IP licensing position
- Financial position and financial requirements

The table below shows how the customer needs are connected to these sources of advantage.

Table 9: Customer Preferences vs. Sources of Advantage

Customer Need	Source of Advantage						
	R&D team expertise	Support experts & resource	Req'ts expertise & relations	Manuf. expertise	Product features	IP Licensing position	Financial structure
Integration cost	x	x			x		
Time to market	x	x	x				
Total platform cost				x	x		
Launch costs			x				
Stable Software	x						
Avoid field failures	x			x			
Long product lifetime							x
Intellectual property coverage						x	x

Product development team expertise is the strongest source of advantage for an embedded module vendor. With the expertise of their teams, vendors can create products with advanced features that can be integrated efficiently and quickly, reducing the OEM's development costs.

Features integrated in the product are a strong source of advantage. For example, by including embedded processing capability into the product, customers may reduce their overall platform cost by removing functional duplication. If the OEM platform has modest processing needs, the microprocessor in the wireless chipset on the embedded module can be used for

both tasks, removing the need for separate components on the OEM product. From the perspective of the module vendor, embedded processing capability creates an additional advantage in a higher future switching cost for the OEM attempting to switch to another vendor's embedded module on future product updates. Increasing feature integration is a type of horizontal integration, extended to the point where the embedded module and the OEM's platform are indistinguishable. If the volumes are high enough, this customer preference switches into a threat of substitution for a chip-on-board design.

Globally distributed product support resources are a moderate source of advantage. With product experts located close to the customer vendors are able to rapidly respond to customer inquiries. Support resources located in the target countries of deployment attain local expertise which can be shared through the company to other parts of the world.

Requirements expertise for each country and their network operators is a moderate source of advantage. This expertise is most important for regions with steep regulatory and carrier certification requirements, such as USA and Europe. Launch costs for the OEM can be reduced by an embedded module vendor that has pre-certified the module with a network operator. Strong relationships between the embedded module vendor and the operator can smooth the launch process for the OEM. For example, if an operator is favourable towards the module vendor, they may be more willing to grant waivers for items which fail test cases but are generally rare or benign.

Manufacturing expertise can also be a source of advantage; however it does not tend to be highly valued by customers compared to the investment it requires. Warranty claims may be many years removed from the initial selection of the embedded module vendor. It is difficult for an OEM to validate claims of manufacturing expertise, so an aggressive sales team may overstate capabilities during the bidding phase, diminishing the differentiation by competitors with genuine expertise. Once an OEM comes to understand the vendor's actual ability to deliver reliable product, it is generally too late to switch vendors but may create a precedent that causes the OEM to switch on a future project.

In terms of a company's financial structure, an advantage is created by having a strong balance sheet. The financial position creates the opportunity to continue to invest in future projects. It also indicates to customers that the company is strong enough to withstand forces from macro-economic cycles and will be able to be relied upon for many years to come.

Finally, the IP licensing position can create an advantage, but a truly strong position is not valued strongly by OEMs. A statement of indemnification can be provided by any embedded module vendor, but the reliability of that statement will depend on the number of licenses actually held, the ability of the embedded module vendor to address litigation claims and the financial resources of the module vendor. Similar to warranty claims, strength in litigation support cannot be immediately observed, where most other sources of advantage can be observed during the bidding phase.

This section identified a number of sources of advantage which related to costs, customer utility or both. They are consolidated in the table below for reference.

Table 10. Summary of Sources of Advantage

Source of Advantage	Importance	Related to Cost	Related to customer utility	Description
R&D location	High	X		Costs are lower in Asia, Higher in N. Am & Europe
BOM Cost	High	X		Cost of procured components
R&D expertise	High		X	Easy to integrate/low cost to OEM
Product features	High		X	Incorporate advanced functions in the product.
R&D efficiency	Moderate	X		Output per engineer. # of validation builds & lab test cycles.
Customer Concentration	Moderate	X		Support team focus on larger customers.
IP Licensing position	Moderate	X	X	Licenses held & cost for other royalties. Ability to indemnify customers.
Indirect & O.H. Costs	Moderate	X		Inventory, Warranty, Depreciation & Operations staff costs.
Customer support experts and resources	Moderate		X	Timely response to customer. Share local expertise.
Requirements expertise & relationships	Moderate		X	Local country knowledge. Close relationships with network operator.
Manufacturing expertise	Low		X	Reduce customer warranty claims.
R&D overhead costs	Low	X		Team management and training.
MVA Cost	Low	X		Costs paid to contract manufacturer.
Financial structure	Low		X	Strength of balance sheet.

3.8. Relative Competitiveness Analysis

Alpha Wireless currently holds the #1 market share for M2M embedded modules. The other significant direct competitors are Gamma Communications and Beta Wireless. We will also consider the competitive threat of other wireless vendors that pursue this industry. In recent years, several similar vendors have entered then exited from this market, yet impacting the market while present. For this analysis, Delta is considered as representative of potential large-scale market entrants. Previously only participating in the Chinese market, Delta recently entered the M2M market in Europe. The chart below illustrates the market share of existing participants in this market.

Embedded Modules Market Share (2011)

- Alpha 32%
- Beta 25%
- Gamma 16%
- Kappa 9%
- Iota 6%
- Delta 4%
- Omega 3%
- Others 5%
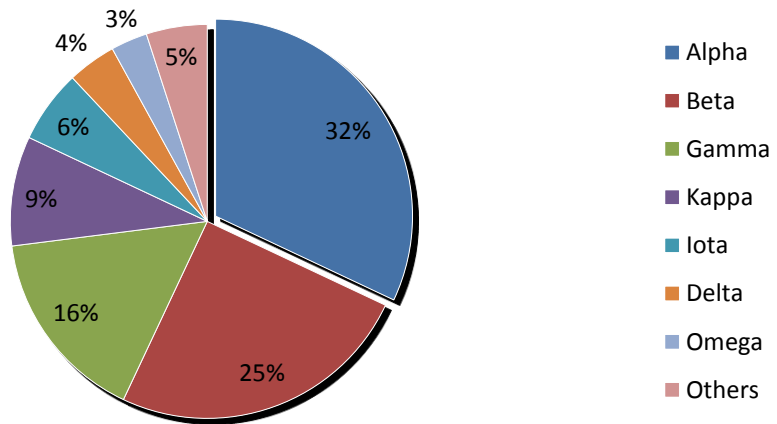
Figure 10. Market Share for Embedded Modules

Source: Anonymous (March 2012)

The chart below shows the strength of the sources of advantage for each competitor. Advantages are marked on a scale of strong disadvantage (--), disadvantage (-), neutral (0), advantage (+) and strong advantage (++).

Table 11. Source of Advantage Competitive Comparison

	Importance	Alpha	Beta	Gamma	Delta
R&D location	High	0	--	-	++
BOM Cost	High	-	0	0	++
R&D expertise	High	++	+	+	-
Product features	High	+	+	0	- -
R&D efficiency	Moderate	-	0	0	+
Customer Concentration	Moderate	-	+	0	0
IP Licensing position	Moderate	+	+	0	+
Indirect & O.H. Costs	Moderate	-	0	0	0
Customer support experts and resources	Moderate	+	+	+	-
Requirements expertise & relationships	Moderate	+	0	0	+
Manufacturing expertise	Low	+	+	0	-
4. R&D overhead costs	Low	0	0	+	-
MVA Cost	Low	+	+	-	++
Financial structure	Low	+	+	--	++

Alpha Wireless tends to enjoy an advantage in most categories, aside from those related to cost. The relative ranking between the competitors is explained in the following section. When OEMs choose an M2M module vendor, they are strongly cost-sensitive. A vendor with differentiated can command a small price premium, but that premium tends to be limited to 5-8%. If a vendor's costs are not close enough to those of their competitors, that weakness could outweigh their other sources of advantage.

Here is a hypothetical example of how price premiums are balanced against product costs. Table 7 identified that the ASP of a WCDMA module should be $24. Let's assume that Gamma is selling an equivalent module to Alpha, but Alpha is able to extract an 8% price premium for having a better offering based on reliability and OEM speed to market. Taking the 2011 gross margin information from Table 4, it would imply the following cost structure:

	Alpha Wireless	Gamma
ASP	$26	$24
Gross Margin	32.4%	38.2%
Implied per-unit cost	$17.58	$14.83

The per-unit manufactured cost does not take into account the R&D or other expenses necessary to get the product to market. It remains unclear how a smaller company would achieve costs which are 15% lower than Alpha. It is possible that some of this effect is related to different accounting practises, such as expensing certain types of costs rather than considering them as part of COGS. Not enough detail is available in public records to confirm the precise practises, but there is a large variation in Sales & Marketing expenses (14% vs. 8% of revenue) which could be an indicator of this activity.

4.1.1. *Relative position of SoA for industry competitors*

This section will consider each of the sources of advantage and identify competitors with advantages or disadvantages. The assessments in this section

are primarily qualitative, based on the author's experience in the embedded modules industry and publically available information.

Alpha Wireless has R&D locations in both low cost and high cost regions, so their personnel expenses are considered to be neither an advantage nor disadvantage. Beta's development teams are primarily in Europe, so this will be a strong disadvantage for their costs. Gamma's development teams are primarily in Europe, but those costs are offset by teams in Israel and Korea. Delta's development teams are almost exclusively in China, creating a significant cost advantage relative to the other competitors.

As a vertically integrated company with significant scope, Delta will have a strong advantage related to BOM cost. It is difficult to extrapolate the precise levels of BOM cost for Beta and Gamma, but information provided by certain vendors indicates that Alpha may be at a disadvantage in this regard.

Alpha Wireless has an extremely high degree of R&D expertise which is valuable to the OEM customers in terms of their product design. As specialists, Gamma and Beta also have some expertise, although their technology development tends to lag behind Alpha.

Alpha and Beta have both succeeded in creating products with features which are valuable to OEMs, particularly in Automotive. Delta creates general products and suffers from a significant disadvantage in this area.

In terms of R&D efficiency, it is assumed that Delta is at an advantage given their wide scope and the reputation of their teams. The high level of R&D spending for Alpha Wireless is an indicator that their teams may be at a disadvantage in terms of efficiency in relation to Gamma and Beta.

Serving a smaller number of large customers rather than many small customers is related to total customer service cost. A significant portion of Alpha's business comes from small customers, where Beta is known to have won several major accounts.

In terms of intellectual property, public information indicates that Alpha and Beta have taken similar positions. Gamma claims to indemnify the customers, but they do not have the necessary licenses in place to support that claim. Delta's advantage comes from the scope of their operation, and the broad set of licenses they own.

Indirect and operations overhead costs are difficult to assess for other companies. However, observing the reported gross margins and competitive price levels indicates that Alpha is likely at a disadvantage in this category.

Customer support experts and resources are an important advantage to get customers to market quickly. All three of the companies who focus exclusively on this market share this advantage, where Delta is missing this team.

With the participation in related industries where network operators are direct customers, both Alpha and Delta have developed an advantage to develop close relationships with those operators and to closely understand their requirements. Gamma and Beta have not developed this advantage.

With a dedicated focus on automotive products, both Alpha and Beta have developed proven expertise on meeting strict requirements for manufacturing quality. Gamma's capabilities are unproven in this regard, though they claim that they are just as good. Delta is at a disadvantage, as locally developed products from China have a long-earned reputation of sacrificing manufacturing quality for cost.

R&D overhead costs are related to managing an R&D team, and engaging in retraining when staff leave and need to be replaced. Delta is considered to be at a disadvantage in this regard, given the high turnover rates in China and the hierarchical management structure that Chinese teams require.

All of the vendors in this industry use contract manufacturers in China or other low-cost countries. Delta's size will give them a strong advantage in manufacturing costs. Alpha and Beta will also have an advantage, as they are the largest vendors in the industry. As a much smaller competitor, Gamma is assumed to be at a disadvantage.

The strong balance sheet gives Alpha an advantage on their financial structure. The acquisition of Beta by NationalTech also provides an advantage to

that team. Delta is also a massive organization, partially supported by Chinese government contracts, thus is at a strong advantage financially. Gamma's lack of liquid assets puts them at a strong disadvantage in terms of financial structure.

We can see that Gamma and Beta will continue to be meaningful competitors in this market, as they are closely ranked with Alpha on many similar advantages. For the threat of new entrants, the vendors like Delta are a credible threat. They currently lack the expertise and product features which create an advantage for the differentiated competitors; however these vendors enjoy a low cost-basis generated by economies of scope (via complementary businesses such as handsets and infrastructure) and strong financial backing. For OEMs who care most about the price, vendors such as Delta are likely to win the business. It may only be a matter of time while Delta develops product expertise or product features. The drawback to vendors like Delta participating in this market is that M2M modules are a relatively small niche market (~$1B total) compared to the scale of a mega-corporation ($32B). In other words, this market may not currently be large enough to be interesting – I believe this is ultimately the reason why the other two vendors of this nature entered and exited the market in the past five years.

4.2. PEST Analysis and associated opportunities and threats

This section considers the impact of external factors in the industry from the perspective of political, economic, social and technological forces. The resulting opportunities and threats are identified.

4.2.1. Political

Several political factors affect the embedded modules industry. In several regions, pending legislative regulations likely will spur growth for this industry. In particular, the European Commission is planning to make emergency calling capability mandatory for all new vehicles. In Brazil, Resolution 245 will make stolen vehicle tracking capability mandatory. These capabilities are generally delivered by an embedded module and the legislative changes create an opportunity for a vendor to focus on this area.

Political factors can create headwinds for the embedded modules industry. In most countries, wireless spectrum is federally regulated, and the independent choices of regulators in each country can lead to a complex landscape of local regulations and variety in product requirements. This challenge is increasing with the deployment of LTE as wireless spectrum is becoming scarcer. The resulting threat is in the difficulty for embedded module vendors to manage the resulting product portfolio complexity.

4.2.2. Economic

The embedded modules industry is affected by economic factors as funding for M2M projects is strongly tied to macroeconomic cycles. This was particularly evident in the global economic downturn of 2008-2009. When the economy is not as strong, there is an observable reduction in shipments for existing programs, as well as a reduction in new project starts. Financial strength in a company's balance sheet can be used to offset this threat.

4.2.3. Social

Social factors impact the embedded modules industry, although these are usually exploited in the end-industries which take up the embedded modules. For example, environmental considerations and desire for efficiency can drive customers to use sophisticated fleet-tracking systems to plan trucking routes. Trends towards digital payment systems drive the adoption of mobile point-of-sale terminals.

4.2.4. Technological

The relentless pace of technological advancement is the strongest external driver of the embedded modules industry. Products in this industry use highly sophisticated technology, and it is imperative that the vendors keep up with technology. Some of the key ways that technology is driving this change include:

- Faster, more efficient wireless networks (2G>3G>4G>LTE>LTE Advanced)
- More energy-efficient technologies, making more applications suitable for mobility
- More power microprocessors available at shrinking costs

These technology trends result in changes to the types of customer who may use embedded modules and a continual evolution in the way that products need to be designed to address the market. The pace of change creates both an opportunity for an embedded module vendor, as new product needs are constantly emerging, and also a threat in that new product developments become obsolete quickly.

4.3. Summary and Conclusion via SWOT

The table below summarizes the strengths, weaknesses, opportunities and threats which were identified in the earlier sections on relative competitive analysis, five forces analysis and PEST analysis.

Table 12: Summary of SWOT

Strengths	Opportunities
• Development expertise • Support resources • IP Licensing position • Differentiated product features • Financial structure (balance sheet)	• Emerging technologies & quick pace of change • Strong growth in all M2M segments • Legislative changes in Auto Industry • Deployment of LTE & LTE Advanced
Weaknesses	**Threats**
• Per-Unit Costs during production • High R&D spending as fraction of revenue	• Technology goes obsolete quickly • New entrants who push down market pricing. • Customer backwards integration (substitutes) • Powerful suppliers

The M2M Embedded Modules industry is a highly rivalrous industry with many strong forces being exerted on it from the outside, particularly from major suppliers, major customers and the threat of new entrants. The industry is predicting strong growth and has high potential in specific areas such as regulated installation of product into vehicles.

At the outset of the analysis, the challenges identified by Alpha Wireless were how to create returns for shareholders and how to grow revenue and profitability in the face of rapidly changing technology, stiffening competition, increasing product commoditization and the resulting margin erosion. The analysis completed in this section confirms that those are genuine challenges for embedded module vendors such as Alpha Wireless.

Success in this industry will go to a vendor who can sufficiently reduce costs to survive despite sinking product prices, or to a vendor who can continue to differentiate their products sufficiently to command premium prices. Success will also come with securing the largest, most lucrative customers in the industry, as that will allow development and support expenses to be deployed most efficiently. Successful participation within this industry will require the vendor to have a strategy which accommodates the pace of technological evolution.

The next section will consider several strategic alternatives which may be able to reinforce strengths, reduce weaknesses, embrace opportunities or mitigate threats.

5. Option Analysis (Strategic Alternatives)

5.1. Strategic options identification

This section identifies several distinct strategic options from which the final recommendation will be developed. These strategic options are designed to respond to the strengths, weaknesses, opportunities and threats identified in the prior section.

5.1.1. Option A: Offer more extensive choices of processing capability.

The first option is to create an even broader array of differentiated embedded modules by creating a new product line. This approach would require a significant new investment to expand the company's product line offering to sell new products with enhanced features within the existing industry. Products pursued as part of this strategic option would need to be set apart from the competitor offerings along a dimension which reflects an advantage that customers are willing to offer premium prices.

As identified in Table 9, the source of advantage generated by product features is related to the customer's need for reduced integration cost and reduced total platform cost. By reducing the OEM's expenditure on integration and other platform component costs, Alpha may be able to capture some of that

expenditure as value reflected in the price of the embedded module. By commanding premium prices, this option would offset the weakness of having higher unit costs. It will also mitigate the threat of new entrants which generally tend to enter the market with undifferentiated products, and will raise the switching cost to move to a competitor's product.

To execute this option, Alpha would develop a brand new product line using a stronger microprocessor in order to completely remove the need for other processing capability in the customer's platform. Alpha offers some products that have a limited amount of processing capability, but by offering a wider array of processor and memory configurations, it would be able to match more closely to a OEMs precise need. Smart phones use this approach by using Snapdragon processors which are integrated with the wireless communications engine.

The criteria which would be used to choose the exact project pursued under this option would be one that is not easily copied by a competitor, for sustainable differentiation, and where the value to the OEM can be captured as a premium price. As a distinct strategic option, this approach would require a significant investment to create a brand new product line, rather than reflecting evolutionary features in existing products.

5.1.2. Option B: Expand to Complementary Services via Acquisition

The second option is to expand Alpha Wireless' position in the value chain by offering services which are related to the M2M modules industry, but which

are complementary to the hardware product offering, and make it even easier for an OEM to get to market quickly with the hardware product offering. Through the offering of design or manufacturing services, the wireless M2M capability can be made accessible to more companies which lack the technical expertise to fully design in an embedded module.

As Alpha Wireless does not have significant expertise in this type of service offering and developing that expertise could take a long time, this option will consider the viability to extend the company through the acquisition of a company, technology or team. Some example candidates which could be considered in this category is to offer software design or hardware manufacturing services, or to offer custom-designed finished goods based on the OEMs requirements.

The criteria for choosing which complementary offering may be attractive as an acquisition target will depend on revenue potential and which ones may be enablers for existing business versus a distinct standalone business. In order to mitigate the current weakness of high unit costs and high operating expenses, this option should be evaluated on its potential to increase margins or reduce operating expenses. Finally, Alpha would need to confirm whether the option can enhance the existing strength of technical expertise to execute the enhancement in product or service offering.

This option will embrace the opportunity of the quick pace of technological change, and will take advantage of Alpha Wireless' strong financial position with a high amount of cash available. This option would take advantage of Alpha's existing expertise on M2M and wireless topics and could sell more products to existing customers or extend the product offering to customers which are not accessible today.

5.1.3. Option C: Feature development and targeted promotion for the Smart Energy end-industry

The third option is to tune existing products to more closely suit the smart energy end-industry, and to develop a dedicated marketing and sales team to focus on penetrating those specific customers. The smart energy industry is of particular interest as it is showing strong growth, and has a high degree of customer concentration.

Alpha has already successfully executed a similar approach for Automotive OEMs and for the laptop/tablet computer industry.

This option would enhance promotional messaging around specific sources of advantage which are related to the needs that are more highly valued by the smart energy industry than the general M2M customer base (stable software, long product lifetime, low field failure rate), and develop specific relationships with collaborators (governing bodies who grant safety approval, or utility companies). Specific product features that are unique to the smart energy segment (such as an interface protocol, or operating voltage level) – could be

brought in as options on existing products. This will create additional differentiation in Alpha's product line for this type of customer.

This option would extend the existing strengths of development expertise and support resources, to embrace the opportunity of segment growth within the smart energy segment, and to lower per-unit customer support costs by serving very large customers. Similar to the automotive market, there may be future legislative changes that will further boost the smart energy segment.

5.1.4. Option D: Execution focus – Cost Reduction

The final option is to improve the internal execution to increase the cost efficiency of products. This strategy would require a philosophy change to squeeze out costs through the reduction of both unit costs and operating costs. Alpha Wireless is currently a premium provider – they price similar products higher than the competition, yet spend a higher amount on R&D than their two nearest competitors and also report the lowest gross and net margins.

Unit costs may be reduced through the selection of cheaper components or negotiation with suppliers, or by using new chipset suppliers. Two competitors have switched to an alternate chipset vendor, which is believed to be lower cost than the existing offerings from the dominant supplier. Indirect and overhead costs are also a significant fraction of the unit cost where Alpha is experiencing a disadvantage. Under this strategic option, Alpha Wireless would need to

reconcile the cost/benefit of all activities which affect overhead costs and identify specific improvements to reduce the allocation rates.

Alpha maintains the broadest M2M modules portfolio in the industry, invests heavily to develop emerging technologies, and maintains a large team of support engineers close to the customers. The result is the highest expenditure on R&D among the top three competitors. Every product in the portfolio has an associated R&D cost, even if the product does not result in significant revenue. Products based on new or emerging technologies are amongst the most expensive to develop. These products require longer development cycles, require the most skilled (and thus expensive) engineers and may require additional cost for prototype builds or third party lab testing.

R&D operating expenses can be reduced through developing fewer products, developing products after the technology matures or transitioning more development activities to low-cost regions. If some products were removed from the roadmap under this option, Alpha Wireless would also focus on executing their remaining products with maximum efficiency.

This option will address current weaknesses both in unit costs and in operating expenses. If a new chipset supplier is brought online, it could also address the high power of the existing, dominant supplier. It also may allow Alpha Wireless to pursue more business as they would be able to price more competitively. If Alpha Wireless is not investing heavily in emerging technologies,

there is a risk that this option could exaggerate the risk that they could not keep up with the fast pace of technology evolution.

5.2. Option Evaluation

To evaluate the options, it is necessary to first identify and prioritize the goals and evaluation criteria. The evaluation criteria are based on the SWOT identification, as well as several key corporate goals.

As discussed in section 2, the primary challenges experienced by Alpha are related to revenue and profit growth, the pace of technology change, difficult competition and product commoditization. Alpha is a public company in a volatile industry, so remaining financially strong is also important. The criteria that are used for evaluation are shown in the two tables below. The first table gives the high level criteria, including the fit to SWOT. The second table gives a further breakdown of fit for the options to SWOT. Although many of the items listed in the SWOT contribute to some of the other categories indirectly, the SWOT fit is considered to verify how well the strategic option is aligned with the prior analysis.

Table 13. Evaluation criteria for Options Analysis

Title	Importance	Weight	Description
Revenue Growth Potential	High	30%	Growth of top-line revenue. Growth rate to meet/exceed predicted growth rate of industry. Requires that increase in unit shipments exceeds unit price declines.
Increase or Defend Market Share	Medium	15%	Stay the industry leader with the #1 position in market share. Separate target from revenue growth due to overall growth rate of industry.
Increase Net Income via GM% improvement	Medium	15%	Reduce unit costs or increase unit selling prices.
Increase net income via Op Ex reduction	Medium	15%	Improve the cost required to develop each product. Launch products based on the first revision.
Address to SWOT	Medium	15%	How well does the option address items identified in SWOT – see separate sub-assessment
Innovation	Low	10%	Corporate reputation as an innovator & trailblazer to new technologies. First to launch products in new categories

Table 14. Criteria for fit to SWOT sub-assessment

Title	Weight	Description
Development Expertise	8%	Take advantage of existing strength of development expertise
Support Resources	4%	Take advantage of existing strength in support resources
IP Licensing	2%	Take advantage of existing strength in IP licensing
Differentiating product features	7%	Take advantage of existing strength in differentiating product features
Balance Sheet	4%	Take advantage of existing strength in balance sheet
Unit Costs	15%	Offset weaknesses in unit cost structure
R&D Expenses	10%	Offset weaknesses in operating cost
Emerging Technologies & fast pace	10%	Grasp opportunity provided by emerging technologies and fast pace of the industry
Segment Growth	5%	Grasp opportunity provided by the fastest growing industry segments
Legislative Changes	5%	Grasp opportunity provided by legislative changes for emergency calling and stolen vehicle tracking
LTE / LTE Advanced deployment	5%	Grasp opportunity provided by deployment of LTE and LTE Advanced networks
Technology obsolescence	10%	Mitigate threat from technology going obsolete quickly
New entrants / price reduction	5%	Mitigate threat from new entrants who drive down market prices upon entry
Customer Backwards Integration	5%	Mitigate threat from customers developing their own systems (backwards integration)
Strong Suppliers	5%	Mitigate threat from strong suppliers to control roadmap and competitive position

With the options evaluation criteria identified, the next step will be to consider how each of the options score against the evaluation criteria. The scoring used in the analysis is as follows:

- Score of 1: Much worse than current situation

- Score of 2: Worse than current situation

- Score of 3: Same as current situation

- Score of 4: Better than current situation

- Score of 5: Much better than current situation

With this approach, a "3" could be given to every dimension for the current situation (status quo / no action); therefore a strategic option which will set Alpha Wireless in a better situation than the status quo is one with a total net score higher than 3. The table below gives the scores for the options considered in terms of their fit to the SWOT.

Table 15. Analysis of Options vs. SWOT Criteria

Item	Weight	Score for "New Product Line"	Score for "Acquire Complementary"	Score for "Smart Energy"	Score for "Execution/Cost Focus"
Development Expertise	8%	5	3.5	3.5	2
Support Resources	4%	2	4	4	4
IP Licensing	2%	3	3	3	2
Differentiating product features	7%	4	3	4	1
Balance Sheet	4%	4	2	3	3
Unit Costs	15%	2	3	3	5
R&D Expenses	10%	1	2	2.5	5
Emerging Tech. & fast pace	10%	5	3.5	3.5	1
Segment Growth	5%	4	4	5	2
Legislative Changes	5%	3	5	3.5	3
LTE / LTE Adv. deployment	5%	4	3	4	1
Technology obsolescence	10%	5	3	2	1
New entrants / price reduction	5%	4	4	3	4
Customer Backwards Integration	5%	4	5	3	2
Strong Suppliers	5%	2	3	3	4
Total Net Score		**3.4**	**3.3**	**3.2**	**2.8**

Table 16. Analysis of Options vs Evaluation Criteria

Item	Weight	Score for "New Product Line"	Score for "Acquire Complementary"	Score for "Smart Energy"	Score for "Execution/Cost Focus"
Revenue Growth Potential	30%	4.5	5	3.5	4
Increase or Defend Market Share	15%	3.5	4	3.5	2.5
Increase Net Income (GM% improvement)	15%	2.5	4	3	5
Increase Net Income (Opex Reduction)	15%	1	2	2.5	5
Addresses SWOT	15%	3.4	3.3	3.2	2.8
Innovation	10%	5	4	3.5	1
Total Net Score		**3.4**	**3.9**	**3.3**	**3.6**

The option which proposes to develop a new product line addresses most of the opportunities and strengths, so it seems appealing in that regard. Yet, many of the activities which contribute to Alpha's strengths are expensive to achieve. Any option which requires additional emphasis on these areas of expense would exaggerate the weaknesses related to cost. This becomes apparent in the second step which considers organizational goals in addition to the SWOT.

The second option, which considers an acquisition to offer complementary services, addresses several of the key items in the SWOT related to customer backwards integration and the threat of new entrants. An acquisition would consume much of the balance sheet cash, so would diminish that particular strength. As a complementary service, it would require expertise to be brought into the company rather than exploiting current strengths. If the acquired team

brings revenue with them, this option helps to meet company goals to be a larger participant in the broader M2M ecosystem.

The option of developing product features and promotional strategies for the Smart Energy market, helps to address the growth of this segment but leaves many aspects of the SWOT as the same as the status quo. While this option likely would result in some financial improvement for the company, it could be offset by the greater investment needs.

The final option heavily emphasizes internal company changes to reduce costs. Cost improvements address all of the current weaknesses, and would lend themselves to revenue and growth improvement as the company could compete more effectively in price sensitive accounts. Unfortunately, this option would require the company to sacrifice company goals of innovation and strengths in product differentiation. It would also emphasize threats related to the pace of technology obsolescence.

Based on the scoring shown in the two tables above, the strategic option that should be preferred is to offer complementary services through an acquisition. In the next section, we will analyze the feasibility of implementing this preferred option.

6. Feasibility analysis

This section assesses internal capabilities of Alpha Wireless and determines the aspects that are sufficient or could be made sufficient to implement the strategic options. The options are assessed in terms of their fit with management experience and preferences, organizational capabilities and organizational resources.

The gaps which are discussed in this analysis are identified according to the following criteria:

- Chasm: A gap exists which is insurmountable.

- Major: A significant gap exists, but it is not insurmountable

- Minor: A small gap exists

- None: No gap exists

In addition to confirming feasibility, additional recommendations are given for changes necessary to implement the recommended strategic option.

This feasibility analysis follows the Diamond-E framework set out by Crossan, Rouse et al (2013). Management preferences and experiences are evaluated from the perspective of the CEO and Executive team, and the five primary teams which comprise the embedded modules business (sales,

marketing, R&D, operations and systems engineering). The CEO and many members of the executive team have developed their careers through the sales organization, so preferences of the sales team may carry a higher weight than other teams. Also, as technology organization which historically has been heavily focused on developing the latest technology and launching new innovations, the preferences of the R&D team will also factor significantly into the feasibility assessment.

Organizational capabilities are assessed in terms of organizational structure, systems and process capabilities and organizational culture. Organizational resources are considered in terms of operational resources including physical and intangible assets, human resources and financial resources.

6.1. Feasibility related to Option A – "New Product Line"

The first option is to introduce a new product line offering more extensive choices with respect to embedded processing capability. From the perspective of existing management experiences and preferences, six management teams are considered. Three teams are identified which have some deficiency in their preferences. None of the gaps are considered too wide to bridge and the suggestions to close the gaps are shown in Table 17.

Alpha has long been oriented toward product development, and there is close alignment between this option and Alpha's organizational capabilities. This

option is especially well aligned to Alpha's organizational culture, which takes great pride in developing advanced, innovative products. Given the technical complexity of launching this type of initiative, several minor suggestions are identified to maximize close alignment between the teams that would develop, sell and support the technically complex product.

Alpha Wireless has enough operational and financial resources to execute this option. Unless there was a major change to other projects already on the roadmap, there would need to be a significant expansion in Human Resources. While this is not an insurmountable gap, closing this aspect may be difficult without overly diluting the existing expertise of the technical teams.

Overall, this option remains feasible, and the final viability will depend on the top executive team's appetite to engage in the significant investment required to add a new product line, and the impact that it would have on operating expenses during the development phase until production starts and that investment starts to payback. An in-depth business case would be required to fine tune the assessment of the investment requirement & expected payback cycle. Based on previous projects of a similarly ambitious nature, preliminary estimates place the investment at $15-20M, with payback taking three to five years. The full market analysis of the detailed product definition, business case and expenses is beyond the scope of this analysis.

Table 17. Management Preferences and Experience under Option A – "New Product Line"

Management Group	Required Preferences / Experience	Observed Preferences / Experience	Gap Identification	Gap Closing Recommendation
Executive Team (CEO/SVP level)	Desire to stay at forefront of innovation curve. Willingness to commit to technology investment	Drive to increase shareholder value after several "investment" years.	<u>Major</u>: Significant investment required with potentially long payback cycle (3yrs to revenue, 5 yrs to payback)	In depth study of business case to determine precise investment required and success criteria. Est. investment = $15-20M
Sales Team	Desire to win complex customer accounts.	Some experience in complex deals, tendency to revert to less complex customers.	<u>Minor</u>: Increase desire to win complex deals.	Link ongoing revenue for this product line to sales compensation.
Marketing Team	Promote Alpha as leading technology innovator.	Clearly show the preference to have innovation & leadership position.	None	n/a
R&D Team	Experience in executing highly advance, highly integrated products & preference to continue	Similar products previously launched, of a different scope. Option takes advantage of existing preferences	None	n/a
Operations Team	Experience in sourcing of components and manufacturing for new, technically advanced products.	Experience on sourcing/ mfg for similar products. Drive to reduce manufacturing costs & complexity	<u>Minor</u>: New product line at odds with desire to reduce manufacturing complexity.	Consider to streamline portfolio in other areas (obsolete old products).
Systems Engineering Team	Prefer to work in complex accounts, as it increases the importance of this team.	Experienced team, with advanced technical skills. Builds on existing strengths.	None	n/a

Table 18. Organizational Capabilities under Option A - "New Product Line"

	Required Capabilities	Observed Capabilities	Gaps Identification	Gap Closing Recommendation
Organizational Structure	Development team with integrated most advanced hardware, firmware and software expertise. Sys. Eng team alignment with Sales team to support sales process	Current development teams are set up regionally. Sys Eng team already reports into Sales organization. Sales managers don't have direct 1:1 support of SE.	<u>Minor</u>: Expertise sharing across development sites. <u>Minor</u>: Direct support of Sys Eng in Sales process	Build project team with direct interfaces between peers, not just regional managers. Closer integration of SE team with Sales team. Direct identification of support by target account.
Systems Capabilities	Development tools to support new product line development.	New product would be able to leverage existing systems for previously developed products.	None	n/a
Organizational Culture	Drive to be first to market & pride in having unique products.	Innovation & being first to market are strongly valued.	None	n/a

Table 19. Organizational Resources under Option A – "New Product Line"

	Required Resources	Observed Resources	Gap Identification	Gap Closing Recommendation
Operational Resources	Channel to target customers, deep development and support expertise. Leveraging existing brand for innovative product launch	New product line is well aligned with existing operational resources including channels, brand and IP position	<u>Minor</u>: Sales team may need more expertise to close technically complex deals.	Training for sales team supplemented by Sys Eng support
Human Resources	Large dedicated team required for successful execution of new product line. Team would need deep expertise on advanced projects. SE team may need to dedicate support through pre-sales cycle.	Existing teams are highly capable, with strong expertise. No spare capacity to add a major new project without adding a new team. SE team is capable, but is already fully deployed.	<u>Major</u>: Existing development teams are fully deployed. <u>Minor</u>: Systems Eng team – support intensity may increase.	Cancel existing projects or Transfer existing strongest resources to new project, Hire additional resources to backfill. Increase size of SE team. (Personnel cost included in total investment estimate).
Financial Resources	Estimated total investment required to execute this option and to close identified gaps $15-$20M. Project would be spread over several years & would impact Opex during that period.	Significant cash balance on balance sheet. Available cash is well in excess of required investment.	<u>Minor</u>: Op Ex intensity would affect net income during development period, potentially impacting share price.	Communicate to shareholders of need to invest for future growth.

Table 20. Summary of Gap Closing Recommendations for Option A - "New Product Line"

Category	Type of Gap	Gap Description	Recommendation
Financial Impact of Implementation	Major	Significant investment required with potentially long payback cycle (3yrs to revenue, 5 yrs to payback)	In depth study of business case to determine precise investment required, projected payback and success criteria. Est. investment = $15-20M
	Minor	Op Ex intensity would affect net income during development period, potentially impacting share price.	Communicate to shareholders of need to invest for future growth.
Personnel Requirements for successful implementation	Major	Existing development teams are fully deployed.	Cancel existing projects or Transfer existing strongest resources to new project, Hire additional resources to backfill.
	Minor	Systems Eng team – support intensity may increase. Need direct support of Sys Eng in Sales process. Sales Team expertise to close technically complex deals	Increase size of SE team. Create Closer integration of SE team with Sales team. Direct identification of support by target account. Training for Sales team, supplemented by Sys Eng team support.
	Minor	Expertise sharing across development sites.	Build project team with direct interfaces between peers, not just regional managers.
Other Gaps	Minor	New product line at odds with desire to reduce manufacturing complexity.	Consider to streamline portfolio in other areas (obsolete old products).

6.2. Feasibility Related to Option B - "Acquire Complementary"

The second option is to offer design and manufacturing services for OEMs that wish to expand their M2M offerings, but lack the expertise to integrate an embedded module or the internal resources to deploy more projects. This line of business would be a substantial new offering in addition to current line of business, so this option considers the viability to acquire the team that would deliver these services. It is anticipated that securing a team that can deliver both revenue and expertise would require an acquisition of $25-50M in magnitude. This estimate is based on observations of acquisition activity in related industries.

Alpha Wireless recently announced they are divesting some assets with the transaction expected to add $100M in cash to the balance sheet after completion. In the public announcements surrounding this transaction, the executive team has openly stated their desire to use this cash to pursue additional M2M-related acquisitions.

Considering the possibility to offer design or manufacturing services to OEMs, there are gaps in the sales, R&D, operations and systems engineering team. These gaps are related to the expertise in delivering the new services, and it is assumed that the acquired team would carry in the expertise to fill those gaps. With the addition of a potentially large team, some gaps would develop in the organizational structure and systems. These gaps would be addressed

through the integration process. Integration costs are estimated at $3-5M in addition to the acquisition transaction cost. This part of the cost estimate is based on integration expenses Alpha has reported from prior acquisitions.

Based on the preliminary analysis, this option appears to be viable. As with any acquisition-based strategy, the details of the option will depend strongly on what companies are available to be acquired and under what terms. Alpha should look for a company which complements the existing offering, and which is successful in their own right, so that they may add to Alpha's financial position rather than take away from it. Identification of specific acquisition targets and the proposed valuations is beyond the scope of this strategic analysis.

Table 21. Management Preferences and Experience under Option B – "Acquire Complementary"

Management Group	Required Preferences / Experience	Observed Preferences / Experience	Gap Identification	Gap Closing Recommendation
Executive Team (CEO/SVP level)	Broaden engagement in M2M markets by expanding to service offering.	Publically stated desire to pursue acquisitions related to M2M.	None	n/a
Sales Team	Experience in selling services, which are a different type of product than M2M modules.	Services are to be sold to existing customer base. Existing team has a desire to pursue more services to the same customers.	None	n/a
Marketing Team	Experience in promoting services, which are a different type of product than M2M modules.	Services to be promoted to existing customer base. Desires to continue focusing on these customers.	None	n/a
R&D Team	Desire to establish leadership in M2M market.	Prefer to be known as the leaders in M2M, which is boosted by offering more services.	None.	n/a
Operations Team	Requires motivation to pursue specialized capability.	Internal team motivated to learn, but lacking experience.	None.	n/a
Systems Engineering Team	Technically astute team, which is tuned in to meeting understanding and meeting customer needs.	Deep expertise and strong relationships with customers. Advocating on behalf of customers.	None	n/a

Table 22. Organizational Capabilities under Option B - "Acquire Complementary"

	Required Capabilities	Observed Capabilities	Gaps Identification	Gap Closing Recommendation
Organizational Structure	Acquired team will need to be integrated into existing organization. Structure will need to be altered to accommodate.	Multiple acquisitions in past 5 years. Some acquisitions left as standalone, some fully integrated.	Minor: To maximize leverage with existing modules business, close integration will be necessary.	Integrate new teams within existing organizational structure after acquisition.
Systems Capabilities	Acquired team will need to be integrated into existing systems and processes. Adaptation will be required on behalf of both new and existing systems.	Internal data systems have been significantly enhanced following recent acquisitions. Process development takes lessons learned from every team.	Minor: Systems of acquired team may be incompatible with existing practice.	Transition systems used by acquired team to follow existing practices within Alpha. Identify if there are best practices in the new team which can enhance. Cost $3-5M
Organizational Culture	Flexible teams willing to embrace the addition of a new set of colleagues. Focus on the opportunity and impact of M2M.	Innovation and developing leading technologies are highly valued. Teams are flexible in working with colleagues at a distance.	None	n/a

Table 23. Organizational Resources under Option B – "Acquire Complementary"

	Required Resources	Observed Resources	Gap Identification	Gap Closing Recommendation
Operational Resources	Established presence in the M2M market. Ability to execute the broader product & service offering.	Alpha Wireless is a market leader in M2M, offering modules and other complementary products.	None	n/a
Human Resources	Skilled teams needed to deliver the expanded design and services capability. Affects R&D, Sales, Sys Eng, Operations.	Existing teams are fully deployed on other projects and expertise is centered on delivering M2M modules.	Major: Alpha currently lacks the expertise in the teams which would be necessary to deliver the design/mfg services to be added.	Sales, R&D, Systems engineering and operations teams to be enhanced through acquisition. Cost of acquisition estimated to be $25-50M
Financial Resources	$25 to $50M to complete the acquisition. Target for acquired team to be accretive to income statement (positive impact on operations) Actual Amounts would depend on the structure of the team acquired.	Cash balance of approximately $160M on balance sheet after closing of Epsilon transaction.	None	n/a

Table 24. Summary of Gap Closing Recommendations for Option B - "Acquire Complementary"

Category	Type of Gap	Gap Description	Recommendation
Personnel Requirements for successful implementation	Minor	Potentially lacking expertise in areas where services would be delivered.	Expand R&D team expertise via acquisition. Cost of acquisition estimated to be $25-50M
	Minor	Sales Team experience in positioning services.	Enhance Sales Team capability through the acquired team.
	Minor	Existing team expertise is deep wireless, but may require different skills to offer mfg services.	Expand operations team expertise via acquisition.
Integration Requirements	Minor	To maximize leverage with existing modules business, close integration will be necessary.	Integrate new teams within existing organizational structure after acquisition.
	Minor	Systems of acquired team may be incompatible with existing practice.	Transition systems used by acquired team to follow existing practices within Alpha. Identify if there are best practices in the new team which can enhance existing systems. Cost $3-5M

6.3. Feasibility related to Option C - "Smart Energy"

The third strategic option is for Alpha Wireless to develop a strategic focus on the Smart Energy industry. Specific aspects of this option would be to modify product features to better meet that industry's needs, to establish a dedicated sales and marketing team to more directly penetrate the Smart Energy market.

The costs related to this strategic option would be related to additional headcount to dedicate to penetrating this market. Cost for that headcount would be $5 to $10M over three years, based on the staffing levels used for other previous market penetration activities.

There are few gaps identified with this strategic option, and from that perspective appears to be feasible. However, it ranked the lowest on the scoring of the options to meet the SWOT and corporate goals. Of all the options considered, this one would have the least impact compared to the status quo. From that perspective, this option is unlikely to be pursued.

Table 25. Management Preferences and Experience under Option C: "Smart Energy"

Management Group	Required Preferences / Experience	Observed Preferences / Experience	Gap Identification	Gap Closing Recommendation
Executive Team (CEO/SVP level)	In depth focus on existing industry, without expansion.	Continued improvement in financial position.	Minor: Option does not deeply address financial goals, aside from winning additional business.	Consider to supplement option with other approaches (ie cost reductions)
Sales Team	Desire to specialize in Smart Energy Market	Prior focus on other segments such as Automotive and PC OEM. Willing to extend that focus to Smart Energy.	None	n/a
Marketing Team	Desire to specialize in Smart Energy Market	Prior focus on other segments such as Automotive and PC OEM. Willing to extend that focus to Smart Energy.	None	n/a
R&D Team	Desire to specialize in Smart Energy Market	Prior focus on other segments such as Automotive and PC OEM. Willing to extend that focus to Smart Energy.	None	n/a
Operations Team	n/a – does not impact	n/a – does not impact	None	n/a
Systems Engineering Team	Desire to pursue Smart Energy Market	Prior focus on other segments such as Automotive and PC OEM. Willing to extend that focus to Smart Energy.	None	n/a

Table 26. Organizational Capabilities under Option C: "Smart Energy"

	Required Capabilities	Observed Capabilities	Gaps Identification	Gap Closing Recommendation
Organizational Structure	Dedicated team members for Smart energy within existing structure	Dedicated team members for Auto and PCOEM already exist within existing structure.	None	n/a
Systems Capabilities	No additional enhancements over existing systems are required.	Existing systems and processes in place for M2M modules business.	None	n/a
Organizational Culture	Focus on smart energy market to become #1 in that area.	Innovation and being a market leader are valued. #1 vendor to Auto and PCOEM market.	<u>Minor</u>: pursuing #1 position in too many markets may be viewed as dilutive	Communicate that maintaining a leadership position overall, requires leadership in many sub-areas.

Table 27. Organizational Resources under Option C: "Smart Energy"

	Required Resources	Observed Resources	Gap Identification	Gap Closing Recommendation
Operational Resources	Smart energy market is within the industry where Alpha already participates– leverage existing resources of brand, IP, expertise etc	As the market leader, existing position is already strong.	None	n/a
Human Resources	Dedicated Sales and Marketing personnel to execute smart energy focus	Existing R&D team able to execute new features on products. Sales & Marketing team would need expansion.	Minor: Sales and Marketing Team needs to expand to add capability penetrate Smart Energy market.	Add additional personnel – estimated cost $5-10M over 3 years.
Financial Resources	Estimated total investment required to execute this option and to close identified gaps $5-10M Project would be spread over several years & would impact Opex during that period.	Significant cash balance on balance sheet. Available cash is well in excess of required investment.	Minor: Op Ex intensity would affect net income during development period, potentially impacting share price.	Communicate to shareholders of need to invest for future growth.

Table 28. Summary of Gap Closing Recommendations for Option C - "Smart Energy"

Category	Type of Gap	Gap Description	Recommendation
Financial requirements	Minor	Op Ex intensity would affect net income during development period, potentially impacting share price.	Communicate to shareholders of need to invest for future growth.
Personnel requirements	Minor	Sales and Marketing Team needs to expand to add capability penetrate Smart Energy market.	Add additional personnel – estimated cost $5-10M over 3 years.
Other Gaps	Minor	Org Culture may be impacted by - pursuing #1 position in too many markets - viewed as dilutive	Communicate that maintaining a leadership position overall, requires leadership in many sub-areas.
	Minor	Option does not deeply address financial goals, aside from winning additional business.	Consider to supplement option with other approaches (ie cost reduction)

6.4. Feasibility Analysis Related to Option D - "Execution Focus"

The final strategic option is to improve the cost efficiency of manufactured products and to streamline costs during development. This option would focus on reducing both operating costs and unit costs, by selectively reducing the number of products that are developed, changing components that are selected to be designed in to each product and re-evaluating other drivers of internal cost.

The executive team has a strong preference to continue to drive for lower costs and higher profitability. Amongst the remaining teams, which would carry the burden of finding ways to boost efficiency or otherwise reduce costs, this option will prove to be unpopular. If projects need to be cancelled, the resistance to this approach would spread across the sales, marketing and R&D teams.

As the most expensive development projects are related to developing the latest technology, this strategic option is at odds with both the internal culture and external brand and reputation, which prizes innovation and technology leadership very highly. Due to that disconnect, this strategic option is not viable in the form it has been considered here.

Table 29. Management Preferences and Experience under Option D – "Execution Focus"

Management Group	Required Preferences / Experience	Observed Preferences / Experience	Gap Identification	Gap Closing Recommendation
Executive Team (CEO/SVP level)	Cost focus, even if it means to not be developing as many products or being on the newest technology.	Strongly focused on improving financial position of the company.	<u>Minor</u>: Risk that a streamlined product portfolio may affect revenue (can't win as many customers)	Balance portfolio reductions with by ability to compete more effectively on price.
Sales Team	Achieve revenue targets with fewer products to sell.	Easier to sell greater variety of products to sell, but may be offset by ability to compete more effectively on price.	None	n/a
Marketing Team	Promote Alpha as most efficient, most reliable company.	Promote Alpha as innovation leader with broad portfolio.	<u>Minor</u>: Reduced portfolio is at odds with current plans to show innovation leadership.	Engage marketing team support by showing increased profitability targets.
R&D Team	Efficiently execute products, even if not the newest technologies	Prefer to be focused on the newest technologies. Team has previously been focused on efficient execution.	<u>Minor</u>: Need specific targets for operating expenses improvement	Number of projects under development need to be reduced for significant changes
Operations Team	Manufacture products with the lowest cost components and supply chain.	Team has continuously been focused on cost optimization. Further changes may affect product quality.	<u>Minor</u>: Quality of products is at risk to be compromised if low cost components are used	Set specific guidelines on what type of changes can be made to reduce costs
Systems Engineering Team	n/a – option does not impact Sys Eng team	n/a	n/a	n/a

Table 30. Organizational Capabilities under Option D - "Execution Focus"

	Required Capabilities	**Observed Capabilities**	**Gaps Identification**	**Gap Closing Recommendation**
Organizational Structure	R&D team dedicated to focus on operational efficiency. Operations team dedicated to focus on manufacturing excellence	R&D team and operations team are currently structured as self-contained organizations.	None	n/a
Systems Capabilities	Streamlined tools Minimized overhead on decisions	Due to legacy from prior acquisitions, some of the R&D teams use slightly different processes and tools	<u>Minor</u>: R&D teams not aligned on the development tools they use.	Processes development to reduce overhead on development projects. Transition teams to use common tool set
Organizational Culture	Self-identity as a lean organization which leads the markets by doing mainstream products extremely well	Self-identity as organization focused on leading technology and new innovation.	<u>Major</u>: Shift away from newest products is contrary to organizational culture identity for innovation/latest tech.	Leadership team to demonstrate vision on how operational and cost efficiency creates a new kind of market leadership

Table 31. Organizational Resources under Option D – "Execution Focus"

	Required Resources	**Observed Resources**	**Gap Identification**	**Gap Closing Recommendation**
Operational Resources	Brand and reputation will change to delivering lower cost products, without the most advanced technology being available.	Existing brand and reputation are to deliver the highest quality products with the most advanced technology.	Chasm: Low-cost products which are not technically advanced are at odds with brand and reputation as premium technology leader	None –this gap renders this option non-viable
Human Resources	Streamlined teams achieving efficient output are required. Need to achieve productivity with smallest possible team	Existing teams are fully deployed on existing projects. Project count reduction may result in idle staff	Minor: Personnel costs are a significant fraction of operating expenses	Consider whether team size needs to be reduced to achieve op-ex targets
Financial Resources	Minimal direct investment required. Financial impact would be in reductions to COGs and Opex lines for an overall improvement to net income	Balance sheet is currently strong, but Income statement is only showing small profits.	None	n/a

Table 32. Summary of Gap Closing Recommendations for Option D - "Execution Focus"

Category	Type of Gap	Gap Description	Recommendation
Impact on Internal culture and external Brand and Reputation	Chasm	Low-cost products which are not technically advanced are at odds with brand and reputation as premium technology leader	None –this gap renders this option non-viable
	Major	Shift away from newest products is contrary to organizational culture identity for innovation/latest tech.	Leadership team to demonstrate vision on how operational and cost efficiency creates a new kind of market leadership
	Minor	Reduced portfolio is at odds with current Marketing management desires to show innovation leadership	Engage marketing team support by showing increased profitability targets.
Ability to execute cost reductions	Minor	Personnel costs are a significant fraction of operating expenses	Consider whether team size needs to be reduced to achieve op-ex targets
	Minor	Need specific targets for operating expenses improvement	Number of projects under development need to be reduced for significant changes
	Minor	Quality of products is at risk to be compromised if low cost components are used	Set specific guidelines on what type of changes can be made to reduce costs
	Minor	R&D teams not aligned on the development tools they use.	Processes development to reduce overhead on development projects. Transition teams to use common tool set
Ability to win business	Minor	Risk that a streamlined product portfolio may affect revenue (can't win as many customers)	Balance portfolio reductions with by ability to compete more effectively on price.

7.   Final Recommendation

At the outset of this analysis, Alpha Wireless perceived challenges in continued revenue growth and profitability despite stiff competition, steep price declines and margin erosion. Evaluating the overall industry for embedded modules shows the market is growing strongly, yet the landscape is also influenced by strong suppliers, strong competitors and an ongoing threat of new entrants. Short design-in windows and a tendency to engage in price wars generates intense rivalry between industry competitors.

Alpha Wireless is well placed at the top company of the industry, but faces weaknesses in their cost structure. Four different strategic options were considered, each designed to address different aspects of the company's strengths, weaknesses, opportunities and threats. These options were to internally develop a new product line, to offer new complementary services via acquisition, to focus on penetrating the smart energy segment, or to streamline the company to maximize cost reductions.

Viability of the strategic options considered external factors identified in the SWOT and internal factors identified in the feasibility analysis. The recommended option is to pursue adding complementary services for design and manufacturing to the existing embedded modules customer base. It is recommended that the team be added through an acquisition. Alpha Wireless'

executive team has publically stated their desire to use cash assets to pursue acquisitions, and this type of acquisition would be a good fit to the main business of M2M embedded modules. Alpha Wireless has a recent track record of several large acquisitions.

In identifying a company to acquire, Alpha should look for the opportunity to expand the expertise of the R&D, Sales and Operations team. In order to minimize the financial impact to the operations of the existing company, it would be preferred to acquire a company with revenue and profits that would be accretive to the existing business.

Alpha will need to replicate their past successes in integrating acquired companies to ensure that leverage is maximized between operational structure and company systems. If possible, best practices should be taken from the acquired company's processes to improve the overall functioning of the core business.

Although it is not suitable as a distinct strategic option, a secondary recommendation is for Alpha Wireless to identify methods where costs can be reduced, both for operating expenses as well as manufactured unit costs. The cost structure remains Alpha's primary weakness in relation to their industry, and continued downward price trends may increase pressure in this regard.

With the fast pace of the technology industry, and the financial resources to pursue an acquisition readily available, it is recommended that Alpha Wireless

aim to complete any required acquisition within 2013. The actual timeline for the transaction would depend on the availability of a suitable company being identified, and the transaction being successfully negotiated to successful terms. From observations of past transactions at Alpha and in other industries, it is anticipated that the acquisition transaction would be $25 to $50 million, with an additional $3 to $5 million in integration expenses.

Identification and valuation of specific acquisition targets are beyond the scope of this strategic analysis.

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