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Manufacturing Options for Connected Devices and Consumer Electronics

Introduction

When formulating a plan for manufacturing, sifting through and comparing all of the available options can be a daunting task. Manufacturing in itself is a complex specialty with a significant body of knowledge surrounding it. In the context of connected devices and consumer electronics, however, the manufacturing landscape is described in some common ways. This paper provides a high-level orientation to that landscape as a starting point for determining the most appropriate manufacturing strategy for your product.

Background

Mindtribe has done a substantial amount of work on connected devices and consumer electronics, and clients frequently ask us how to handle manufacturing for their products. Mindtribe does not own or operate any factories, so we partner with manufacturers to physically build the products we design.

In general, it can be helpful to divide manufacturers into a few broad categories, each with a different set of capabilities, strengths, and weaknesses. Then, considering the nature of the product and other factors such as expected volumes, certain manufacturer types will begin to surface as the most promising candidates.

Manufacturer Types

There are broadly four types of companies that we work with to manufacture a product:

CMs (Contract Manufacturers): Contract manufacturers are in the business of manufacturing products for other people. They operate factories and employ staff solely for the purpose of manufacturing a product based on a design that a customer provides. While CMs have areas of specialization, their business model is based on being able to manufacture different types of products in an efficient manner. For instance, Foxconn (a.k.a. Hon Hai) is the world's largest CM for electronics, and they manufacture the Apple iPhone, the Microsoft Xbox One, as well as the Amazon Kindle. Of all the different manufacturer types, we work with CMs most frequently because they are well-positioned to manufacture the unique and novel types of products we develop for our clients.

(Contract manufacturers specializing in consumer electronics are also referred to as electronic manufacturing services, or EMS)

ODMs (Original Design Manufacturers): ODMs operate similarly to CMs, however the key distinction is that they focus on more specific types of products and often have intellectual property (such as reference designs) that customers can leverage. For instance, most laptops and notebooks are manufactured by ODMs that have built reference designs for a basic laptop, and they repackage and customize those designs for their customers like HP, Dell, and Lenovo.

The obvious advantage of an ODM is that you can leverage their IP and designs so that you do not have to design everything from scratch. The downside is that it is not always easy to find an ODM that specializes in your product (this is often the case for customers such as ours who build new-to-the-world products). ODMs, almost by their very nature, exist mainly for technologically commoditized products that are differentiated by non-technical factors (e.g. brand). Another downside is that your design becomes entangled with the IP of the ODM so you cannot easily move to a different manufacturer. If your product looks and operates very similarly to an existing class of commodity products (e.g. a PC keyboard, laptop charger, network router), it is very possible that an ODM exists that could supply you with the base design and make the few modifications needed to deliver your product concept.

OEMs (Original Equipment Manufacturers): OEMs are in the business of selling their own products and typically do not manufacture products for other companies. For instance, Apple and Samsung are OEMs. OEMs are not necessarily “manufacturers” in that they may be using CMs or ODMs themselves rather than operating their own factories. However, we include them in the set of possible manufacturing options because we have seen OEMs willing to partner with our clients to manufacture their products.

This can happen if the product is in a segment that the OEM prioritizes and if the client offers unique value that the OEM wants to leverage, such as market understanding, design, or brand. OEMs can be a powerful partner since they have all the resources necessary to design, manufacture, and even market a product. The main downside is that it can be difficult to find an OEM partner where there is mutual business alignment. The OEM partner may eventually act as a direct competitor once the relationship ends, you have to compete for resources with the OEM’s products, and switching away from an OEM partner is difficult since IP will likely be entangled.

Manufacturing Liaisons: Manufacturing liaisons partner with CMs or ODMs rather than operating their own factories. The value of the liaison is that they help you select a CM or ODM partner through their network, as well as manage the CM or ODM to resolve issues when they occur. This can become a significant advantage if your manufacturing partner is overseas (due to language, culture, and time zone differences) or if your organization has limited experience with hardware manufacturing. They may also augment capabilities of the manufacturing partner, especially in the areas of project management, supply chain, and quality control. Examples of manufacturing liaisons include PCH in San Francisco, as well as Dragon Innovation on the East Coast.

Table 1. Trade-offs of manufacturing options

Type	Pros	Cons	Typical Use Case
CM	<ul style="list-style-type: none"> • Many options are available • Flexible to build new types of products 	<ul style="list-style-type: none"> • Limited IP that can be leveraged • Time needed to tune manufacturing processes to your specific product 	Your product is unique but leverages standard consumer electronics manufacturing techniques
ODM	<ul style="list-style-type: none"> • Has existing IP that can be leveraged • Less work needed to adapt manufacturing processes 	<ul style="list-style-type: none"> • Difficult to find a partner unless your product is relatively commoditized • Entangled IP makes it difficult to switch manufacturing partners 	Your product is a variant of existing commodity products
OEM	<ul style="list-style-type: none"> • Has technical capabilities that can be leveraged (IP, engineering, manufacturing) • Has non-technical capabilities that can be leveraged (marketing, regulatory) 	<ul style="list-style-type: none"> • Very difficult to find a partner--usually requires alignment of unique business goals • Potential competitor • Entangled IP makes it difficult to switch manufacturing partners 	Potential OEM partner exists with aligned business interests and significant resources that you want to leverage
Manufacturing Liaison	<ul style="list-style-type: none"> • Reduces the burden on your organization to manage a CM or ODM • Is likely more proactive and communicative in resolving issues 	<ul style="list-style-type: none"> • Higher cost • Risk of slower decisions due to additional overhead 	Your team does not have manufacturing expertise and is not planning to develop an in-house operations team in the near future

Sometimes these categories (CM, ODM, OEM) are more descriptive of the business model than the company itself. There are many examples where a company acts as an ODM for some product categories but a traditional CM in others.

Capability Spectrum

For both CMs and ODMs, there is a wide range of capabilities between specific manufacturers. Often, people talk about a manufacturer falling into a “tier.” This is a shorthand way to refer to the size and capabilities of the manufacturer. At Mindtribe, we typically refer to a three-tier system with Tier 1 manufacturers having the most capability and Tier 3 having the least:

Tier 1: These are the largest and most full-service manufacturers in the world. They typically employ hundreds of thousands of people, manufacture the highest-end consumer electronics on the market, and have revenue in the billions of dollars

per year. Some Tier 1 CMs for consumer electronics include Foxconn, Flextronics, and Pegatron.

A Tier 1 CM partner is appropriate if you expect high volumes. Their typical customers have large production volumes and order sizes (\$50M or greater per year), which makes it difficult to get attention if you do not offer similar amounts of business. Typically it is our larger clients or those with proven sales of prior products that find it possible to work with a Tier 1 CM. Many of our startup clients that are launching their first product find it difficult to go this route. Some Tier 1 manufacturers have special divisions setup to work with small companies. These groups are typically looking for opportunities in emerging categories (such as wearables) with the potential of high growth and eventually high production volume.

Tier 1 manufacturers offer the full set of capabilities needed to reliably manufacture millions of products per month. This includes capability in fabricating parts (such as the printed circuit boards and injection-molded plastics), supply chain and procurement, as well as quality control and testing. They will have engineering teams available for not only design work, but also sustaining engineering after the product is launched. Tier 1 manufacturers are professionally managed with established systems and processes. While this helps ensure cost efficiency and high quality, it also introduces bureaucracy and red tape that can make it difficult to pivot quickly.

Tier 2: As you might expect, Tier 2 manufacturers fall somewhere in-between Tier 1 and 3. They are often professionally managed and can even be publicly traded companies in Asia. They may offer a range of capabilities similar to a Tier 1 manufacturer, but their level of competency in each area may not be as good. Clients who cannot attract the attention of a Tier 1 CM but plan on doing multiple millions of dollars in business per year would benefit from the additional capabilities of a Tier 2 CM versus a Tier 3.

Tier 3: Tier 3 manufacturers can be thought of as the “mom-and-pop shops” of manufacturers. In Asia, this often means a single factory or a small set of factories that are operated as a family business. They will typically have only basic capabilities in regards to manufacturing, supply chain, and quality control.

The major advantage of a Tier 3 manufacturer is their willingness to work on low volume products. For them, orders in the neighborhood of \$500k may be substantial, so they are motivated to compete for business even if it consists of only a few thousand units per year. As opposed to the professionalism and formality of a Tier 1 manufacturer, a Tier 3 manufacturer will be very light on systems and processes. This means they are much more nimble and agile to respond to changes, but also that mistakes can occur more frequently and traceability for issues is low. One of the biggest challenges we face with Tier 3 manufacturers is designing and enforcing quality control processes so defective units do not make it into the hands of end customers.

Table 2. Manufacturer tiers

	Tier 1	Tier 2	Tier 3
Capabilities			
• Fabrication and assembly	Good knowledge of latest processes	Good knowledge of standard processes	Adequate knowledge of standard processes
• Supply chain and procurement	Good, can manage complex supply chain issues	Good to average	Adequate to limited, can handle basic procurement and coordination
• Quality control	Good	Good to adequate	Adequate to limited
• Project management	Adequate	Adequate to limited	Adequate to limited
• Engineering	Good to adequate	Adequate to limited	Limited to none
Volume needed to command attention and responsiveness	High volume (\$50M+ per year of business)	Moderate volume (\$5-10M+ per year)	Low volume (\$500k+ per year)
Agility to changes in plans	Low	Moderate	High

Local vs. Overseas Manufacturers

Clients also frequently ask us whether they should use a local or overseas manufacturing partner. While this decision is complex and cost is often used as the justification, in our experience the overwhelming factors in the decision are:

1. Are there local vendors who would be appropriate for the work?
2. Are the volumes high enough to warrant going overseas?

For some types of products, the lack of an ecosystem in the United States prevents a local strategy. For instance, manufacturing a mobile phone would be very difficult to do locally since the supply chain and manufacturing expertise needed exist almost exclusively in Asia. In fact, even for Tier 1 CMs that are based in the US, the vast majority of their factory capacity is outside the United States. As a result, the types of products that can be made locally are either less complex (so a Tier 2 or 3 CM could execute it), or so new and complex that no existing overseas CM would have a significant advantage.

Regarding volumes, if your volumes are low (less than \$500k order sizes per year) then it is likely a better option to manufacture locally if you can. This is because it is unlikely that you can find an overseas manufacturer who will want to work with you except for a Tier 3. If your product is complex and/or requires high quality, an overseas Tier 3 manufacturer will struggle to meet your requirements, and it will likely take significant effort from your team (and travel to the manufacturer) to resolve issues that arise.

A strategy that we have successfully executed is a hybrid approach of using local Tier 3 CMs for a beta run or limited product launch, then transitioning the manufacturing to an overseas CM if the volumes increase. This allows us to work closely with a nimble,

local CM while the design is being iterated, then transition to a lower cost overseas CM when the design is refined and higher volumes are projected.

Conclusion

The landscape of manufacturing is vast, but companies in this space can be broadly categorized into types (CM, ODM, OEM, manufacturing liaison) and tiers (1, 2, and 3). This provides a framework for evaluating potential partners, as each one will be best suited for a particular class of products. Additionally, an overarching issue is the choice between manufacturing locally or overseas.

Mindtribe has worked with a large variety of manufacturers and products, especially in the industries of connected devices and consumer electronics. We can help you take your product through the manufacturing process, which involves not only engineering, but also manufacturer selection and management, with careful consideration of the specific needs of your product and business.