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The Bargaining Power between
Original Design Manufacturers and
Original Brand Manufacturers: A
Case Study of Dell and Wistron

研 究 生：Stefan Mitzkus

指 導 教 授：Dr. Vincent Kuo

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本校 MBA (Stefan Mitzkus) 君

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係由本人指導撰述，同意提付審查。

指導教授：郭庭魁

指導教授

郭庭魁

年 月 日



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指導教授：郭庭魁

本校 MBA Stefan Mitzkus 君

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經本委員會審定通過，特此證明。

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Abstract

Taiwanese original design manufacturers (ODMs) are facing declining profit margins as a result of the commoditization of PCs and notebooks, which contribute to most of their revenue. Further, severe competition, substitute products and a concentrated buyer industry increase the pressure on Taiwanese ODMs. In order to mitigate this problem, Taiwanese ODMs use several strategies, e.g. becoming an original brand manufacturer (OBM), such as Acer and Asus, or branching out into more profitable downstream markets, such as Wistron.

This paper uses a case study approach to analyse the current buyer-supplier relationship between Dell and Wistron. The findings suggest that Wistron's PC and notebook manufacturing business suffers from low bargaining power. Leveraging customer competences by occupying a niche market does not only increase Wistron's profitability, but can also increase Wistron's bargaining power in its core business towards its customers.



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1 Introduction: The Importance of Innovation to Taiwanese Original Design Manufacturers to Improve Bargaining Power towards their Customers

The rise in global demand in mobile phones and Android tablets is accompanied by a decline in desktop personal computers (PCs) and notebooks. From 2012 onwards global notebook shipments were declining year by year (Chien, 2014, November 28). This decline is accompanied by shrinking profitability and a shrinking average selling price (ASP). Nowadays, the average notebook production leads to a profit margin of only 2% ("Computer Industry Value Chain", n.d.). The ASP of a notebook in 2005 was above \$1.200, whereas in 2015 the ASP is about \$450 (Statista.com, 2015).

These facts are especially important for Taiwan, as the Taiwanese economy is strongly dependent on the global PC and notebook market. Taiwan is the world's number 1 laptop producer ("Taiwan's tech-industry", 2013, July 6). Net exports are Taiwan's most important growth driver, of which 70% consist of intermediate goods (Meltzer, 2014). Taiwanese original design manufacturers (ODMs) play a special role, as they are the leading companies in global PC and notebook production (Foster, 2006). However, the margins of Taiwanese ODMs are low, which means that a high volume is necessary in order to maintain profitability in the future. Their gross margins amount to 3-5%, whereas at an operating level, their margins reach only 1-2% ("Taiwan's tech-industry", 2013, July 6). As a result, the decline in global sales volume of PCs and notebooks poses a serious threat not only to Taiwanese ODMs, but to the Taiwanese economy as a whole.

Hobday (2005) noted that during the 1990s, Taiwanese ODM manufacturers had two basic strategic trajectories to choose. They could stay ODMs, with a strong focus on low cost production or they could become original brand manufacturers (OBM), thereby competing with already established global corporations. Next to these two strategies, Foster (2006) added vertical integration as a third one. For instance, Foxconn started manufacturing cables and connectors. A fourth strategy is to increase the proportion of full systems instead of creating only barebone units (Foster, 2006).

Some Taiwanese PC manufacturers, such as Acer and Asus shifted their business away from ODM towards the OBM business. However, most of the Taiwanese ODMs did not opt for this

choice, but rather aimed at reducing their revenue proportion of PCs and notebooks, and spread into different innovative directions. These ODMs aim at finding innovative solutions to boost their revenue and profit margins. Pegatron, for instance, has shifted from PC manufacturing towards mobile devices. As a result, in 2013 its revenue proportion from PCs went down to 40%, in comparison to 50 - 60% in the previous years. Foxconn, next to vertical integration, aims at decreasing its reliance on Apple, which accounts for about 40% of Foxconn's revenue by moving into retail and increasing its R&D capabilities. Quanta established a new source of revenue by producing servers, which store and process data of mobile devices. As a result, Quanta moved away from the pure ODM business, as it sells its servers directly to end-customers. Its server division accounted for 10% of its revenue in 2013. Inventec also invested in server technology, which contributed 25% to its revenue in 2013 ("Taiwan's tech-industry", 2013, July 6).

Wistron, one of Taiwan largest computer and laptop ODMs has specialized in technological services ("Taiwan's tech-industry", 2013, July 6; Lin, 2012b; Wistron, 2013a). One of its newest projects includes a closed-loop, cradle to cradle green supply chain, which enables Wistron to collect scrap products from its customers and reuse them for their current products, thereby reducing negative environmental impacts as well as enabling long-term cost savings (Wistron, 2013b). Its main customer is Dell, which has dedicated itself in its 2020 Legacy of Good plan to increase the amount of recycled plastics in its computers (Dell, 2012).

Developing new strategies away from the traditional ODM business in order to mitigate decreasing margins does not only affect the strategic trajectory of the company itself, but has a direct influence on the relationships, in which the company is currently engaged. Håkansson and Ford (2002) describe a relationship between two companies as a dynamic process, in which past decisions and interactions between the two parties form the current status of the relationship: "The relationships are likely to be complex and long-term and their current form is the outcome of previous interactions between the business units" (Håkansson & Ford, 2002, p. 133). Thus, taking this dynamic approach, the result of an action by any party influences the relationship with the other party involved. By introducing new innovations and technologies needed by the purchasing company, the ODM therefore faces changes in the relationship with its customers, such as the risk of damaging the previously good relationship as well as increasing or decreasing its bargaining power depending on the outcome of its strategic choice. Therefore, by introducing new innovations, the relationship between the ODMs and their customers will change.

Wistron's engagement in green recycling activities implies a change in the relationship between Dell and Wistron: "Wistron said it has become the US company's first official partner in turning Dell-branded products into recycled plastics for use in manufacturing the US company's new product line" (Ku, 2014, May 22, para. 2). This implies that Wistron might have increased its importance towards Dell in this area. The increase in importance of a supplier to its buying company might be accompanied by an increase in bargaining power resulting in higher volume sales and stability for the supply side. The reason is that there are a few available supply sources, and in order to sustain the continuous supply of critical components, the buyer will be ready to engage in a long-term relationship or even partnership with the supplier (Kraljic, 1983). Strategic partnerships enable the buying company to better coordinate its supply chain activities, the flow of information and materials as well as increase its efficiency. As a result, the whole supply chain may become more competitive (Shin, Collier, & Wilson, 2000).

Hobday (2001, 2005) analysed the international expansion of industrializing countries in Asia-Pacific and examined the innovation models of companies in Taiwan and Korea. Kuo (2009) made a case study concerning Acer's, AsusTek's and BenQ's innovation capability and reconfiguration. Yang and Chen (2013) found that due to a more and more complex production network and shorter life-cycles, the mutual dependence between ODMs and OBM^s increases. Hence, even if some authors take into account the relational aspect between ODMs and OBM^s, no one examined yet the shift in bargaining power as a result of strategic decisions made by one party. In order to understand the interaction between the introduction of new innovation of the supply side and the resulting transformation of the relationship in terms of bargaining power, the research question is as follows:

How does Wistron's strategic shift towards green closed-loop supply chain solutions influences its bargaining power with Dell, one of its main customers?

This research gives an insight into one of the four possible strategic trajectories of Taiwanese ODMs as mentioned by Foster (2006) and proposes a model, which can help companies to increase their situation in an industry dominated by the buying side.

In order to answer the research question, section 2 defines buyer-supplier relationships, their typologies as well as bargaining power. Section 3 outlines the methodological framework of this paper. Section 4 outlines the global PC market from a buyer and supplier perspective. Section 5 outlines the global market of electronic waste. Section 6 talks about Wistron's shift

towards technological services, Wistron's closed-loop cradle to cradle supply chain and Wistron's relationship to Dell. Section 7 analyses the relationship between Wistron and Dell according to the conceptual framework laid out in section 2. Section 8 summarizes the main findings of the study.



2 Buyer-Supplier Relationships

2.1 Definition of Supply Chain Management

Section 2 summarizes the academic discourse about buyer-supplier relationships, starting with the definition of supply chain management (SCM), of which buyer-supplier relationships is a sub-topic. Further, the historical evolution of its broadest categories, transactional and long-term relationships, will be outlined. As the relationship between Wistron and Dell can be categorized as a long-term relationship, and due to the fact that pure transactional relationships are regarded as being outdated as they lack a strategic long-term view, the main part of the paragraph deals with long-term relationships in more detail. The remainder deals with the bargaining power of suppliers and buyers based on Porter's 5 Forces framework and the Kraljic matrix, which will be used in section 7 to analyze the relationship between Wistron and Dell.

Even though the term `supply chain management` seems to be clear-cut, in the academic discourse the term is used differently. According to Simchi-Levi, Kaminsky, and Simchi-Levi (2009, p. 1): "Supply chain management is a set of approaches utilized to efficiently integrate suppliers, manufacturers, warehouses, and stores, so that merchandise is produced and distributed at the right quantities, to the right locations, and at the right time, in order to minimize system wide costs while satisfying service level requirements." Simchi-Levi et al. (2009) distinguish supply chain management from the development chain, which consists of plan/design (product architecture, make or buy decisions as well as early supplier involvement), source (what kind of supplier relationship) and production phase, and which intersects with the supply chain.

Whereas Simchi-Levi et al. (2009) make a distinction between supply- and development chain, Lambert, Cooper, and Pagh (1998, p. 1) emphasize the networking aspect between companies: "Increasingly the management of multiple relationships across the supply chain is being referred to as supply chain management. Strictly speaking, however, the supply chain is not just a chain of businesses with one-to-one, business-to-business relationships, but a network of multiple businesses and relationships. SCM offers the opportunity to capture the synergy of intra-and inter-company integration and management. In that sense, SCM deals with total business process excellence and represents a new way of managing the business and relationships with other members of the supply chain."

Monczka, Handfield, Giunipero, Patterson, and Waters (2008, p. 8) use a more all-encompassing definition by emphasizing the strategic importance of supply chain management: "Supply management is not just a new name for purchasing but a more inclusive concept. We feel supply management is a strategic approach to planning for and acquiring the organization's current and future needs through effectively managing the supply base, utilizing a process orientation in conjunction with cross-functional teams (CFTs) to achieve the organizational mission. Similar to our definition, the Institute for Supply Management defines supply management as the identification, acquisition, access, positioning, and management of resources and related capabilities an organization needs or potentially needs in the attainment of its strategic objectives."

Further, Kannegieser (2008) demarcates the term supply chain management from Porter's concept of the value chain, as the latter is concerned with value creation within a company, whereas supply chain management extends the scope by introducing cross-company networks, which the company needs to exploit in order to improve efficiency and delivery service, and the minimization of costs and inventories. Supply chain management, according to the author, ensures the supply of the buying company as well as enables a cross-company material flow and information exchange.



The reason of these different definitions might be found in the fact that during the 1990s industrial manufacturers and service providers attached more importance to their purchasing and supply management functions. On the other hand, warehouses and wholesalers put their physical location as well as logistics functions into their supply chain management approach. As a result, there are two different paths for the term supply chain management, which stress different functions of the supply chain (Tan, 2001). According to Tyndall et al. (1998), some authors have an operational perspective, other regard supply chain management as a philosophy, whereas others regard it as a process (as cited in Mentzer et al., 2001).

This paper examines the relationship between Dell and Wistron after the introduction of Wistron's green supply chain. For the purpose of this paper, the definition of Monczka et al. (2008) is most appropriate, as the relational aspect between two companies, instead of the operational perspective and process perspective, is the subject of interest.

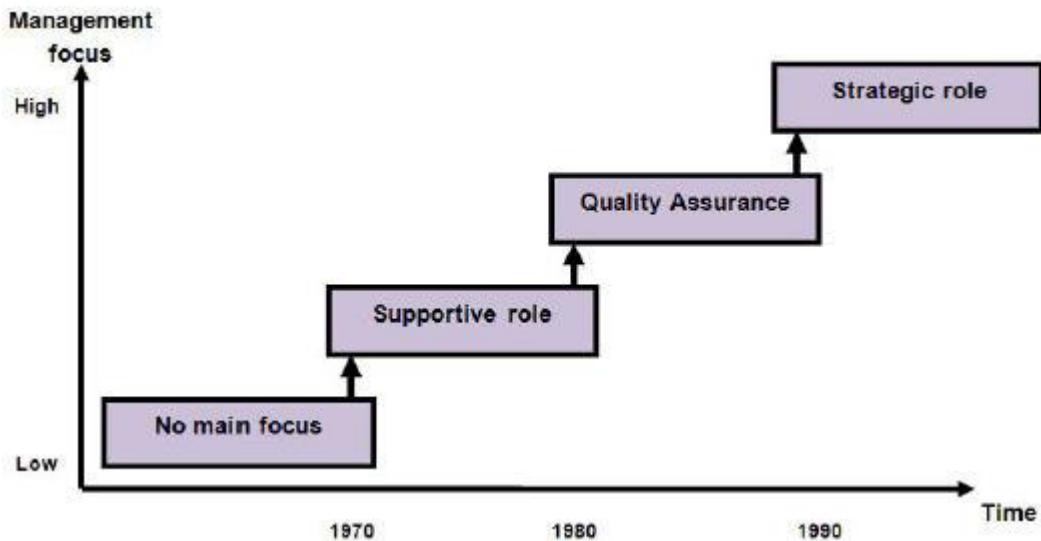
2.2 Historical Outline: From a Transactional to a Relational Perspective

This paragraph outlines the recent historical evolution of purchasing and supply chain management, with an emphasis on the shift from transactional, arm's-length relationships towards strategic, long-term buyer-supplier relationships.

The purchasing function of a company had gained importance during World War 2 due to the scarcity of some required materials during the war period. As a result, to obtain critical materials for the production process became a major task of a company. This trend, however, changed during the post-war period until the 1960s, as materials became available again. Thus, the purchasing function lost its strategic value (Monczka et al., 2008). During this time, the transactional approach was dominant. Suppliers were primarily sourced via price competition. The purchasing function was therefore regarded as a non-strategic, inferior function (Monczka et al., 2008). In the mid-1960s, Henderson (1975) observed that management did not see the value a purchasing department can bring to a company, but instead only tried to minimize its costs: "Procurement is regarded by executive management as a negative function — it can hinder the company if not done well, but can make little positive contribution" (as cited in Bedey, Eklund, Najafi, Warén, & Westerlund, 2008, p. 5).

Under the term materials management, purchasing gained importance again after the late 1960s (Monczka et al., 2008). Purchasing management was a popular topic in academic circles, trade press as well as popular press. Due to international events such as the oil crisis of 1973-1974 and due to the popularity of Porter's famous 5 forces model, the purchasing function shifted from a passive role towards a supportive one, in which the function was not only responsible for buying the cheapest commodity possible, but also to ensure the suppliers' quality standards. In the 1990s, the purchasing function gained further importance. Academic literature recommended to include the purchasing function into the strategic planning process of a company (Bedey et al., 2008). Figure 1 depicts the evolution of the strategic importance of the purchasing function until the 1990s.

Fig.1: Evolution of the strategic importance of the purchasing function. Source: Bedey et al. (2008)



Long-term supply chain relationships emerged relatively recently. During the era of globalization, starting from the late 70s to the late 90s, companies faced unprecedented competitive pressure from emerging global companies from all over the world. Due to the rapid technological progress, especially in the manufacturing sector, such as automotive industry, heavy machinery and engineering, the life-cycle of a lot of products became shorter and the Internet allowed managers to better coordinate worldwide operations, such as the flow of the product from suppliers to customers (Mentzer et al., 2001; Monczka et al., 2008; Sheth & Sharma, 1997; Tan, 2001). Further, the emergence of total quality management (TQM) led to a rethinking of the traditional approach, as TQM stresses long-term relationships over arm's-length ones (Sheth & Sharma, 1997). During these competitive times, supply chain management has been regarded as crucial to corporate success. Drivers such as global sourcing, the importance of quality- and time based consumption both led to a greater uncertain external environment, which companies tried to mitigate via engaging in closer buyer-supplier relationships (Mentzer et al., 2001). Bedey et al. (2008) further add that during the 1990s, companies began more and more to outsource activities, which were not related to their core competencies. Outsourcing leads companies to engage in close relationships. Further, the authors explain that companies started to introduce more sophisticated supplier performance measurements, which went beyond the traditional 'price, quality, delivery' criteria. For instance, during the 1990s, environmental purchasing increased as a result of the growing trend in corporate social responsibility (CSR). However, due to economic obstacles,

green purchasing was rather the exception than common practice. Moreover, companies started to decrease their supply base, which means that a company handpicked the most capable suppliers in order to engage in long-term relationships (Bedey et al., 2008). The growing importance of supply chain management by practitioners has been accompanied by a growing interest in the academic discourse (Mentzer et al., 2001).

This trend continues beyond the years of 2000, where the importance of suppliers has been recognized to an even greater extent (Monczka et al., 2008). The trend is accompanied by a shift from a decentralized domestic purchasing function, towards a centralized function involved in global sourcing and in strategic long-term decisions of the company (Sheth & Sharma, 1997). Sheth and Sharma (1997) forecasted that most companies would engage in partnerships with their suppliers and would introduce key account management practices for their most valuable suppliers. This can especially be seen in the fact that buying companies tend to outsource more and more non-critical activities, establish partnerships with their suppliers and reduce their supply base (Gadde & Snehota, 2000). Further, the increasing importance of supply chain management can also be seen in the rise of the salaries of purchasing professionals in comparison to other fields (Monczka et al., 2008). Table 1 compares the contractual elements of one time transaction versus long-term relationships.

Table 1: Discrete vs. relational business strategies. Source: Benton and Maloni (2005)

Discrete vs. relational business strategies		
Contractual element	Discrete orientation	Relational orientation
Duration	One time	Long-term
Transferability (switching parties)	Completely transferable	Extremely difficult to transfer
Attitude	Independent, suspicious	Open, trusting, cooperative
Communication	Very little	Complex
Information	Proprietary	Shared
Planning and goals	Individual, short-term	Joint, long term
Benefits and risks	Individual	Shared
Problem solving	Power driven	Mutual, judicious

2.3 Transactional Relationships

In section 2.2 the historical outline from transactional, arm's-length relationships towards close, long-term supplier-buyer relationship was outlined. Even though academics and practitioners alike emphasize the strategic importance of long-term relationships, in practice however, arm's length transactions are the most common type of buyer-supplier relationships (Simchi-Levi et al., 2009). Monczka et al. (2008) call this kind of relationship the traditional approach, as companies during the last decades just began to regard the purchasing function as a critical source of competitiveness and therefore nowadays engage more and more in long-term, strategic relationships with their suppliers. Until the mid-1980s, buyer-supplier relationships tended to be arm's-length and were mainly based on the market price of the product or service (Hoyt & Huq, 2000). Gadde and Snehota (2000, p. 305) state that: "The strategic importance of the supply side in companies increased considerably during the two last decades of the 1900s. These changes are commonly referred to as a shift from purchasing to supply management."

The purely transactional model is a short-term arrangement, which fulfills a current business need, but which does not lead to long-term strategic advantages (Simchi-Levi et al., 2009). Because these relationships are only lasting as long as the contractual obligations for a particular item or service, arm's-length transactions are also referred to as the contractual view in comparison to the relational view (Kim & Michell, 1999). In these transactions, the attributes of the product or service at hand, such as quality, quantity and delivery and price, are most important. The way how the supplier produces the item or service is of secondary importance to the buying company. The reason is that within the transactional model of buyer-supplier relationships, each company inside the value chain is rather regarded as isolated and not involved into the processes of upstream or downstream companies (Phillips & Caldwell, 2005).

Because of this silo effect between the buying and supplying organization, there is virtually no effective two-way communication between the two companies (Monczka et al., 2008). The exchange of information usually takes place only during the bidding and contract negotiation phase. The supplier is therefore usually not involved in the design phase of the product, but just produces according to the buyer's specifications. Further, there is not much interchange between the staff of the buying and supplying company (Bensaou, 1999).

In transactional relationships switching costs of both suppliers and buyers are low, as buyers do not require specific customizations to the commodity and a lot of suppliers have the technical expertise to produce the item or fulfill the service (Bensaou, 1999). The degree of trust is also low, as buying companies are very willing to change suppliers and as a result suppliers do not trust their customers (Sheth & Sharma, 1997). For all these reasons the arm's-length approach is sometimes referred to as adversarial approach, as the transaction is regarded as a zero-sum game (Monczka et al., 2008).

The buying firm plays multiple suppliers off against each other, as they have to compete mainly on price. The buyer takes all the cost savings (Monczka et al., 2008). There is no need for the buying company to assure its supply via long-term contracts, especially when the product of interest is a commodity (Hoyt & Huq, 2000). Thus, products purchased via transactional relationships are for the most part items which do not require customization and few technical expertise is needed (Bensaou, 1999).

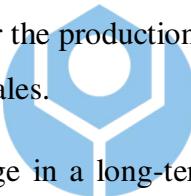
Transactional relationships, in which the buyer can play-off several suppliers against each other imply a high bargaining power of the buying party: "Buyers compete with the industry by forcing down prices, bargaining for higher quality or more services, and playing competitors against each other-all at the expense of industry profitability" (Porter, 1980, p. 24). If the bargaining power of the buying site is high, the conflict resolution and as well as quality assurance is done at the buying site (Monczka et al., 2008). Thus, the purchaser has all the bargaining power and the profit made from the sales of his final products entirely belong to him (Helper & Levine, 1992).

In the academic discourse, a transactional relationship can also be regarded as long-term oriented when single transactions are repeated over a long period of time (Kalwani & Narayandas, 1995). According to Bensaou (1999), some Japanese car makers engage in transactional, but long-term relations with their suppliers. These relationships have continued with occasional breaks for more than 30 years. Single transactions made over a substantial period of time are therefore not regarded as transactional, but are a type of long-term relationships, as mutual trust and dependence grows over time. The next section outlines the reason to engage in long-term relationships.

2.4 Reasons to Engage in Long-Term Relationships

As outlined in section 2.2 the relational, long-term perspective is nowadays regarded as crucial in strategic decision-making. Having the right relationship gives a company an edge over its competitors. For instance, Toyota sends its manufacturing experts to its key suppliers to advise them on how to save costs and to increase their quality standards (Daniels, Radebaugh, & Sullivan, 2013). By doing this, Toyota creates a mutually beneficial relationship, as Toyota secures its supply while being able to concentrate on its core competencies. Its suppliers can be assured of a certain amount of sales and profit from Toyota's expertise.

Creating a win-win situation for both supplier and buyer is referred to as `pie-expansion` by the business press (Jap, 1999). For instance, Xerox could reduce its copier manufacturing costs by 30-40% because its suppliers developed customized components and processes. Xerox' suppliers were able to increase their sales volumes (Jap, 1999). Thus, the benefits gained from relationship can be different for both parties, as the buyer might be more interested in a steady supply needed for the production process, whereas the supplier might be more interested in steady and reliable sales.



Cost efficiency is one reason to engage in a long-term relationship. Engaging in long-term relationships can help a buying company to reduce the unit costs of its supplies. Further, direct transactions costs, e.g. handling goods and ordering costs play an important role when making a sourcing decision (Gadde & Snehota, 2000). Based on the theory of transaction cost economics (TCE), companies who engage in long-term relationships save costs resulting from a declining frequency in repetitive purchases, as in the transactional, arm's-length approach (Sheth & Sharma, 1997). Besides costs inherent in the exchange, supporters of the collaborative supply chain management approach claim that long-term relationships drive down other costs, such as customer acquisition, operational costs as well as production costs (Cannon & Homburg, 1998). Further, less visible costs may depend on specific suppliers. The extent of supplier involvement contributes to his capability to adapt to new circumstances. These costs are referred to as `relationship costs` (Gadde & Snehota, 2000). A long-term relationship therefore urges a supplier to deliver better quality at lower costs than a pure transactional relationship does. As a last point, `supply handling costs` refer to company internal costs of the purchasing organization, e.g. internal communication systems (Gadde & Snehota, 2000). These costs will also be reduced when engaging in long-term relationships.

According to Sheth and Sharma (1997) enabling technology, such as JIT and EDI brings a competitive advantage as well as cost savings to both supplying and buying companies.

Further, engaging in long-term relationships may enhance a buying company's degree of specialization, as it can focus on its core competencies by outsourcing non-core activities. According to Ireland, Hoskisson, and Hitt (2013, p. 65), "core competencies are capabilities that serve as a source of competitive advantage over its rivals. Core competencies distinguish a company competitively and reflect its personality. Core competencies emerge over time through an organizational process of accumulating and learning how to deploy different resources and capabilities." The need to increase a company's effectiveness in its operations has urged a lot of companies to outsource their activities, which are outside their core-competencies. The result is an increased mutual dependence between buyer and seller (Svahn & Westerlund, 2009). In this way, having an efficient supply base indirectly determines the future of the buying company, as the core business is crucial to success (Gadde & Snehota, 2000). Nike, for instance, does not manufacture its shoes itself, but rather concentrates on marketing and sales, distribution and innovation (Simchi-Levi et al., 2009). As the above example of Xerox shows, long-term suppliers can also sell more to their customers by e.g. manufacturing customized products and processes. Therefore, if the buying firm concentrates more on its core competencies, it is able to deliver better value to its customers. The supplier can also specialize more, which gives him an edge over competing supply firms.

Next to concentrating on core competencies, revenue benefits can be obtained by the buying organization when engaging in long-term relationships. These benefits, however, are difficult to estimate. They are related to product performance and quality (Gadde & Snehota, 2000). If the buying company has access to more reliable supply sources e.g. in terms of product quality, the end product will be better than the one of its competitors, which do not have access to high-quality supply sources. Thus, due to the choice of the right supplier the buying company is able to manufacture a product superior to its competitors, which leads to an increasing market share.

Further, product scarcity makes a long-term relationship useful from a buyer's perspective. Sheth and Sharma (1997) mention that a buyer can increase its competitiveness by locking-in a crucial supplier, so that competing firms face difficulties to obtain the critical item or service on the supply market. As a result, long-term relationships help a buying company to assure scarce items, which are important to the production process of their products. The company can further gain competitive edge, if it is able to lock-in the supplying company,

thereby cutting-off competitors from a scarce source of supply. However, the other way-round is also possible. A supplier can also lock-in its buyers. For instance, Johnson Controls Inc. developed Homelink, a system which can link automobiles to home security and other convenience systems. Homelink became an industry standard, and as a result, the automobile manufacturers were locked-in the relationship with Johnson Controls Inc. (Narasimhan, Nair, Griffith, Arlbjørn, & Bendoly, 2009).

For a supplier engaging in a long-term relationship may have the advantages of increasing its capabilities and be able to increase the sales volume. To increase the supplier's capabilities, the buying company engages in supplier development activities. Handfield, Krause, Scannell, and Monczka (2000) define supplier development as follows: "We define supplier development as any activity that a buyer undertakes to improve a supplier's performance and/or capabilities to meet the buyer's short-term or long-term supply needs. Buying firms use a variety of activities to improve supplier performance, including assessing suppliers' operations, providing incentives to improve performance, instigating competition among suppliers, and working directly with suppliers, either through training or other activities" (Handfield et al., 2000). The way in which a buying company engages in supplier development programs differs a lot, and ranges from promises towards increased future business based on performance measures towards initial direct investments from the buying to the supplying side, even before the supplier could deliver any value to the purchasing firm (Forker & Stannack, 2000).

To summarize, cost efficiencies, revenue benefits, product quality, technological advantages, a focus on core competencies and the assurance of critical items are the main reasons buyers engage in long-term relationships. Suppliers, on the other hand, expect a higher and more stable sales volume, technological and managerial improvement and a competitive advantage through specialization on the supply market.

2.5 Bargaining Power of Buyers and Suppliers

2.5.1 The Relationship between Power and Dependence

This paragraph establishes the concepts of power and dependence, which are needed in order to understand the concept of bargaining power between suppliers and buyers. While this section establishes the conceptual framework, the next section will introduce two very famous analytical tools in order to assess bargaining power: Porter's 5 Forces framework as well as the Kraljic matrix.

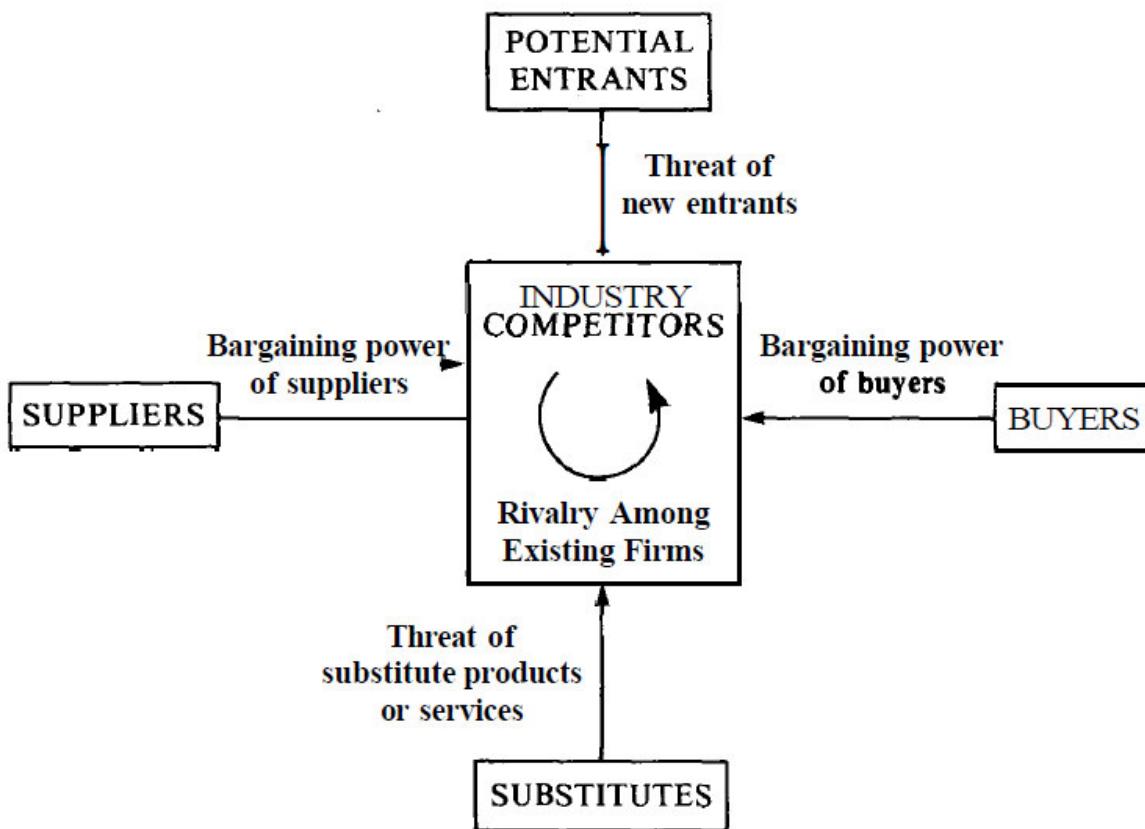
As the previous sections pointed out, companies are engaging constantly in both short-term and long-term relationships. Engaging in a relationship creates dependence on the trading partner (Caniëls & Gelderman, 2005). Power and dependence are related in the way that if one company is more dependent on its counterpart it becomes less powerful. As Caniëls and Gelderman (2005, p. 143) put it: "Mutual dependence and power are closely related concepts. The buyer's dependence on the supplier is a source of power for the supplier, and vice versa. A wellknown definition is that the relative power of an organization over another is the result of the net dependence of the one on the other." Further, the authors conducted a literature review and concluded that the academic discourse makes a distinction between relative power, which is the result of an asymmetry in the interdependence of both trading partners and total power, which equals full interdependence of both parties. Cummings and Worley (2009, p. 752) define power as follows: "The ability to influence others so that one's values are satisfied. It may derive from several sources, including organizational position, expertise, access to important resources, and ability to reward and punish others."

Shi, Wang, and Wang (2012) add that dependence and power have an indirect effect of a company's strategic flexibility. If a company is strongly dependent on its counterpart, who is not willing to let the company change its strategic direction, the company is trapped in a certain strategic trajectory. As a result, the authors argue that increasing the flow information, resulting in more trust between both parties, can enable more strategic flexibility.

2.5.2 Analysis of Bargaining Power: Porter's 5 Forces and the Kraljic Matrix

In his famous book 'Competitive Strategy: Techniques for Analyzing Industries and Competitors' Porter (1980) describes his 5 forces model, which offers an insight into the attractiveness of a particular industry. The 5 forces which shape the industry are current competitors, the bargaining power of suppliers, the bargaining power of buyers, the threat of new entrants as well as the threat of substitutes. Figure 2 depicts the 5 forces model.

Fig. 2: Porter's 5 Forces. Source: Porter (1980)



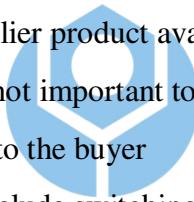
According to Porter (1980) a powerful buyer is able to decrease his purchasing costs by forcing down prices, play suppliers against each other and is able to bargain for a better quality and service. The bargaining power of a buyer is particularly high if the following points hold to be true:

- Buyers buy large volumes relative to supplier's sales: The buyer is very important to the supplier, as he takes a lot of the revenue portion from the supplier
- Buyer's costs of the purchase are significantly high: The buyer is price sensitive and will most likely haggle over lower prices

- The products purchased are commodities: Buyer can easily find alternatives and is therefore less dependent on one particular supply source
- The buyer faces few switching costs, and the seller faces high switching costs
- The buyer's business earns low profits and as a result he has incentives to decrease purchasing costs
- Buyers pose a threat of backward integration: If a buyer is able to produce the product in-house, he can get concessions from the supply side
- Product of buyer is unaffected by supplier input: Buyers are more price sensitive, as the product is not crucial to the end-product
- The buyer has full information: Knowledge about the market or the supplier cost structure give him a better bargaining position

Porter (1980) describes in the same manner the bargaining power of suppliers. The bargaining power of a supplier group is high if the following points hold to be true:

- The supplier group is more concentrated than the industry it sells to
- There are no substitutes for the supplier product available
- The industry the supplier sells to is not important to the supplier group
- The supplier's product is important to the buyer
- The products are differentiated or include switching costs
- The supplier can pose a threat of integrating forward



Whereas Porter's model serves as a tool to assess a particular industry as a whole, portfolio matrices help purchasing professionals to establish the right kind of relationship between the buying company and its suppliers. Those relationships are context specific and differ from company to company. As Gadde and Snehota (2000, p. 307) put it: "Companies make different use of supplier relationships, depending on the nature of their business, the kind of technology used and the context in which they operate." This distinction is in line with the different portfolio models, which prescribe how a company should engage in a specific relationship, depending on external and internal circumstances.

Very often, these portfolio matrices consist of 4 dimensions. For instance, Liu, Li, and Zhang (2010) established a four-dimensional matrix based on the degree of commitment and trust. Franceschini, Galetto, Pignatelli, and Varetto (2003) offer a four-dimensional matrix based on 'specificity', the ability to reuse the good or process for different purposes as well as 'complexity', which refers to the difficulty of monitoring the conditions of the outsourcing

process. Wynstra and ten Pierick (2000) established a four-dimensional matrix based on the degree of involvement a buyer should have with its supplier within a new product development (NPD) project. Bensaou (1999) established a four-dimensional matrix based on the supplier's specific investments as well as the buyer's specific investments. While these models all take a different angle concerning their dimensions, some portfolio models put the bargaining power of suppliers and buyers in the foreground.

The most famous portfolio model is the Kraljic matrix by Peter Kraljic. His article was first published in Harvard Business Review in 1983 under the name: 'purchasing must become supply management' (Bedej et al., 2008). In this model, the purchasing professional categorizes an item according to its 'complexity of supply market' as well as its 'importance of supply' to the buying company. The complexity of the supply market is defined as availability of the product, the number of suppliers, competitive demand, make-or-buy opportunities of the buying company, storage risks and substitutes (Kraljic, 1983). The importance of supply can be categorized as cost of materials/total costs, value-added profile, or profitability profile.

Based on these dimensions Kraljic (1983) established 4 different supply categories: 'leverage items', 'non-critical items', 'bottleneck items' as well as 'strategic items'.



Leverage items, e.g. electric motors or heating oil, have a high value to the company, but a low market complexity. It is suggested that companies should exploit their purchasing power on the competitive supply market, as supply sources are abundant. A mix of contracting and spot purchases is preferred.

Non-critical items, e.g. coal and office supplies, are considered to be low on both dimensions, which means that efficient processing is priority. These items do not need strategic consideration and short-term transactions are sufficient.

Bottleneck items, e.g. electronic parts or outside services, are of low value, but are to be purchased on a complex supply market. For these reasons, the companies must assure to acquire these items via reliable short-term sourcing mechanisms in order not to experience supply shortages.

Strategic items, e.g. scarce metal or high-value components, have a high value on two dimensions, which means that the buying company should engage in a long-term partnership with the supplier in order to assure the supply of the critical item.

Gelderman (2000) adds that in order to assess a relationship, the power dimension is important. He criticizes that Kraljic lacks this dimension. According to Geldermann, the ‘bottleneck’ dimension is characterized by a buyer’s dependence, whereas the leverage item category is characterized by a supplier dependence. The remaining two categories show a balance of powers.

Fig. 3: Kraljic matrix. Source: Kraljic (1983) as well as Gelderman (2000)



3 Methodology

3.1 Selection of Case Method

The purpose of this paper is to analyze the relationship between Wistron and Dell, after the introduction of Wistron's green supply chain solutions. While section 2.5 proposed a macroeconomic approach towards bargaining power via Porter's 5 Forces as well as a company-specific approach via the Kraljic matrix, this section presents the relevant methodological framework for this study.

In order to analyze the relationship between Wistron and Dell a case study method is most appropriate. According to Gerring (2004, p. 342), a case study is "an intensive study of a single unit for the purpose of understanding a larger class of (similar) units." A case study method can refer to a within-case analysis as well as a comparison between various cases (Bennett, 2004; Eisenhardt, 1989; Yin, 1994). The sample of a case study is always one entity, such as an organization, a company, or even just a decision. Case studies offer an in-depth understanding of cause-and-effect relationships, which may be more difficult to attain for other kind of methodologies (Jensen & Rodgers, 2001). Further, the case study method is advantageous for situations in which the researcher cannot control various factors, or if the phenomenon is unique and taken from a real-life event: "In general, case studies are the preferred strategy when "how" or "why" questions are being posed, when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context" (Yin, 1994, p. 1). The relationships between two companies are always rooted in numerous situations, including various external factors and take place between different levels of a company. For instance, Holmlund (2004) distinguishes a relationship according to five different interaction levels. According to the author, the unit of analysis might be a simple action-based transaction (simple exchanges between individuals) or might be a based on interactions between multiple companies at a strategic level. Further, Gadde and Snehota (2000, p. 307) describe the dynamics of a relationship after it has been exposed to changes: "Various technical, commercial and organizational solutions in a supplier relationship, and any change in the actual arrangement, ultimately affect costs and benefits of both companies. Some consequences are quite easy to expose, measure and quantify; others are less obvious, more indirect and more difficult to measure, but no less important." As a result of the above mentioned attributes of a relationship, it becomes clear that a case study

method seems most appropriate, as it covers an actual real-time phenomenon, in which various factors and circumstances cannot be controlled by the researcher.

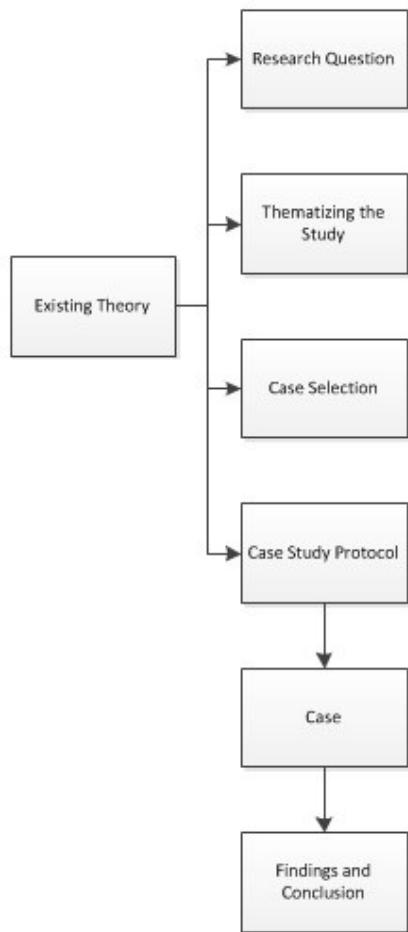
3.2 Case Study Design

A single case study is used in order to determine the relationship between Wistron and Dell. According to Yin (1994) one rationale to use a single case method is when the case is either an extreme or a unique one, which makes the case worth analyzing. As the prosperity of the Taiwanese economy depends on a great deal on Taiwanese ODMs, which face the threat of declining profitability due to a decline in global sales of laptops, which is their core business, new ways to stay competitive need to be found. As described in the introduction, no Taiwanese ODM uses a similar strategy.

Further, this case is written from a holistic perspective. According to Yin (1994) a holistic approach is advantageous if no logical subunits can be identified and if the research question under examination is itself a holistic one. The research question of this paper aims at finding the influence of Wistron's supply chain on the relationship between the company and Dell with regard towards the bargaining power between the companies. Therefore, the research question and its possible outcome will be of holistic nature. Further, the unit of analysis is the relationship between two companies, and due to the limited resources of the author as well as the size of two globally operating companies, a multi-level analysis, as proposed by Holmlund (2004) is not possible to conduct. A possible problem of the holistic approach can occur, however, if the researcher's global approach leads to a lack of details in an operational level (Yin, 1994). In order to avoid this pitfall, a survey at Wistron has been conducted at the middle management class. Therefore, the pitfalls described by Yin (1994) can be circumvented.

The research design is done in line with the suggestions of Rose, Spinks, and Canhoto (2014). Figure 4 outlines the single steps conducted.

Fig. 4: Steps in the case design. Source: Adapted from Rose et al. (2014)



3.3 Validity, Generalizability and Reliability

Yin (1994) emphasises that a case study approach must maximize the following aspects: construct validity, external validity and reliability.

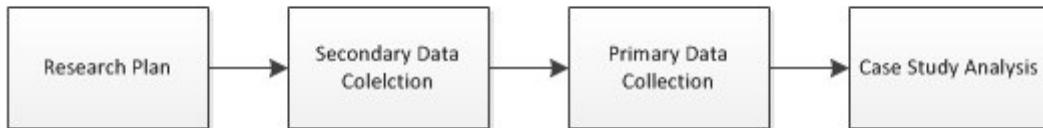
Construct validity establishes correct measures for the concepts being researched. In this case study academic literature, secondary data from multiple sources as well as a survey from Wistron create construct validity.

A study shows a high level of reliability when its operations can be repeated and lead to the same results. In this study, the interview structure, the case study protocol as well as the secondary sources used during the data collection process lead to a high level of reliability, as other researchers, having the same information and methods at hand, would come to similar conclusions.

External validity refers to the generalizability of the case study. Even though a single case study is used, the unit of analysis, the relationship between Dell and Wistron, is observed according to the bargaining power of both parties via frequently used measurements, i.e. Porter's 5 Forces as well as the Kraljic matrix. Thus, companies who find themselves in a similar relationship will be exposed to similar problems. As a result, the suggestions brought forward by the paper do not apply for Taiwanese ODMs alone, but might be generalized to a broader spectrum of supply companies.

3.4 Data Collection

After establishing the theoretical background, the first phase of data collection consisted of an online research from multiple sources, e.g. newspapers, annual reports, interviews with the CEOs of Wistron and Dell and industry reports. In the second phase, based on the insights of the secondary data, a survey was sent to Joanna Chen, AM manager at Wistron. The survey served two main purposes: to find complementary data needed for the analysis of the relationship as well as confirmation of secondary data collected beforehand. Figure 5 depicts the case study protocol.



4 The Global PC and Laptop Market

4.1 The Buyer Perspective

This paragraph outlines today's global PC and laptop market with the a focus on original brand manufacturers, the buying side, as well as original design manufacturers, the selling side, starting with PC manufacturers.

In comparison to the Taiwanese ODM market, the PC vendor industry is more segmented. According to a study published by Gartner, the top 5 PC Vendors hold about 67% of the global market share (Gartner, 2015). Gartner (2015) says Lenovo ships 19.4% of PCs, notebooks and tablets, followed by HP with 18.8%, Dell 12.7%, Acer 8.1% as well as ASUS with 7.5%.

Table 2: Preliminary worldwide PC vendor unit shipment estimates for 4Q 14.

Source: Gartner (2015)

Preliminary Worldwide PC Vendor Unit Shipment Estimates for 4Q14 (Thousands of Units)						
Company	4Q14 Shipments	4Q14 Market Share (%)	4Q13 Shipments	4Q13 Market Share (%)	4Q14-4Q13 Growth (%)	
Lenovo	16,284.8	19.4	15,153.5	18.3	7.5	
HP	15,769.6	18.8	13,591.3	16.4	16.0	
Dell	10,674.1	12.7	9,810.6	11.8	8.8	
Acer Group	6,786.9	8.1	6,083.4	7.3	11.6	
ASUS	6,259.8	7.5	6,220.2	7.5	0.6	
Others	27,971.5	33.4	32,070.0	38.7	-12.8	
Total	83,746.7	100.0	82,929.1	100.0	1.0	

Notes: Data includes desk-based PCs, notebook PCs, premium ultramobiles and all Windows-based tablets. It excludes Chromebooks and other non-Windows-based tablets. All data is estimated based on a preliminary study. Final estimates will be subject to change

When comparing financial metrics of the top 4 PC vendors Dell has the highest operating margin, followed by HP, Lenovo and Acer. Table 3 summarizes the results.

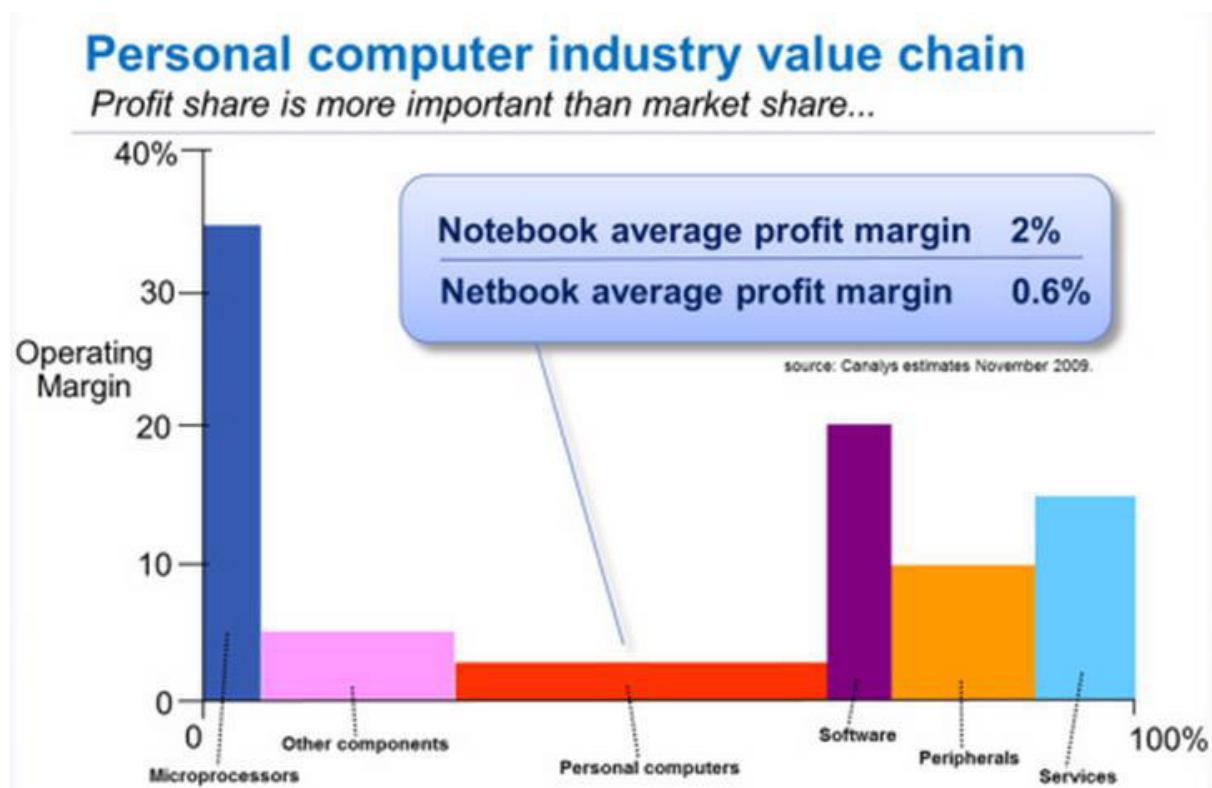
Table 3: Financial metrics of top 4 PC vendors. Source: Calculations by the author are based on figures taken from the annual reports

	Revenue					Gross Profit Margin					Operating Margin				
	2010	2011	2012	2013	2014	2010	2011	2012	2013	2014	2010	2011	2012	2013	2014
<u>Lenovo</u>	16.61	21.59	29.57	33.87	38.71	10.8	10.9	11.7	13.1	13.1	1.1	1.7	2.0	2.4	2.6
<u>HP</u>	126.03	127.25	120.36	112.3	111.45	23.9	23.4	23.2	23.1	23.9	9.1	7.6	-9.2	6.4	6.4
<u>Dell</u>	52,900	61,500	62,100	n/a	n/a	17.5	18.5	22.3	n/a	n/a	4.2	5.5	7.1	n/a	n/a
<u>Acer</u>	629,059	475,342	429,627	360,132	n/a	10.25	8.12	10.06	6.26		2.90	-1.35	0.24	-3.17	n/a

*Units are million US Dollar except for Acer, which is million NTD

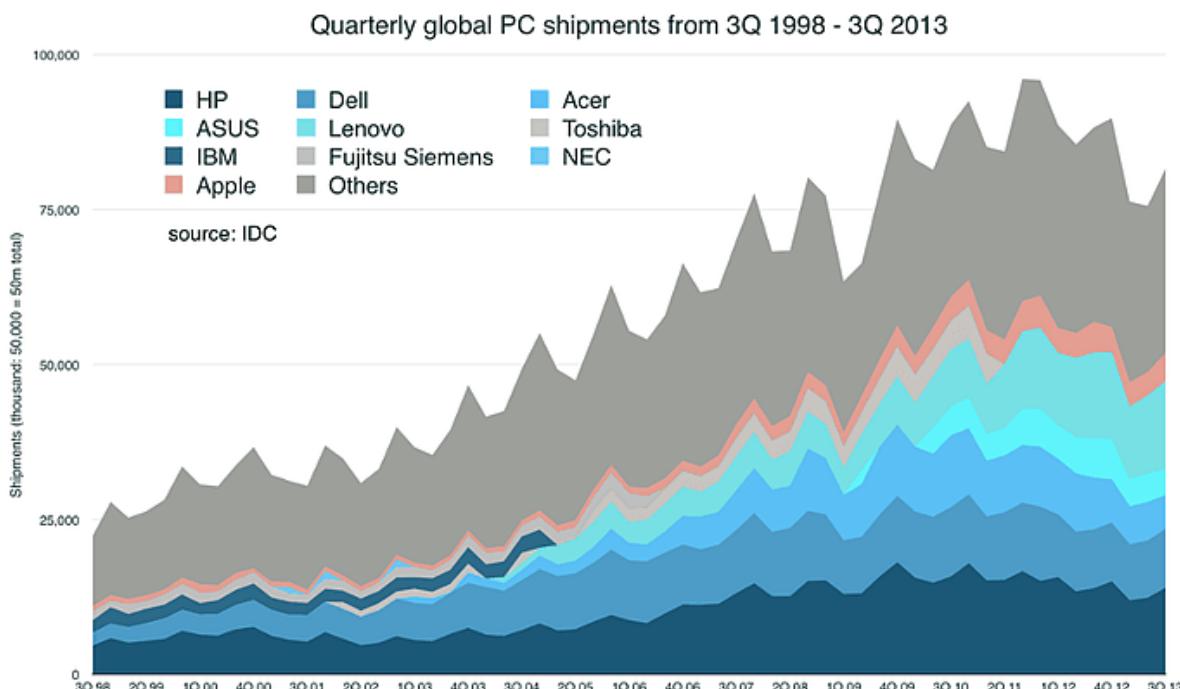
The operating margin does not only differ between companies, but is highly dependent on what kind of products the company produces. According to dataplusinsight, whose article is based on the works of Gadiesh and Gilbert (1998), producing microprocessors is most profitable inside the industry's value chain (e.g. Intel), followed by making software (e.g. Microsoft) ("Computer Industry Value Chain", n.d.). Further, services offer operating margins of around 15%. Least profitable is the PC, notebook and netbook production. The notebook average profit margin lies at 2%, whereas as the netbook average profit margin only lies at 0.6% profitability. Figure 6 compares the profitability of the personal computer industry value chain.

Fig. 6: Personal computer industry value chain. Source: "Computer Industry Value Chain" (n.d.)



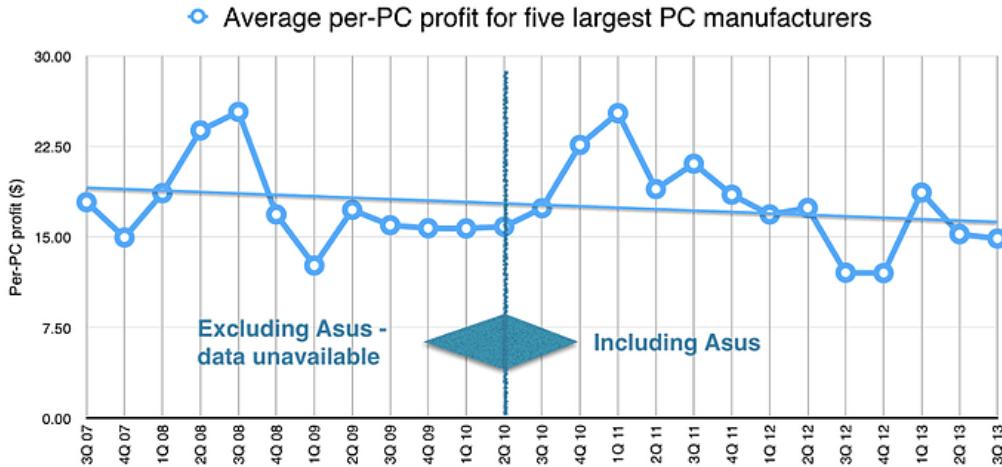
This chart is in line with the Arthur (2014, January 9), who states that: "Analysis by the Guardian suggests that as well as falling sales, the biggest PC manufacturers now have to contend with falling prices and dwindling margins on the equipment they sell." This is especially detrimental for the Top 5 PC Vendors, HP, Dell, Lenovo, Acer and Asus, as they account for 60% of the global PC sales. Figure 7 depicts the quarterly global PC shipments of leading PC vendors from 1998 to 2013.

Fig. 7: Quarterly global PC shipments from 3Q 1998 – 3Q 2013. Source: Arthur (2014, January 9)



Further, the author shows that the average profit per PC is declining at high pace. In the first quarter of 2010, the weighted average profit per PC was \$15.71 at a 2.55% margin. Due to the rise of smartphones and tablets, which started to exceed PCs in 2010, the weighted average profit had fallen to \$14.87 in 2013. Even though the profit margin slightly increased, the total PC shipments went down, which means that PC manufacturing has become a risky and unprofitable business. This phenomenon is called 'value trap' by Arthur (2014, January 9).

Fig. 8: Average per-PC profit for five largest PC manufacturers. Source: Arthur (2014, January 9)



Apple's relatively high profitability can be explained by its high proportion of software manufacturing and because it can sell PCs at a premium price due to its high brand value ("Computer Industry Value Chain", n.d.). This is also the reason why Dell bid for the service company Electronic Data Systems in order to increase its revenue proportion of services. Arthur (2014, January 9) puts it as follows: "While HP and Dell (and to a lesser extent Lenovo) use PC sales to corporations as the Trojan horse for more profitable services contracts, any PC sale to a consumer is effectively the end of the financial relationship. The OEMs [original equipment manufacturers]¹ can't extract any more value from them. That's why many tried (and still try) to extract as much as possible at the point of sale." That is why all PCs have so much pre-installed software, as the PC manufacturer can increase its profit. For instance, by offering accessories and antivirus software, Dell was able to double its profit with its laptop sales.

Taipei's Market Intelligence Center reported that global PC companies usually have two or three first-tier suppliers from Taiwan. Further, the level of outsourcing differs from company to company. Table 4 summarizes the outsourcing activities of HP, Dell, Toshiba and IBM and lists their most important suppliers (Market Intelligence Center, 2003, as cited in Yang, 2006). Further, Foster (2006, p. 21) adds: "The flagship companies usually divide their product line among these multiple suppliers. The major advantage of the flagships' use of multiple suppliers is to get the suppliers to compete against each other so that the flagship carrier gets the minimum price for the product it sources. Branded PC makers may have as many as 25 individual notebook products, of which about one-half are put out to bid each year, each of

¹ Arthur (2014) refers to brand PC manufacturers, such as Dell and Apple as original equipment manufacturers. This paper, however, refers to PC component manufacturers as original equipment manufacturers.

which is bid separately. The result is great volatility for notebook makers as the flagships tend to routinely switch between vendors for individual products.”

Table 4: Proportions of outsource manufacturing of leading notebook companies in 2002.

Source: Market Intelligence Center, 2003, as cited in Yang, 2006

Company	Proportion of Outsourcing	Outsourcing to Taiwan	Outsourcing to Korea	Taiwanese Supplier
HP	100%	87%	13%	Inventec, Arima, Quanta
Dell	100%	95%	5%	Quanta, Compal, Wistron
Toshiba	24%	24%	0%	Compal, Inventec
IBM	40%	25%	15%	Wistron, Quanta

Yang (2006) further concludes that Taiwanese ODMs will face difficulties to move up to the OBM businesses, because they would possibly lose their current customer base, as they would act as both competitors and suppliers towards PC vendors. In order to minimize this conflict, Taiwanese ODM companies can spin-off their OEM business, as Acer successfully did. Asus, on the other hand, allocated its OEM business to a subsidiary. As a last point, Taiwanese companies can also opt for focusing only on the OEM business, what half of the Taiwanese notebook manufacturers do.



4.2 The Supplier Perspective

The term `Taiwan miracle` refers to Taiwan`s rapid economic growth over the last decades. Nowadays, Taiwan is among Asia`s strongest economies, whereas in the 1960`s, its economy was comparable to Zaire and Congo (Sui, 2011). Taiwan`s initial start-off period for electronic goods began during the 1960`s and 1970`s (Hobday, 2001). Three factors contributed to Taiwan`s strong PC industry today: the establishment of Mitac Corporation, Taiwan`s first PC manufacturer, the government`s policy target in supporting the Taiwanese PC industry and IBM`s PC innovation in 1981 (Hung, 2000). Further, Hobday (2001) mentions that the electronic sector rose not only because of governmental intervention, but due to entrepreneurial activities of Taiwanese small to medium-sized enterprises (SMEs), which contributed most to Taiwan`s economic progress.

Taiwanese original design manufacturers play a special role nowadays, as they accounted for 90% of the global notebook PC production in 2013 (Taiwan Notebook ODMs, 2015, May 29). At this time, Taiwan produced 175 million notebooks (89% global share), 97 million tablets (87% world share) as well as 58 million desktop PCs (44% global share) (Ministry of

Economic Affairs, 2013). As a result, Taiwan's technology sector contributed to about 40% of Taiwan's Gross Domestic Product (Sui, 2011). However, as reported by Digitimes, the Taiwanese global PC production is vulnerable to seasonality. In the beginning of 2015, Taiwan only contributed 78.1% of the global notebook production due to seasonality and inventory left-overs from the previous year (Chien, 2015, April 16).

Taiwan's IT industry is very concentrated, consisting only of a handful of companies. As Dou (2011, November 15, para. 8) puts it: "Ushering nearly all of the world's laptop models into existence takes place in a half-dozen shiny buildings clustered around Taipei. The companies' names are little-known: Wistron Corp., Inventec Corp., Pegatron Corp., Quanta Computer Inc. and Compal Electronics Inc. Although their headquarters and design staff are in Taiwan, their factories are largely in mainland China, where labor costs are lower. Executives at these so-called original design manufacturers say their big-brand clients usually sketch out the general framework of a computer, leaving it to the ODM to tackle the nuts and bolts of design and production."

Dedrick and Kraemer (2006) published an estimation of the global notebook shipments in 2006 of Taiwanese ODMs. According to the authors, Quanta sold most of the units, followed by Compal and Wistron.

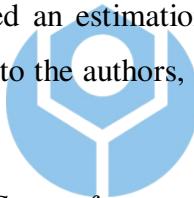


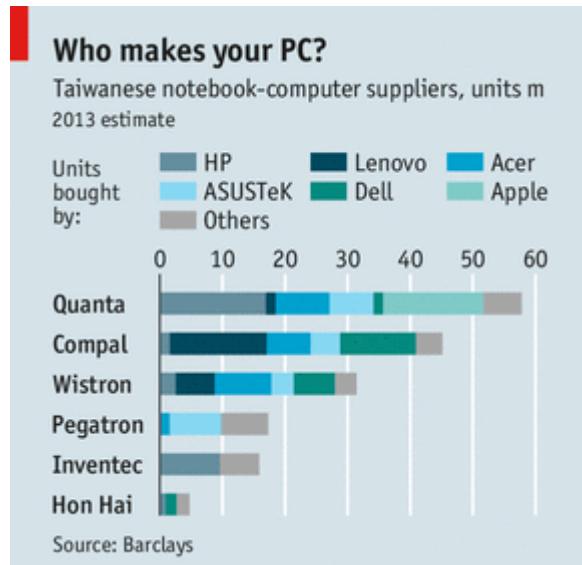
Fig. 9: Top 10 Taiwanese notebook PC manufacturers. Source: Dedrick and Kraemer (2006)

Table 1. Top 10 Taiwanese notebook PC manufacturers.

Company	2004 volume (thousands)	Major customers
Quanta	11,100	Gateway, Dell, Hewlett-Packard (HP), IBM, Apple, Sharp, Sony, Fujitsu-Siemens (F/S)
Compal	7,700	Dell, HP, F/S, Toshiba, Acer
Wistron	3,200	IBM, Dell, Acer, Hitachi, F/S
Inventec	2,800	HP, Toshiba
Asus	2,700	Epson, Canon, Sony, Apple, Trigem
Uniwill	1,400	F/S, Samsung, clones
Mitac	1,400	Sharp, F/S, NEC
Arima	700	HP, NEC
FIC	600	NEC
ECS	500	Apple

The Economist published a recent estimation of the global notebook shipments in 2013, with a slightly different rank-order after the fourth place ("Taiwan's tech-industry", 2013, July 6).

Fig. 10 Who makes your PC? Source: "Taiwan's tech-industry" (2013, July 6)



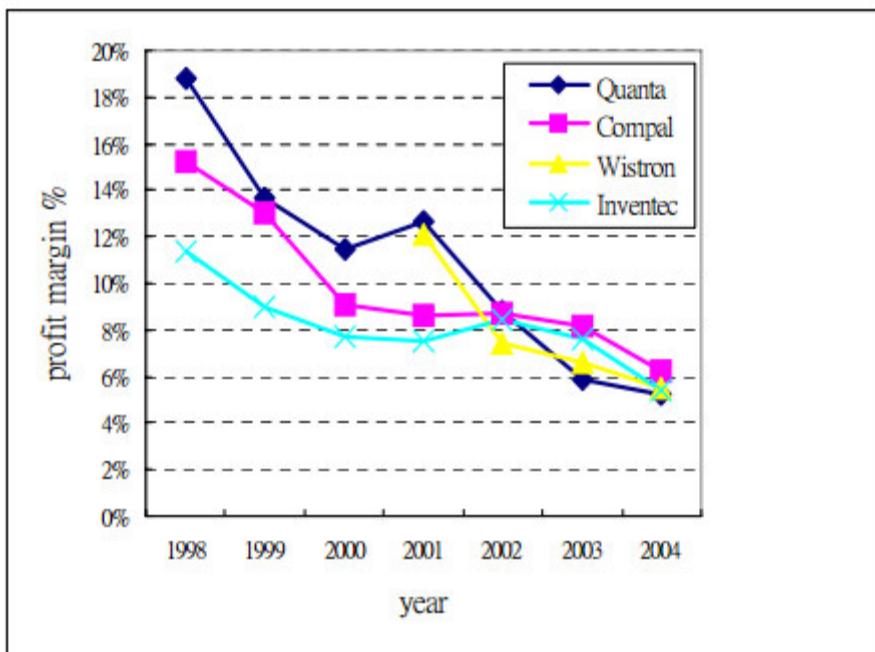
Further, the Market Intelligence Center in Taiwan published a report stating the main customers of the Top 4 Taiwanese ODMs. Table 5 summarizes the results (Market Intelligence Center, 2006, as cited in Kuo, 2006).

Table 5: Customers of the top 4 ODM firms in Taiwan. Source: Market Intelligence Center, 2006, as cited in Kuo, 2006

ODM	Customer								
	Dell	HP	Toshiba	Acer	Lenovo-IBM	Fujitsu-siemens	Sony	Apple	Gateway
Quanta	○	○	○	○	○	○	○	○	○
Compal	○	○	○	○	○				
Wistron	○	○		○	○				
Inventec		○	○	○					

The margins of Taiwanese ODMs are low, which means that a high volume is necessary in order to maintain profitability in the future. Whereas in 1998, the profit margins ranged from about 12-19%, they fell down to 5-7% in 2004 (Yang, 2006).

Fig. 11: Profit margins of top 4 Taiwanese ODMs from 1998-2004. Source: Yang (2006)



In 2013, the margins decreased even further. The gross margins of Taiwanese ODMs amounted to 3-5%, whereas at an operating level, the margins were 1-2% ("Taiwan's tech-industry", 2013, July 6). Further, Yang (2006) adds that the low margins have its source in the introduction of discount PCs by PC vendors as well as the focus of Taiwanese ODMs on middle to low value end products. Further, in the late 2000s, Foxconn and Flextronics entered the computer business (Woyke, 2009). Next to low profit margins, Taiwanese ODMs have to struggle with quarterly fluctuations as a result from the loss in production contracts. Foster (2006) showed the extreme case of Arima, which fell from 9 million shipments in 2003 to 700.000 shipments in 2002 due to a loss in a HP contract.

As a result of the declining laptop market, Taiwanese ODMs are struggling to maintain profitability: Quanta's profit declined from NTD23 billion in 2012 to about NTD18.6 billion in 2013 (Quanta, 2013). Compal's income dropped from NTD6.4 to NTD2.5 billion during the same period of time (Compal, 2013). Wistron's net income fell from NTD7.3 to 5.8 billion (Wistron, 2013a). In order to restructure the business, some Taiwanese PC manufacturers, such as Acer and Asus shifted their business away from ODM towards the OBM business. Most Taiwanese ODM manufacturers, however, tried to find other ways to increase their profitability. Pegatron increased its sales in mobile devices and in 2013 its revenue proportion from PCs went down to 40%. Foxconn reduced its reliance on Apple by moving into retail and increasing its R&D capabilities. Quanta produces servers, which store and process data of mobile devices. As a result, Quanta shifted from the pure ODM business, by selling its servers directly to end-customers. Inventec also invested in server technology,

which accounted for one quarter of its revenue in 2013 ("Taiwan's tech-industry", 2013, July 6).



5 Electronic Waste Worldwide

While section 4 dealt with the PC and notebook market, which belongs to Wistron's core business, this part deals with the market for electronic waste (e-waste), which Wistron is going to step in with its green recycling solutions.

According to the OECD (2001) the definition of the term e-waste comprises any appliance, which uses an electric power supply and that has reached the end of its life. Lundgren (2012) further divides electronic waste into 2 broad categories, namely electronic appliances such as air conditioners, microwaves, washing machines as well as electronic products, e.g. notebooks, laptops or cell phones. In the US e-waste mainly comes from 3 sources: individuals and small businesses; large business, institutions and governments as well as PC and laptop vendors (Puckett et al., 2002).

From 1980 onwards electronic waste started to become an increasing problem. The reason lies in rapid technological changes, an increasing customer demand, which results in increased mass production and a shorter life-cycle of electronic products. In 1992, the average lifespan of a PC in the US was 4.5 years. In 1999, the lifespan decreased to 3 years and in 2005, the average lifespan was only 2 years (Kang & Schoenung). The Silicon Valley Toxics Coalition (2001, p. 2) estimates that in 2005, "one computer will become obsolete for every new computer put on the market." Further reasons for the increase in e-waste are the usage of electronic devices in developing countries as well as a well-developed replacement market in the first world (UNEP, 2007).

Nowadays, e-waste is the largest growing waste stream, with a 4% growth rate each year and an annual creation of about 40 million tons worldwide (Schluep et al., 2009). The EU and US are the world's leading e-waste producers, with about 10 million as well as 9 million tons respectively, followed by China with about 7 million tons in 2012 (StEP Initiative, 2014). Collins, Kuehr, Kandil, and Linnell (2013) estimate that from 2012 to 2017 the accumulated growth rate is expected to jump even higher up to 33%. To visualize this, the authors quote that: "By 2017, all of that year's end-of-life refrigerators, TVs, mobile phones, computers, monitors, e-toys and other products with a battery or electrical cord worldwide could fill a line of 40-ton trucks end-to-end on a highway straddling three quarters of the Equator" (Collins et al., 2013). This would equal the weight of 200 Empire State Buildings or 11 Pyramids of Giza (Collins et al., 2013). Lundgren (2012) identifies six main issues associated

with e-waste: 1) high-volumes, due to high customer demand and the quick obsolescence; 2) toxic design, as 40% of heavy metals in landfills comes from e-waste; 3) poor design and complexity, because electronic devices require sophisticated recycling efforts to divide toxic and non-toxic materials; 4) labor issues, especially in under-developed countries (lack of safety standards); 5) financial incentives, as responsible e-waste recycling is costly and might become profitable with a rise in the price of some materials as well as 6) lack of regulation, as many nations do not have sufficient regulations or lack the capability to enforce them.

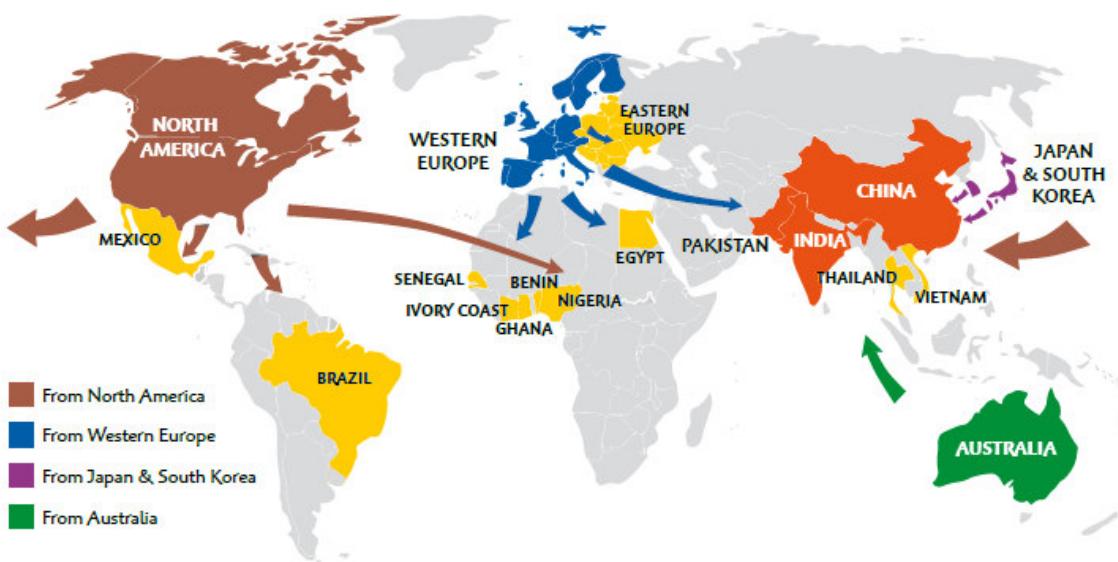
The amount of computer related waste occupies a large and fast growing portion in the e-waste stream as a whole. In Europe, according to the Waste Electrical and Electronic Equipment (WEEE) directive, electronic equipment such as computers, telephones, fax, printers as well as monitors amount to 25% of the total e-waste (Heberlein, 2006). In Western Europe, the amount of information and communication technology (ICT) related e-waste even amounts to 33.9%, thereby taking the largest part (Widmer, Oswald-Krapf, Sinha-Khetriwal, Schnellmann, & Böni, 2005).

Computers contain a lot of different waste sources. In the decade between 1997-2007, it is estimated that the US produced more than 500 million obsolete PCs. 500 million obsolete PCs amount to 6.32 billion pounds of plastic, 1.58 billion pounds of lead, 3 million pounds of cadmium, 1.9 million pounds of chromium and 632,000 pounds of chromium (Silicon Valley Toxics Coalition, 2001). Some of these ingredients do not only pose an environmental threat, but are hazardous to the human body. Lead e.g. "causes damage to the central and peripheral nervous systems, blood systems, kidney and reproductive system in humans" (Silicon Valley Toxics Coalition, 2001, p. 9). Cadmium can cause irreversible effects on the human body, especially the kidney. Mercury can cause damage to the brain, the kidney as well as to the fetus of pregnant women (Silicon Valley Toxics Coalition, 2001).

According to Lundgren (2012), it is believed that recycling rates increase year by year at a rate of 18%. In addition, the stream of e-waste flows mostly from developed to developing countries, where labor is cheap and regulations and enforcement is weak (Lundgren, 2012; Puckett et al., 2002). To take an example, exporting e-waste to Asia is 10 times cheaper than recycling it in the US. However, e-waste does not flow from developed countries to developing countries in every case. There is also a considerable amount of e-waste flowing from one developing country to another developing country. This regional trade between developing countries is growing at high pace (Lundgren, 2012). It is estimated that China receives 70% of the global e-waste export (Lundgren, 2012). Even though the exact amount

of the global e-waste trade is not clear, Puckett et al. (2002) put forward that about 80% of recycled e-waste in the USA is actually exported to China. Further, due to labels, maintenance stickers, phone numbers and similar identifiers on the computers, the authors estimate that the largest amount of computers exported to China comes from the US, followed by Japan, South Korea and the European Union. Figure 12 shows the global trade of e-waste between developed and developing countries.

Fig. 12: Global export of e-waste (Lundgren, 2012)



Due to the huge growth of e-waste over the past two decades, it is not surprising that the recycling market of e-waste is becoming more and more lucrative. According to a study of Allied Market Research (2015), the global e-waste management market will be worth approximately \$49.4 billion by 2020. IT and telecommunications will take the largest share of e-waste, and the Asia-Pacific region will generate most of the revenue, followed by Europe, the USA and the LAMEA region. Another report by Transparency Market Research puts forwards that in 2019 the market will amount to \$41.36 billion. From 2013-2019, electronic waste will increase at a 23% growth rate. Further, the report concludes that the European Union will become the world leader in electronic recycling due to strict governmental regulations. However, the US, in order to keep up with the EU, also increases its recycling efforts. Metal is the most recycled material, due to its high occurrence and expensive mining process. Further, computers will remain the most recycled product and their amount will even grow due to their shorter life spans (Global Market for Electronic Waste, 2014).

6 Case Study: Wistron's Green Supply Chain

6.1 Wistron's Strategic Shift Towards Green Manufacturing

The Wistron Corporation is an original design manufacturer and was established in 2001 after Acer spun off its design, manufacturing and after sales service operations division. Its main products are notebook PCs, followed by desktop PCs and displays (Wistron, 2013a, 2014). Table 6 displays the sales value of Wistron's PCs and notebooks.

Table 6. Sales value of Wistron's PCs and notebooks 2013-2014. Source: Wistron (2014)

Year		2013				2014			
		Domestic		Export		Domestic		Export	
Sales Value	Major Product	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
		500,639	5,457,230	26,411,979	328,555,325	272,257	3,102,023	21,350,164	293,590,551
NB Computer	Desktop PC	715,150	4,392,113	14,072,309	71,558,202	406,880	2,464,100	14,685,143	71,920,910
Others		339,634	3,197,513	36,994,864	210,848,690	1,471,665	5,082,256	70,377,885	216,186,893
Total		1,555,423	13,046,856	77,479,152	610,962,217	2,150,802	10,648,379	106,413,192	581,698,354



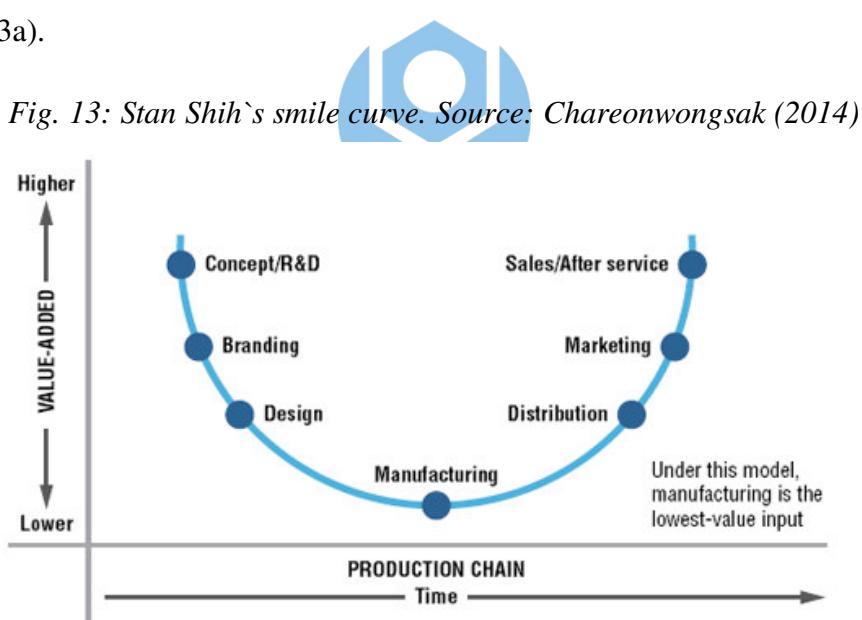
During the last years, the global decline in notebook demand has posed serious obstacles to Taiwanese ODMs. Taiwanese ODMs produced 89% of the world's notebooks in 2013, as well as 46% of the world's desktops ("Taiwan's tech-industry", 2013, July 6). Original design manufacturers in Taiwan, in comparison to global original brand manufacturers have a very low profit margin. The gross margin amounts to 3-5%, whereas the operating margin amounts to 1-2%. This means a high volume has to be sold in order to stay profitable and competitive ("Taiwan's tech-industry", 2013, July 6). In an interview with Wall Street Journal, Simon Lin, the CEO of Wistron Corp., concludes: "Notebook computers used to make up 70%-80% of our revenue, but it will drop below 50% this year. Demand for notebooks is no longer growing. We've realized that if we continue the traditional business model, our margins will continue to be eroded. We believe services bring more value to our customers, so we are expanding our services, including after-sales repairs and electronics recycling" (Dou, 2013, February 4, para. 5). In 2009, Lin decided to invest \$200 million into new businesses, including recycling (Woyke, 2009).

From 2011 onwards, Wistron has changed its strategic position and has invested more resources in order to increase the revenue proportion of its technical services (Wistron,

2012b). For instance, Wistron bought 5% ownership in Super Dragon technology, a company specialized in waste recycling (Woyke, 2009).

The reason for branching out into technical services lies in the higher profitability. Stan Shih established the smiling curve, which states that manufacturing offers the lowest profitability in comparison to upstream and downstream operations. With an increase of technical services, Wistron therefore branches out to the downstream part of the model: "Simply put, we aim to flatten the middle of the smiling curve of Mr. Stan Shih's ODM theory. The bottom of the smiling curve represents the manufacturing and assembly sector, which is characterized by low gross profit. At the current stage, major ODM companies are squeezed into a tight market and are competing to survive" (Wistron, 2011b, p. 94). Figure 13 shows the smile curve.

Due to the declining profitability of its core business Wistron is changing from being a mere ODM towards a technology service provider (TSP) and offers not only design and manufacturing, but also an after sales service support for information and communication technology (ICT) as well as a recently established green recycling service (Lin, 2012b; Wistron, 2013a).



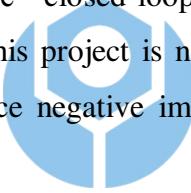
Even though the amount of e-waste is growing year by year and as a result, the recycling market is equally growing at high pace as shown in section 5, Wistron does not expect immediate benefits from its green cycle solution. The green recycling service is regarded as a long-term investment in the future (Lin, 2014; Wistron, 2010b). Simon Lin said at the Fortune Brainstorm Green Sustainable Solutions Summit in 2014 that environmental friendly solutions and waste reduction do already play an important role for ICT-related companies. He expects that after Dell has successfully implemented Wistron's Green Supply Chain, more and more companies will follow Dell's approach and Wistron's customer base will grow. In

this way, through economies of scale, Wistron's green supply chain might become profitable in the future (Lin, 2014). The recycling business first targets only OBMs, but in the long-run aims at targeting a wide range of customers: "Eventually, it aims to process every part of a computer, followed perhaps by moves into home appliances and even cars" (Woyke, 2009, para. 7).

Wistron's non-core business, including cloud computing, after-sales services, medical equipment and recycling adds already up to 10% of the total revenue ("Taiwan's tech-industry", 2013, July 6). Simon Lin hopes that in the long run, recycling alone can contribute to 3-5% of Wistron's revenue (Dou, 2013, February 4).

6.2 Wistron's Green Supply Chain Implementation

Wistron first announced its plans for the green recycling supply chain in 2010 (Wistron, 2010b). At this time, Wistron's vision was: "To be the leading service supplier of e-waste recycling" (Wistron, 2010b, p. 55). This vision was accompanied by the mission to provide "ODM/OEM clients 'cradle to cradle' closed-loop solutions" (Wistron, 2010b, p. 55). According to Wistron's estimations, this project is not profitable at the beginning, but will first of all fulfill the purpose to reduce negative impacts on humans and the environment (Wistron, 2010b).



While traditional eco-efficient measures aim at reducing the negative environmental impact, the cradle to cradle concept rearranges the old paradigm by only producing positive externalities: "Rather than seeing materials as a waste management problem, as in the cradle-to grave system, cradle-to-cradle design is based on the closed-loop nutrient cycles of nature, in which there is no waste. By modelling human designs on these regenerative cycles, cradle-to-cradle design seeks, from the start, to create buildings, communities and systems that generate wholly positive effects on human and environmental health. Not less waste and fewer negative effects, but more positive effects" (McDonough & Braungart, 2003, p. 14).

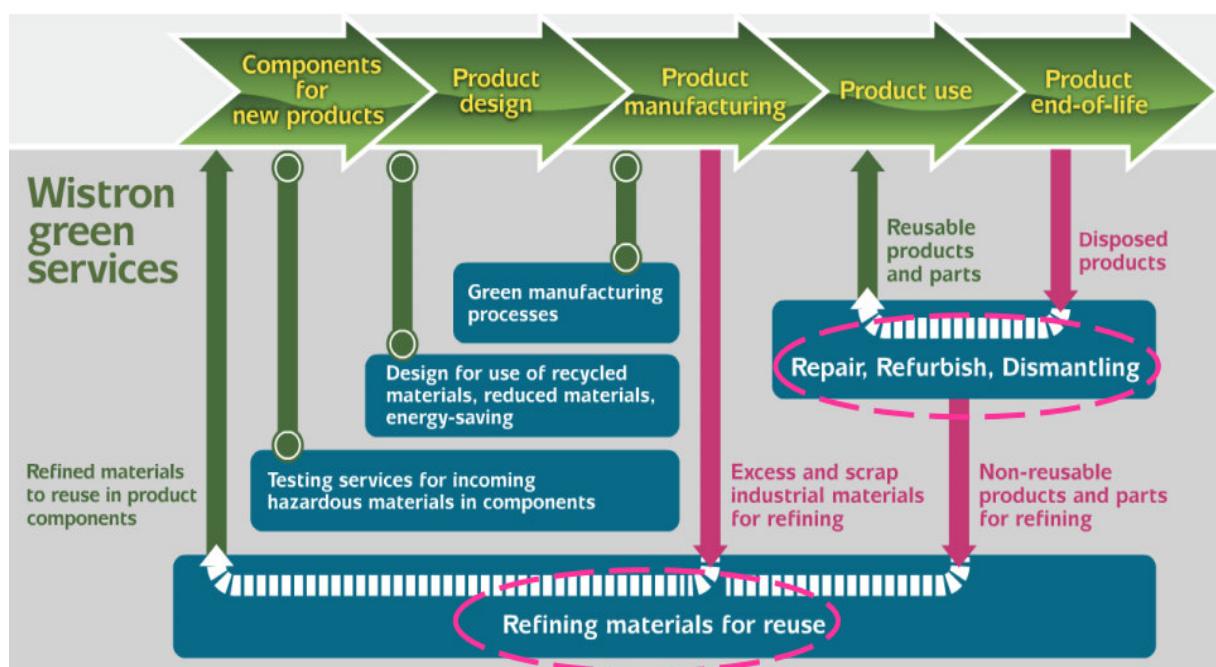
In a closed-loop supply chain, in comparison to a forward supply chain, the customer returns the product back into the supply chain and the manufacturer gains additional value from the product after its end of life. Therefore, a closed-loop supply chain combines a forward supply chain approach with a reverse supply chain (Guide Jr., Harrison, & Van Wassenhove, 2003). Wistron's closed-loop manufacturing process comprises 4 steps: Collection, sorting and refining, manufacturing as well as consumption. During the collection phase, the product is collected from consumers to either recycle or dispose it. After this, the waste is sorted and

refined into new raw materials. Wistron takes these materials and manufactures new products during the manufacturing phase. In the last phase, the customer uses the product made up of recycled materials. The loop begins anew when the product reached the end of its life (Wistron, 2012b).

Thus, Wistron's cradle to cradle closed-loop solution aims at reducing negative externalities as well as increasing positive externalities by integrating a reverse supply chain into its activities. In order to achieve this, Wistron established in 2010 the Green Recycling Business Development Division. Its focus is to recycle different material groups: plastics, circuit boards, batteries, and displays, as these have the most impact on the environment and offer the greatest recycling value (Wistron, 2010b, 2013b).

Wistron's ICT product life cycle consists of 5 steps. First of all, the product design phase uses refined materials, acquired from scrap products in the last phase. The products are designed in line with material reduction and energy savings. During the product manufacturing stage, excess and scrap materials are not thrown away, but are saved for further refining. During the product use stage, the customer buys a PC, which already contains recycled parts. In case the customer needs a repair service, spare parts are also made of reusable, recycled parts. After the customer disposes his product, the product enters the end-of-life stage. This stage consists of 2 subsequent phases: First of all, the scrap is collected, repaired, dismantled and refurbished in the front-end operations phase, and then refined in the back-end operations stage (Lin, 2012b; Wistron, 2010b). The back-end operations stage offers the components for new products, and the cycle repeats itself at the design stage, which makes use of these materials.

Fig. 14: Wistron green cycle solutions. Source: Lin (2012b)



Using closed-loop systems for recycling is not entirely new. It has already been used for printer cartridges and recycled plastics from water bottles and CD cases have already been used in enclosures. However, this is the first time where plastics from electronic product are a large input for manufacturing a new product (Kyle, 2014).

Wistron GreenTech's closed-loop recycled plastics is certified by the organization Underwriters Laboratories (UL) Environment (Dell sustainability initiative, 2014, May 27). UL Environment is one of the leading organizations in providing companies with environmental safety standards (Underwriters Laboratories, 2012). Dell says that this certification established the first environmental industry standard concerning closed-loop recycling (Dell sustainability initiative, 2014, May 27).

The above mentioned recycling process is not located at a single facility, but is a global operation in itself. Wistron's GreenTech Recycling division has two main core businesses, and these core businesses are also geographically divided. One core business is in Texas, USA and the other core businesses is located in Kunshan, China (Wistron, 2013b). The following paragraphs outline in detail the division of labor between these facilities.

6.3 Wistron's Plant at McKinney, Texas



The back-end operations phase (refining of precious materials, copper and fiberglass) is done at a recently established recycling plant in Texas (Lin, 2012b; Wistron, 2011b, 2013b). Next to refining, the facility also offers IT asset recovery services, e.g. logistics, parts recovery, reuse, data destruction and repair, battery collection and sorting (Wistron, 2013b). The plastics obtained from e-waste at McKinney are sent to Wistron Advanced Materials in Kunshan, China for sorting, purification and compounding (Wistron, 2013b). The plant started its operations in January of 2013 (Clark, 2012). Wistron invested \$21 million to build up its recycling plant in McKinney, a suburb of Dallas, which at its beginnings already employed 80 people (Carlisle, 2012, October 19). This number was expected to grow to 120 within the years to follow (Clark, 2012). Simon Lin's goal in the end of 2013 was to recycle 1 million circuit boards per month at the plant (Dou, 2013, February 4).

At the Texas plant, precious materials are being extracted from printed circuit boards (PCBs) (Lin, 2012b). According to Lin (2012b), 1 ton of printed circuit boards contains 265 gram of gold, which has a value of about \$13.400. Further metals include 86 kilogram of aluminum (\$165), 220kg of copper (\$1700), 56 gram of palladium (\$1320), 725 gram of silver (\$670) as well as 18 kilogram of tin (\$420). Thus, 1 ton of recycled PCBs have a value of about \$17.500.

Extracting precious materials from printed circuit boards is usually done by smelters, a process where circuit boards are burnt (Carlisle, 2012, October 19). Wistron, however, uses a more energy-efficient approach, which can be divided into two different processes. In the physical process, gold and silver are being removed from bare boards and integrated circuits via milling and gravity separation. Milling is a process in which mechanical or computerized machines cut out the required components of a printed circuit board (Eurocircuits, 2014). Gravity separation requires relatively low capital and operating costs, and is environmentally friendlier than excessive heating or chemical-based separation approaches. There are numerous approaches available, however all have in common that they make use of the different gravity of each specific material in order to sort them out (Falconer, 2003).

The chemical process uses first gold leaching and then electrowinning in order to receive the precious materials from the printed circuit boards (Lin, 2012b). The leaching process transforms the precious metal into a liquid form by putting it into a chemical solution (Warhurst & Noronha, 1999). Afterwards the process of electrowinning passes electricity through the solution. The electrons reduce silver and gold ions and make them turn into a solid form again (Gekko, 2015).

6.4 Wistron`s Plant at Kunshan, China



Wistron Advanced Materials (Kunshan) Co. Ltd. in Kunshan, China was founded in 2011. The city of Kunshan was given the status of an export processing zone (EPZ) by the Chinese government in the year 2000 (Chen, 2008; Wistron, 2012b). Business taxes in these zones (15%) are higher than in high-tech parks (10%). However, export processing zones allow companies the duty-free import of machinery and equipment (Chen, 2008).

Wistron`s Kunshan plant occupies a space of 293.000m², where the plastics refining facility takes 53.000m² (Lin, 2012a). It started its first commercial operations in the beginning of 2013 (Wistron, 2012b). The plant refines post-consumer resin (PCR). The plant development is based on 5 principles: “state-of-the-art technology, IT production management system, world-class safety management and pollution control, energy-saving and low carbon emission, and green architecture” (Wistron, 2011b, p. 98). The main purpose of the plant in Kunshan is to recycle materials and use them for new ICT products (Wistron, 2011b). The plant was fully operating in the end of 2014 (Lin, 2012a).

Its main outputs are post-consumer recycled ABS, HIPS as well as PC-ABS (Lin, 2012a; Wistron, 2012b). ABS is a high-quality engineering plastic, containing acrylonitrile,

butadiene and styrene (Chi Mei Corp., 2012). HIPS stands for high impact polystyrene and is a highly rigid plastic (Plastics Direct, 2015). PC-ABS (polycarbonate-ABS) has both the strength of polycarbonate and the flexibility of ABS. This material is most commonly used by products related to automotive, communications as well as electronics (Javelin Tech, 2014).

The recycling process at Kunshan is divided into 3 main parts: Material sorting, purification and compounding (Lin, 2012b; Wistron, 2010b). Instead of using traditional approaches such as visual inspection or burning the material, Wistron uses an optical sorting technology in order to sort out different materials. During the purification phase, semi-finished products are further purified into highly purified plastic chips via hydro-purification. During the compounding phase, the plastic is adjusted according to customer specifications and pelletized (Wistron, 2010b, 2012b, 2013b). As Wistron Advanced Materials consolidates the aforementioned steps under one roof, Wistron names this approach `one stop refining` (Lin, 2012b; Wistron, 2012b).

6.5 Dell's Sustainability Initiative: The 2020 Legacy of Good Plan



Dell can already prove a long track record of sustainable initiatives. In 2010, it was ranked number 1 in Newsweek's green ranking for US companies (Newsweek, 2010). Dell received this ranking due to its sustainable supply chain and operations, and for the fact that Dell helps consumers become more environmentally friendly, e.g. via its convenient recycling programs as well as its packaging solutions (Dell, 2010). Nowadays, Dell engages in various sustainability programs and initiatives. Dell's new strategic sustainability vision revolves around 21 goals for 2020, summarized in the 2020 Legacy of Good plan.

In 2013, Dell announced its 2020 Legacy of Good plan (Dell, 2014a). This plan contains 21 environmental, community and human goals, which should be implemented by 2020. Michael Dell commented on the plan as follows: "We are setting the bar high. By 2020, we expect to reduce the energy intensity of our product portfolio by 80 percent, use only packaging that is 100 percent compostable or recyclable, and rally our global workforce to give 5 million volunteer hours to the communities we call home — just to name a few. But we are also laying out a new vision that extends well beyond what Dell can do alone. We've set an aspirational goal of generating 10 times more benefit through our technology than it takes to make and use it. We call it the 10x20 Goal — A Legacy of Good" (Dell, 2012, p. 3).

One of these goals is to use 50 million pounds of recycled-content plastic and other sustainable materials in their products (Dell, 2014a): "At Dell, we take a lifecycle approach to

all aspects of sustainability — including waste — considering the environment at every step: product design, building, packaging and shipping, use and recycling. Our waste reduction efforts thus start with incorporating sustainable materials, such as recycled-content plastics and natural fibers, into the design of Dell products and packaging whenever possible” (Dell, 2012, p. 30).

Wistron’s closed-loop green cycle approach helps Dell to come closer to the above mentioned goal. The next section describes how Dell makes use of Wistron`s green supply chain in one of its latest computers, the Optiplex 3030. Further, the section describes the initial success of Dell`s pilot project.

6.6 Dell`s Usage of Wistron`s Green Supply Chain

At the Fortune Brainstorm Green Sustainable Solutions Summit in 2014, some time after Simon Lin has spoken about Wistron`s green cycle, Michael Dell explained his aspirations and plans concerning his company`s sustainability programs. After having eaten mushroom-made edible packaging with soy sauce together with the host on stage, Michael Dell continued to talk about the green cycle, which Dell uses in collaboration with Wistron: “We are introducing our first product, one of our Optiplex all-in-one desktops, using closed-loop recycling materials. This is certified by the UL process. The plastics in this product [...] are coming from older products. We had our partner Wistron, in one of the panels earlier, working with them. It’s a complete closed-loop system” (Dell, 2014d). Wistron`s supply chain is currently used by Dell in order to produce the Optiplex 3030 all-in-one laptop (Dell, 2014b). The Optiplex 3030 was first commercially available in June 2014.

Dell`s green cycle starts by collecting e-waste from customers and businesses. In the United States, Dell offers its recycling solutions for businesses and individual customers. Businesses can choose to recycle all their assets or only recycle non-valuable goods, while selling systems which still have value (Dell, 2015a). Individual customers have the option to send back their PC or laptop at no charges. Further, Dell offers the recycling service also for non-Dell PC`s and laptops if the customer agrees to buy a new Dell product (Dell, 2015b). Further, the Reconnect program, a collaboration between Dell and Goodwill, allows customers to drop off their PCs at a participating Goodwill store in the US for recycling (Dell, 2015c). In Dell`s Global Recycling Program, Dell offers similar services to different degrees depending on the region (Dell, 2015d). In the first stage of the green recycling project Dell will use recycled plastics from 7 US states for the production process of the Optiplex 3030 (Kyle, 2014).

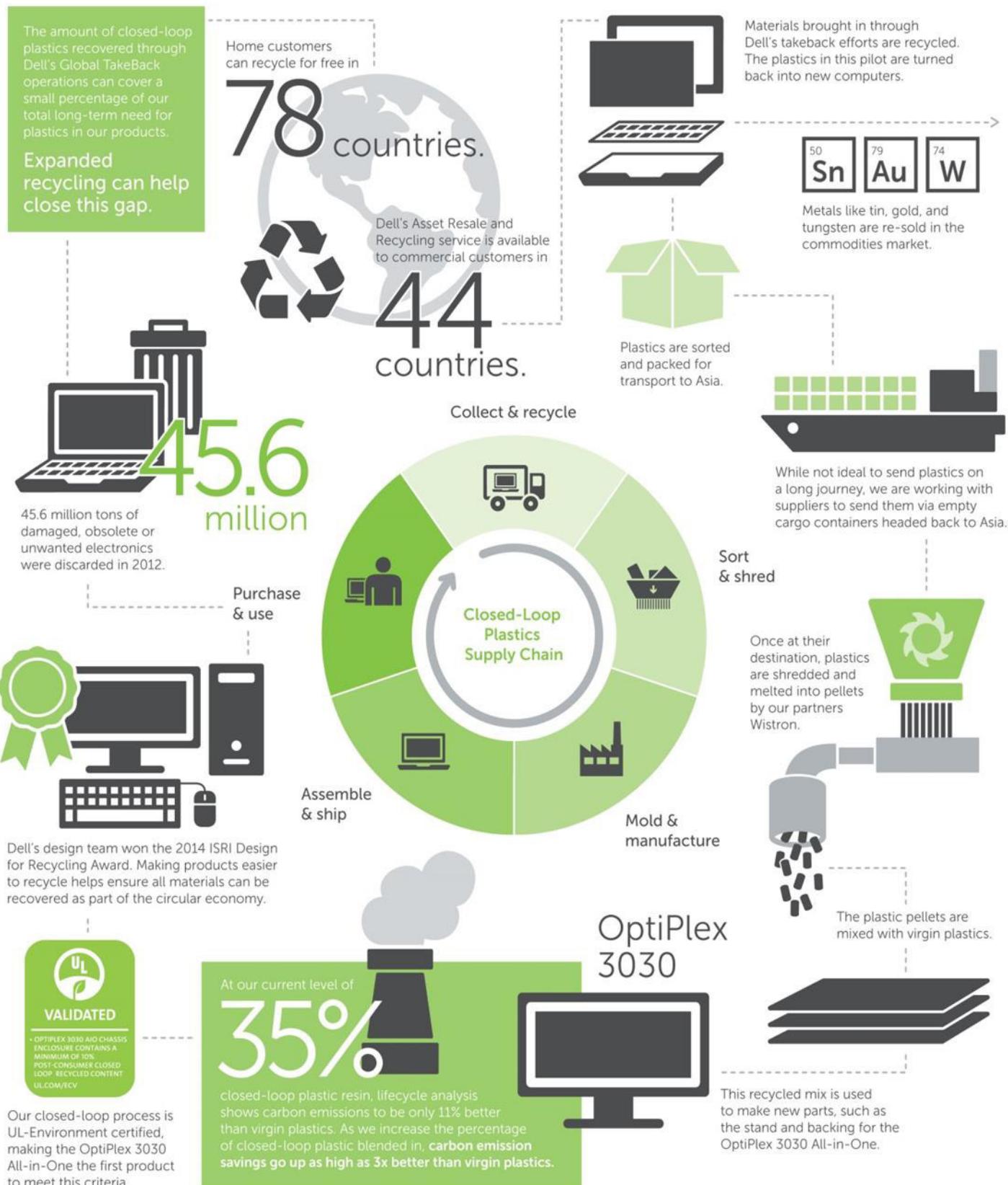
Beside these initiatives, Dell was also the first company which banned e-waste export to developing countries (Dell, 2015e).

The notebooks and laptops collected at the 7 states are being recycled at Wistron GreenTech in Texas. The plastics extracted in the pilot project are ABS and PC-ABS (Kyle, 2014). Further, precious metals such as tin, gold and tungsten are being resold in the commodities market (Dell, 2014c). The plastic parts obtained in Texas are then sent to Kunshan for sorting, purification and compounding (Dell, 2014c; Wistron, 2013b). Even the shipping process from Texas to Kunshan is optimized to use minimal waste. Dell uses empty cargo containers of its suppliers, which are heading back to Asia (Dell, 2014c). Once arrived in Kunshan, China, Wistron uses the approach as described in section 6.4. The resulting plastic pellets are then mixed with virgin plastics (Dell, 2014c). Virgin Plastics are plastics which have never been processed before (American Chemistry Council, 2014). The recycled ABS plastic parts are used for the back panel and the stand of the Optiplex 3030, and contribute 35% while virgin plastics contribute 65% of the plastic needed for production. The recycled plastics used to manufacture the laptop make up for 12% of the total plastic weight. The current amount of recycled plastics let Dell save 11% in carbon emissions. By using more and more recycled plastics, Dell estimates to be able to reduce its carbon emission by 3 times (Dell, 2014c). Dell plans to increase the parts of the laptop, which can be produced by using recycled plastics as well as to increase the total share of recycled plastics. Further, Dell has also started to use recycled plastics in different versions of Optiplex laptops and monitors (Kyle, 2014). According to Scott O'Connell, director of environmental affairs at Dell, the new models will also be certified by Underwriters Laboratories (Shah, 2014). The mixed plastics go to the manufacturing phase. Dell uses a green manufacturing approach in order to make its products easily recyclable. As a result, it won the 2014 award of the the Institute of Scrap Recycling Industries (ISRI) for their models Latitude 10, Latitude E7240 as well as XPS 10 (Carpenter, 2014; Dell, 2014c). It is the most valuable award of the organization and given to designs where recycling takes a major priority (Carpenter, 2014). After the design and manufacturing process, the products are sent out to customers, who use the recycled computers until they return them at the end of their life. Figure 15 summarizes Dell's closed-loop recycling business. In the fiscal year of 2014, Dell was able to use more than 10 million pounds of recycled plastics for the production of Optiplex laptops as well as flat-panel monitors (Dell, 2015f). This is already 1/5th of Dell's aspiration to use 50 million pounds of recycled plastics in their products, as stated in the 2020 Legacy of Good plan.

Fig. 15: Dell's closed-loop recycling process. Source: Dell (2014c)

Dell's Closed-loop Recycling Process

Dell becomes the first to offer a computer made via the UL Environment certified closed-loop process with the launch of the OptiPlex 3030 All-in-One. By using plastics collected through our existing takeback and recycling programs to build new systems, we are helping drive a circular economy for the IT industry.



7 Case Analysis: Buyer-Supplier Relationship between Wistron and Dell

7.1 Porter's 5 Forces Framework: The Bargaining Power of Buyers

Section 2.5.2 described Porter's 5 Forces framework, in particular with regard to the bargaining power of buyers and suppliers. Based on the framework, this paragraph analyses the case while the following section uses the Kraljic matrix to analyze the relationship between Wistron and Dell.

According to Porter (1980) the bargaining power of a buyer increases when he buys large volumes relative to supplier's sales

Yang (2006) states that global PC manufacturers usually have two or three Taiwanese ODMs as their first-tier suppliers. Further, according to the Market Intelligence Center, Wistron's main customers are Dell, HP, Acer and Lenovo (Kuo, 2009). This is in line with Wistron's customer data as summarized in table 7. According to the data, in 2013-2014 4 buyers account for about 60% of the net purchases made at Wistron. This confirms that Wistron is highly dependent on each of its main customers, which increases the bargaining power of the buying side and decreases Wistron's position.

Buyer's costs of the purchase are significantly high: The buyer is price sensitive and will most likely haggle over lower prices

Costs of goods sold contribute a huge part of the cost structure of PC and laptop OBM (see table 3). Further, Dell outsources its entire manufacturing process to third parties (see table 5). As a result, Wistron's products and services contribute a substantial part to Dell's purchasing costs. The decline in global sales over notebooks and PCs in combination with a shrinking profitability make it necessary for OBM to haggle over prices. As Foster (2006) mentions, OBM encourage competition among Taiwanese ODMs by letting some of their first-tier suppliers bid over the same product line. Therefore, the bargaining power of buyers is higher, as one way to stay competitive is to reduce costs, which has to be borne by the suppliers. For these reasons, nowadays the margins of Taiwanese ODMs are very low.

Table 7: Wistron's key buyers from 2008-2013 (in 1000 NT\$). Source: Wistron (2009, 2010a, 2011a, 2012a, 2013a, 2014)

Buyer	<u>2008</u>		<u>2009</u>		<u>2010</u>		<u>2011</u>		<u>2012</u>		<u>2013</u>		<u>2014</u>	
	Amount	% of total net purchase	Amount	% of total net purchase	Amount	% of total net purchase	Amount	% of total net purchase	Amount	% of total net purchase	Amount	% of total net purchase	Amount	% of total net purchase
Acer	113,307,655	26.83	158,250,855	30.25	128,863,063	23.57	75,913,928	12.95	-	-	68,642,784	12.27	-	-
Buyer B	89,128,779	21.11	104,832,537	20.04	81,197,008	14.85	105,583,837	18.00	129,766,889	21.67	125,740,421	23.29	79,001,703	14.45
Buyer A	-	-	88,191,762	16.86	-	-	-	-	-	-	-	-	47,259,035	8.65
Buyer D	-	-	-	-	56,233,089	10.29		-	69,806,809	11.66	50,131,952	9.29	-	-
Buyer H	-	-	-	-	177,965,793	32.56	136,522,526	23.28	87,679,263	14.64	-	-	-	-
AIIH	-	-	-	-	-	-	87,813,450	14.97	88,780,051	14.83	78,520,073	14.55	134,389,996	24.58
WITX	-	-	-	-	-	-	-	-	-	-	-	-	61,280,806	11.21
Others	219,844,934	52.06	171,842,614	32.85	102,369,203	18.73	180,643,442	30.80	222,725,500	37.20	216,749,278	40.15	224,713,867	41.11
Total	422,281,368	100	523,117,732	100	546,628,156	100	586,477,183	100	598,758,593	100	539,784,508	100	546,645,407	100

*Note: Undisclosed Buyers (Buyer A, B, D, H) do not necessarily have to be the same companies over two time periods. For instance, Buyer B of 2009 is not necessarily Buyer B of 2014

The products purchased are commodities: Buyer can easily find alternatives and is therefore less dependent on one particular supply source

According to Chen (2015), Wistron sells customized products to Dell. Further, Dell and Wistron interact on a daily basis concerning operational and strategic issues. As a last point, due to the few suppliers available, Dell does not have a lot of supply alternatives.

Despite these facts, it is equally true that OBM^s change on a constant basis their suppliers, which leads to quarterly fluctuations. Foster (2006) says that OBM^s regularly change suppliers primarily due to price considerations. This is in line with Chen (2015), who states that the future business between Dell and Wistron is determined by a bidding process. The notion of the ‘value trap’ of the PC market, as mentioned by Arthur (2014, January 9) further indicates that PCs and laptops have nowadays already become commodities. Thus, it becomes clear that even though there are not a lot of alternative supply sources, OBM^s still conduct a competitive bidding process in order to determine the business relationship. This means that OBM^s impose their power on Taiwanese ODM^s.

The buyer faces few switching costs, and the seller faces high switching costs

Even though it is not possible to put a monetary value on the switching costs on both sides due to strict non-disclosure policies, based on the prior examples it is clear that buyers regularly engage in switching suppliers, whereas suppliers have to compete for each order. Foster (2006) states that OBM^s routinely switch between their suppliers for each new project. Thus, the supply side is in a weak position, which does not allow it to change its customers, whereas the buying side can easily make use of its bargaining power.

The buyer’s business earns low profits and as a result he has incentives to decrease purchasing costs

When comparing the operating margins of the top 4 PC vendors with the average operating margins across multiple industries, it becomes clear that PC OBM^s are operating below average. Damodaran (2015) compared the operating margin of several industries in the US and calculated an average operating margin across all industries of 10.08%. Dell’s margin of 7.1% in 2012 is below average and therefore Dell has high incentives to haggle over prices. The previous examples also affirm this.

Buyers pose a threat of backward integration: If a buyer is able to produce the product in-house, he can get concessions from the supply side

In the case of computers and notebooks, the threat that OBM^s move back to their roots and manufacture in-house is very small. First of all, PCs and laptops are declining in sales volume and profitability. Secondly, these products already have become commodities. According to Wharton University (2012, para. 8), if a product has become commoditized, a more specialized approach is taken where each company occupies an expert role in the supply chain: “In the case of PCs, a group of companies now makes different parts of the machine that are then put together to create the final product: Microsoft builds operating systems, Intel makes processors, Nvidia provides graphic chips and a series of companies manufactures hard drives.” As a result, there is no threat of backward integration from the buying side.

Product of buyer is unaffected by supplier input: Buyers are more price sensitive, as the product is not crucial to the end-product

In the case of the PC and notebook industry, Taiwanese ODMs offer crucial input to notebook OBM^s. However, as seen in the previous examples, the price sensitivity due to declining sales and profitability is very high.



The buyer has full information: Knowledge about the market or the supplier cost structure give him a better bargaining position

According to Chen (2015) Dell engages in supplier development practices for Wistron, which means it supports Wistron financially in order to get customized products. Monczka et al. (2008) state that effective supplier development strategies require an intensified two-way communication. Thus, the knowledge gap between Wistron and Dell is smaller due to Dell’s supplier development practices.

7.2 Porter's 5 Forces Framework: The Bargaining Power of Suppliers

Porter (1980) describes in the same manner the bargaining power of suppliers. The bargaining power of a supplier group is high if the following points hold to be true:

The supplier group is more concentrated than the industry it sells to

It is true that the Taiwanese ODM industry is more concentrated than their OBM counterparts. However, this difference is very small. Basically, a handful of ODMs do business with a handful of OBMs. Further, ODMs also only have 3 or 4 buyers, which contribute a huge portion of their income. The unique selling proposition of Taiwanese ODMs is their low price. As a result, in order to benefit from economies of scale, they need to sell huge portions to some OBMs, as OBMs also demand customization. Thus, even though the Taiwanese ODM industry is concentrated, the companies cannot make use of this advantage, as they are facing a concentrated buying industry.

There are no substitutes for the supplier product available

During the last years, there were no substitutes available for PCs and notebooks. However, after the introduction of smartphones and tablets, the computer industry has changed. In 2014, about 317.000 traditional PCs, notebooks and ultramobiles were shipped worldwide, while 1.96 million tablets and mobile phones were shipped worldwide (Gartner, 2014). This means that for the main product of Taiwanese ODMs, the notebook, there are a lot of substitutes available.

The industry the supplier sells to is not important to the supplier group

OBMs are of crucial importance to the survival of Taiwanese ODMs. Taiwanese ODMs usually have only a few buyers, which contribute a huge deal of the total sales proportion. In case of Wistron, 4 buyers alone account for about 60% of its total sales in 2013 and 2014.

The supplier's product is important to the buyer

Taiwanese ODMs input is very important to OBMs. As Foster (2006, p. 12) puts it: "These CMs [contract manufacturers] and ODMs are now the key operational part of the industry's supply chain, linking component and peripheral suppliers to meet the product requirements of the branded companies."

The products are differentiated or include switching costs

As mentioned by Chen (2015) Dell engages in supplier development practices towards Wistron in order to receive customized goods. Thus, if Dell would choose another supplier, switching costs incurred. However, as seen in the previous examples, OBM^s foster competition among ODMs, and also stop ordering even huge quantities, as the case of Arima and HP demonstrates. As a result, switching costs do not impede the buying side from switching its suppliers.

The supplier can pose a threat of integrating forward

There is a threat of integrating forward, as Acer and Asus have demonstrated. However, there are several barriers for Taiwanese ODMs to overcome. First of all, if Taiwanese companies become OBM^s, they face the threat of losing their revenue stream from their prior customers, as they are now competing against them. As a result, in order to become an OBM a company restructure must be done. Further, as Acer and Asus show, becoming an OBM is a risky business, as according to Kuo (2009) these companies have technological competencies, but lack market knowledge. Nowadays, Acer and Asus find themselves both in a very competitive environment, as they have to compete against strong OBM market leaders. Therefore, there is a threat of forward integration, which is however very difficult to successfully implement.

7.3 The Kraljic Matrix

Section 7.1 and 7.2 analysed the relationship between Dell and Wistron via Porter's 5 Forces. This section uses the Kraljic matrix' 2 dimensions 'profit impact' and 'market complexity' for this purpose.

Notebooks and PCs are of crucial importance to the buying company, as they are the key input for OBM s. Further, in order to save costs, OBM companies have outsourced huge portions of their manufacturing activities to Taiwanese ODMs. Dell outsources its complete manufacturing portion to third parties, and the Taiwanese ODMs Quanta, Compal and Wistron contribute 95% of the PC production. The remaining 5% are manufactured by Korean companies (Yang, 2006). As a result, the input of Wistron and other Taiwanese ODMs is crucial for Dell's profitability.

Even though the PC manufacturing industry is very concentrated, the fact that Taiwanese ODMs compete over the same product lines of a commoditized product make the supply market not very complex, as OBM s can switch easily from one supplier to another in order to save costs. As cost savings are the main factor of the competitive bidding process, Taiwanese ODMs have to accept low margins in order to win the bid. These factors lead to the assumption that most of Wistron's items can be categorized as 'leverage items' from Dell's perspective. Leverage items are valuable to the buying company, as they account for a huge proportion of the company's profitability. However, the supply market is very competitive, as no supplier has a special unique selling proposition.

Caniëls and Gelderman (2005) say that a buying company has two different options of how to deal with a supplier, which delivers leverage items to the buying company. First of all, the buying company can exploit its power or it can engage in a strategic relationship with the supplier. It is clear that Dell engages in the first alternative. As a result, Dell fosters competition among its suppliers by letting multiple ODMs compete for the same product line in order to ensure high quality at the lowest possible price. Thus, Dell engages in a kind of long-term relationships mentioned by Kalwani and Narayandas (1995) and Bensaou (1999). These relationships are based on short-term contracts, which are however frequently repeated over a long period of time. This is in line with Yang and Chen (2013), who state that most of the relationships between ODMs and OBM s are either long-term or institutionalized price-competitions. These price competitions, according to the authors go beyond traditional arm's length relationships, as there is an extensive communication and information exchange.

The previous analysis makes it clear that Dell has a great bargaining power over Wistron in the PC and notebook market. The next section deals with the bargaining power between Dell and Wistron after Wistron implemented its green supply chain.

7.4 Wistron's Bargaining Power in the area of Green Supply Chain Solutions

Chen (2015) mentions that every Taiwanese ODMs engages in green supply chain activities. For instance, Quanta's suppliers have to sign a 'Letter of Commitment to Environmental Protection', they have to pass tests certified by qualified laboratories and Quanta does random check-ups for hazardous materials. Further, Quanta promotes green policy and educational training for its suppliers and engages in green design and green production (Quanta, 2012).

Compal also asks its suppliers to sign the so-called 'suppliers/ subcontractors code of conduct agreement', which is based on the Electronic Industry Code of Conduct (EICC) and controls specific hazardous inputs of its suppliers. Further, it controls its suppliers energy consumption and carbon reduction and does not make use of conflict minerals (Compal, 2015).



Next to common performance measures such as quality, costs, delivery and service, Inventec also assesses its suppliers according to green design, green process, hazardous substances limitation, child labor prohibition, human rights protection, safety of working environment. In order to ensure supplier quality it holds annual supplier conferences, and actively engages in pollution and energy saving controls (Inventec, 2011).

This is in line with Chen (2015), who says that green supply chain management has become industry standard, and therefore a green supply chain alone is not a selling proposition of Wistron. However, during the last years Wistron heavily engaged in the development of its green supply chain services, resulting in the establishment of the division Wistron GreenTech and its cradle-to-cradle, closed loop supply chain. For this reason, it built a new recycling plant in McKinney worth \$21 million (Carlisle, 2012, October 19).

Wistron built its recycling facilities as a direct response to increased customer demand. During the late 2000s, OBMs needed a comprehensive electronics recycling company in order to attain their corporate social responsibility (CSR) goals. As a result, Wistron established its subsidiary Wistron GreenTech in 2010 (Institute of Scrap Recycling Industries, 2014). Wistron and Dell early on engaged in a joint planning process. Clancy (2014, May 28, para. 5) describes it as follows: "Scott O'Connell, director of environmental affairs at Dell, said the

company's long-time relationship with Wistron GreenTech – a division of one of its longstanding ODMs – was instrumental in pulling this off. The planning for this particular milestone reaches back at least three years ago, when the Wistron division was created and the two began brainstorming about potential uses for the e-waste being collected from Dell customers." In the long run, Lin hopes that the recycling business alone makes up for 3-5% of Wistron`s revenue, and that future markets, next to other OBM_s, also include home appliances and car recycling (Dou, 2013, February 4; Woyke, 2009).

This shows that even if other companies all have green supply chain programs, nobody puts that much emphasis into the green recycling business as Wistron does, which is therefore its unique selling proposition.

Due to the small size of the e-waste market it is clear that Wistron entered a niche market. In 2012 the global PC market was worth about \$390 billion (Statista.com, 2012) . In contrast, the e-waste recycling market is going to grow to about \$50 billion in 2020 (Allied Market Research, 2015).

As a result, Wistron will obtain a leading position in a niche market. In terms of the Kraljic Matrix, this niche market does not belong to Dell`s core business, and further has a low impact on its profitability. However, as Wistron takes a leading role in this market, where no substitute companies are available, the supply market can be categorized as highly complex. As Dell`s profit impact is low, and the market complexity is high, Wistron occupied the 'bottleneck' item part from Dell`s perspective, of which Caniëls and Gelderman (2005) say suppliers in this dimension have a lot of bargaining power over their customers.

8 Discussion and Conclusion

8.1 Leveraging Customer Competence in Niche Markets to Increase Bargaining Power

This section provides the answer to the research question of this paper, its main findings and addresses theoretical and managerial implications.

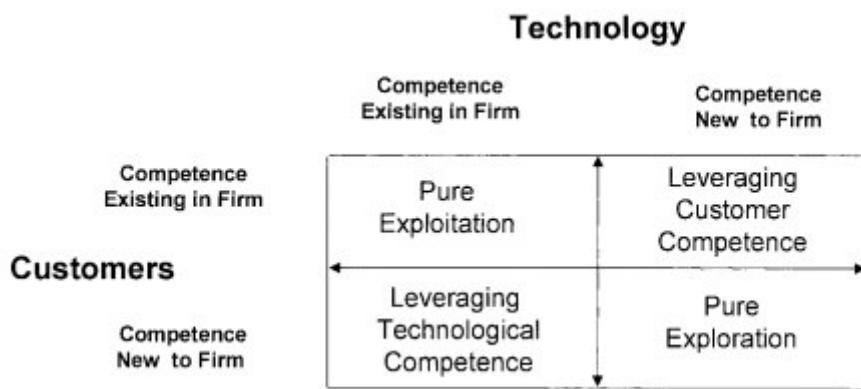
The paper outlined Wistron's attempt to deviate from its core-business in order to obtain more profitable sources of revenue by going downstream in the PC supply chain. By going into the service industry, and in particular, into the e-recycling business it finds a smaller, however less competitive and faster growing market. Here Wistron aims at obtaining leadership and plans to expand its business to household appliances and cars in the long-term. According to Leeflang (1990), to be attractive a niche market has to possess the following characteristics: sufficient size and profitability, no real competitors, or ignored by other companies, growth potential, purchasing ability, a need for special treatment, customer goodwill and opportunities for an entrant to exercise its competencies (as cited in Dalgic & Leeuw, 1994). Further, the strategic approach towards niche-markets differs from mass-markets: “[...] niche marketing is a bottom-up approach. The marketer starts from the needs of few customers and gradually builds up a larger customer base” (Shani & Chalasani, 1992, p. 45). A niche-marketing approach, according to the authors, can lead to a long-term mutually beneficial relationship.

As Wistron's e-recycling business is aligned to its core-business, and its customer Dell is the same one as in the core-business, it is unlikely that these two business relationships do not have any influence on each other. Yang and Chen (2013, p. 74) found that different modes of relationships between ODMs and OBM^s “overlap and interact with and affect each other”. Even though Wistron's green recycling services do not contribute to Dell's core business, in order to achieve the ambitious 2020 Legacy of Good plan Dell becomes dependent on Wistron's input. This dependence might grow in the future due to the fact that governments impose more and more environmentally-friendly regulations on companies and customers are becoming more critical towards environmentally-unfriendly company practices.

These assumptions are in line with the quadrant of 'leveraging customer competence', as proposed by Danneels (2002). In this quadrant, the company introduces a new technology,

targeted for an already existing customer (see figure 16). According to the author, the market potential is easy to access as customers are already known, however the returns are hard to assess in the first place and a technological feasibility assessment is also hard to predict. Thus, in this model the company exploits an existing market by exploring new technological capabilities.

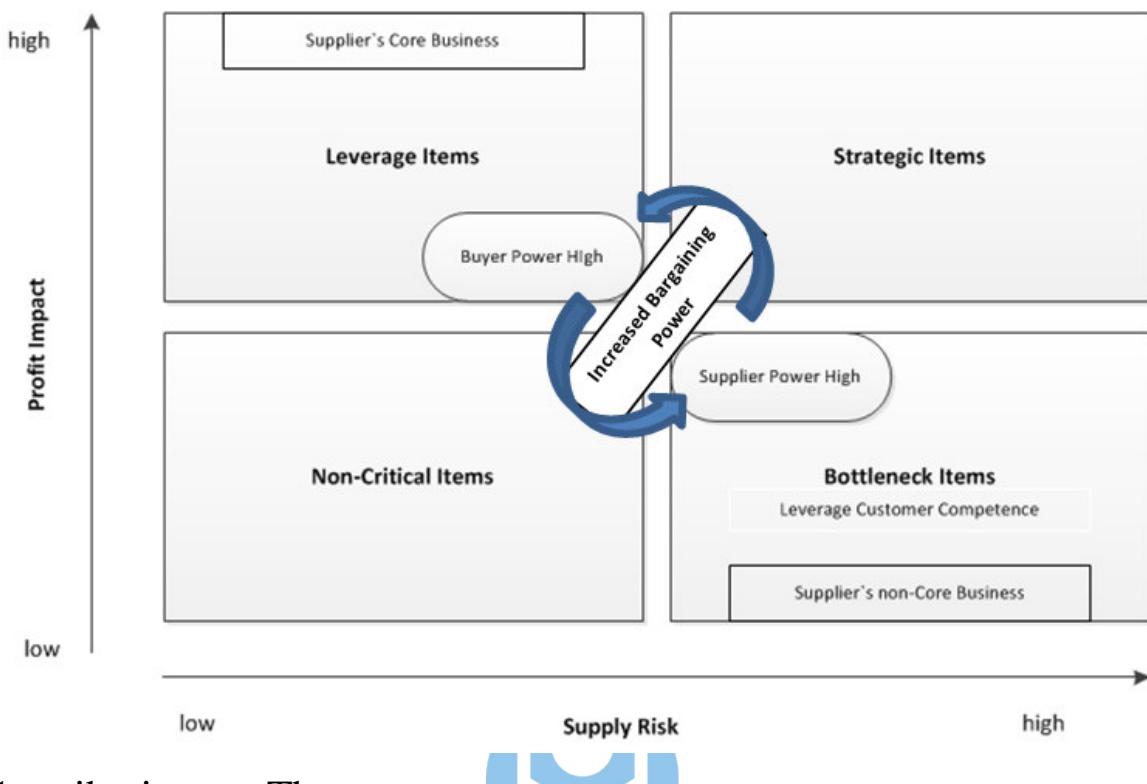
Fig. 16. Competence-based new product typology. Source: Danneels (2002)



By leveraging customer competence Wistron delivers a service to Dell, which is not easily imitable by other companies. Further, technology exploration, according to Danneels (2002) increases a company's adaptive capability. For instance, if customers react positively to the possibility of recycled PCs and notebooks, Wistron already has the recycling knowledge and may also gain knowledge in the field of environmentally-friendly notebook and PC production more easily than its competitors.

This means in terms of the Kraljic matrix, leveraging customer competence may also increase the bargaining power of the supplier towards the buyer, as the buyer gets more customized and rare products and services. This is especially true in this case as Wistron entered a niche market, in which it has much more dominance than in the PC and laptop market. The bargaining power shifts to Wistron, as it is the market leader in the area of recycling PCs. Figure 17 summarizes the findings.

Figure 17: Wistron's way to increase bargaining power. Adapted from Kraljic (1983) and Gelderman (2000)



8.2 Contributions to Theory



The findings of this paper bring together two different fields of management science. It combines supplier relationship management practices with a competence-based view of the company. Whereas multiple studies are concerned with the balancing act between exploring and exploiting markets and technology (cf. Kyriakopoulos and Moorman (2004); March (1991); Özsomer and Gençtürk (2003); Schulz (2001)), no article relates this balancing act with the resulting bargaining power between buying and supplying companies. This study presents an attempt to link these two separate streams of management literature. By going into a new niche market, Wistron explores new technological capabilities. It exploits its market knowledge, as it can increase its amount of services sold to Dell, one of its main long-term customers. Danneels (2002) calls this approach ‘leveraging customer competence’. By going into this niche market, Wistron sells so-called ‘bottleneck items’ to Dell, which are characterized by a complex supply market and a low profit impact for the buying company. As these items or services are hard to obtain by the buying company, the purchasing power shifts to Wistron. Thus, the results of this paper make clear that a supplier, which is in a leverage position can improve its situation by leveraging customer competence in the bottleneck quadrant. This might even increase its bargaining power in the long-term term in

the leverage quadrant, if it can apply its recycling knowledge in PC manufacturing and if demand in this area increases.

8.3 Contributions to Practice

Next to theoretical contributions, this paper offers a guideline for suppliers in similar situations as Wistron, i.e. being located in a competitive market where buying companies can exercise their power. In order to gain more competitive power, the supplying company can increase its technology exploration practices to find a niche market, where it can add value to its services for its main customers. This becomes even more necessary in an industry with declining profitability. An example may include the aerospace industry (cf. Little, 2014), whose supplying companies face huge competition, cost pressures and low profitability. Little (2014) states that aerospace suppliers need a wider in-breadth portfolio (e.g. product range and material offers) as well as a wider in-depth portfolio (e.g. systems and solutions) to become ‘sustainable leaders’. This approach is in line with the findings of this paper, as suppliers need to find more complex offerings and solutions in the bottleneck quadrant in order to increase their bargaining power. However, it needs to be mentioned that the limitation of this study is its generalizability to other supply industries. As a single-case study and an interpretative approach is used, the outcomes of this study apply to the relationship of Dell and Wistron, and further research is required to make the findings generalizable to supplier-buyer relationships in different product markets and countries. The paper of Little (2014) however contains indices that different industries with similar buyer-supplier characteristics will show similar results.

8.4 Conclusions

This study examined the relationship between two specific companies, Wistron and Dell. The outcomes show that Wistron was able to increase its bargaining power by leveraging its customer competence, i.e. offering the customer a more customized, unique service. In order to do this, Wistron had to explore new technologies. This strategy helped Wistron to shift its focus away from the laptop industry, which is suffering from declining sales and profit margins. As a result, Wistron finds itself in the bottleneck quadrant, which usually brings a higher profitability, and it may also increase its bargaining power in the leverage quadrant, which is characterized by a high buyer power.

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