

## **Inter-Organizational Structural and Co-Opetition Relationships: A Case of Industrial Waste Management Institutions**

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### **Abstract**

This study investigated the opportunities and limitations created by inter-organizational structural composition and co-opetition relationships, focusing on industrial waste management institutions. This study examined dual differentiation between foreign and domestic sources of waste and recyclable products from the perspective of multi-organizational structure to develop a sales model. This process varied from the inter-organizational manufacturing processes for single products in the general manufacturing industry. The study found that there are more parallel organizational structures than vertical ones built in the industrial waste industry. The link between trans-border organizational investments and strategic alliances has a subsidiary role in the post-production regenerative cycle. Simultaneous competition and cooperation between waste disposal and management institutions—"frenemies"—within an organizational structure promotes the development of many innovative ideas.

**Keywords:** Industrial waste management institutions, Inter-organizational relationship, Co-opetition.

## 1. Introduction

In recent years, international commercial competition has become more and more intense. Firm size and industry characteristics have a considerable influence on sustainable industrial development. With regard to strategies, each company focuses on ways to combine external forces and internal resources to operate in the environment of intense competition. Different industry characteristics and firm sizes result in the development of different industrial organizations. Vertical and level relations are important models of industrial internal operations with an organizational structure. Organizational operations on different levels can bring substantial benefits to an industrial organization. With the advent of the era of breaking the territorial boundaries, a tendency has developed toward trans-border territorial expansion. Organizational structures and business models of new territories have attracted global attention. This gave the models of vertical and level organizational integration, including trans-border, vertical, and level cooperation models, a prominent place in the research on internal structural operations of organizations.

The industrial waste industry seems to have attributes similar to those of the general manufacturing industry but is also characterized by specific organizational operation modes. The issue of inter-organizational structural composition and co-opetition relationships has been a central topic among both practitioners and academia. Both vertical and level organizational structures can promote effective communication and information sharing, allowing for more productive interaction between parties (Duncan and Moriarty, 1998; Mohr and Spekman, 1994).

With the growth of globalization, industrial competition becomes more intense. In order to maximize profits, firms often increase efficiency and reduce costs using R&D, low-wage employment, and high-skilled labor. According to Porter(1980), vertical integration is integration of different production, distribution, sales, and other economic processes under the jurisdiction of a firm. Level organizational structure was believed by Jacob (1995) to become the most prevalent in the following 50 years. The level organizational structure is characterized by the ability to create a higher added value in addition to satisfying customer needs through maintaining a competitive advantage with respect to customer demand and different company processes. (Lehmann, 1998; Shafer and Oswald, 1997; McCalman, 1996; Jacob, 1995; Chung, 1994). Moreover, competitiveness of modern industrial technology is becoming more strongly associated with the national, regional, and economic position in the global market. Transfer of such a position has changed the original model of production technology and location, as well as the competitiveness of lower-reaches industry (Hsia, 2000). Cross-organizational and trans-border production challenges the resilience of firms. Effective connection of local and trans-border production will be an important issue in the future.

Currently, many products seen on the market are not manufactured completely by one firm. Many industries use vertical, level, and trans-border organizational integration as a strategy to achieve higher production efficiency. In fact, the progress of science and technology has increased caution in industrial division and deepened implications and scope of organizational inter-dependence. That is why new forms of organizational structure occur, which is referred to as organizational innovation (Möller and Svahn, 2006). Inter-organizational co-opetition relationships are often developed between firms that produce same or similar products, in which case the shared use of industrial products, manufacturing innovations, and market opportunities results in competition. However, companies can also use joint R&D and alliances to develop innovative products in order to beat their common competitors. Innovations developed through mutual competition and cooperation allows to obtain cost advantages with regard to professional information and maintenance, thus, creating agglomeration benefits (Anderson, 1994). Therefore, the success of alliance strategies is dependent on how the co-opetition relationship between companies is balanced and controlled (Das and Teng, 2000).

In order to investigate vertical, level, and trans-border operation modes in institutions within

industrial organizations, this study examined institutions within domestic and overseas (trans-border) organizations based on the industry's development processes. Chapter 1 provides an introduction. Chapter 2 reviews and discusses literature regarding models of inter-organizational structure and operations in organizations connected by co-opetition relationships. Such a review can clarify directions of internal operations within an organization. Chapter 3 focuses on the issue of multiple complicated organizational relationships under internal composition methods and operations of industrial waste management institutions. Chapter 4 discusses structural development strategies used by organizations in the industry. Finally, the conclusion chapter reflects on the industry's potential development and countermeasures.

## **2. Theories on Inter-Organizational Structural and Co-Opetition Relationships**

### **2.1 Multi-Aspect Structural Integration of Organizations**

#### **(1) Vertical Organizational Structure**

In the continuous process of production from raw material to processing, manufacturing, and sales, products go through different production stages that can be operated by different vendors. The factors of production are obtained via external market transactions. Perry (1989) distinguished between two types of vertical integration, upstream and downstream. Total upstream production output is used as total or partial intermediary inputs for downstream production. Total intermediary input required in downstream production is obtained from total or partial upstream production output. Avenel and Barlet (2000) considered vertical integration as upstream and downstream supply-demand integration, in which the execution of different production stages is concentrated in one company.

Vertical integration is a strategy that internalizes integration targets; during the production process, a company manufactures necessary inputs or manages outputs through operations (Porter, 1980). Vertical organization integration has its advantages and disadvantages. In addition to reduced transaction costs, its benefits include guaranteed product supply, improved coordination between organizations, enhanced technical skills, and higher barriers to entry (Buzzell, 1983), as well as avoidance of price risks, countervailing bargaining power and input cost distortions, increased capability for differentiation, and control over supply and demand (Porter, 1980). Disadvantages of vertical integration include the need for large funds, varying output per unit, reduced operational flexibility, and decreased specificity. Additionally, Hernan and Kujal (2006) pointed out that vertical integration by a firm imposes the pressure of increased production cost on its rival, reducing quality investment and competition and allowing an integrating firm to provide products of higher quality and gain higher profits.

#### **(2) Level Organizational Structure**

Recently, economic management scholars from Taiwan and abroad have advocated that a company must adapt to environmental changes and moderately or greatly adjust internal organization in order to gain a competitive advantage and continue to earn profits. A basic feature of level organizational structure is the importance of creating a higher added value in maintaining a competitive advantage in the market in addition to satisfying customer needs and improving company processes (Lehmann, 1998; Shafer and Oswald, 1997). Companies with a level organizational structure can effectively reduce product cycle times, reduce costs and increase product quality (Makridakis, 1995), while increasing customer satisfaction (Jacob, 1995) and a competitive advantage (McCalman, 1996; West III, Page, and Meyer, 1997). Chung (1994) found that the level organizational structure influences new skills and opportunities.

Klaus (1989) found the following advantages of level organizational structure: 1. improves leadership abilities on each level; 2. encourages individual decision making; and 3. achieves

team success through individual achievement which helps gain a competitive advantage on innovation (White and Poynter, 1989). Stalk and Black (1994) predicted that the ultimate organization trend would be the level organizational structure as it effectively reduces cycle times and costs and provides higher product quality.

### **(3) Trans-Border Organizational Structure**

Companies often establish cross-border organizational structures via network connections. Due to a small market size and changing operating environment of the industry in Taiwan and growing overseas markets, many Taiwanese companies actively exploit wider overseas markets and gradually start transferring production and manufacturing activities to China in order to reduce production costs and improve competitiveness (Ching and Chen, 2007). Driven by globalization, Taiwan uses R&D, technological advantage, and neighborhood relations to access external resources via cross-border connections, uses cooperation as a method to construct knowledge spillover via technology transfer and resource complementation and builds the mechanism of cooperation and mutual benefit in order to avoid risks. Cross-border organizational structure provides double benefits through such interdependence.

Companies in Eastern and Western countries form different types of cross-border organization due to differences in the system environment they operate in. Company organization type may differ even within the same region of Asia because of different system environment specific for each country. Depending on system norms, the following organization types can be developed: family-style (Wang & Wen, 2011), vertical and level specialization (Whitley, 1990), internal management and control mechanism (Kwang & Fang, 2005), and external consultation mechanism, which are described in more detail below.

- a. Family-style organization. Family business is one of the oldest and most common types of business organization. Family businesses of different sizes are spread across different industries all over the world, contributing to employment and economic growth of each country. Approximately 60% of small and medium companies in Taiwan are family businesses (Wang & Wen, 2011).
- b. Vertical and level specialization type refers to division of labor and specialization or degree of vertical integration, including business specialization and self-efficacy of actors.
- c. Internal management and control mechanism involves authorization, business administration system, personal authority, power circles, and close relationships.
- d. External consultation mechanism refers to the type of transactions between two companies or a company and the third party which are characterized by contractual relationships, connections, and outsourcing relationships.

## **2.2 Inter-Organizational Co-Opetition Relationships**

Anderson (1994) maintained that close relationships between organization members within an industry are based on mutual efficiency and competitiveness and are formed in three following aspects:

### **(1) Buyer-Supplier Relationships**

Relationships between buyer and supplier are supply-demand relationships. This includes companies that provide products or services to the ultimate consumer, those that provide intermediary processing and raw material for products, and product/service distributors. In many cases, supply-demand relationships create agglomeration benefits through reduction of costs.

## **(2) Competitor-Cooperator Relationships**

Such relationships are mainly developed between firms that produce same or similar products, in which case the shared use of industrial products, manufacturing innovations, and market opportunities results in competition. Companies can also use joint R&D and alliances to develop innovative products in order to beat their common competitors. Innovations developed through mutual competition and cooperation allows to obtain cost advantages with regard to professional information and maintenance, thus, creating agglomeration benefits.

Competition is caused by scarcity of resources on the market. In the competitive environment, companies may provide a supply/demand balance mechanism to the market in order to gain more profit. However, before establishing a balance, companies often apply various methods, such as campaigns, bribery, and monopoly, to gain advantages from the government, e.g. business licenses and patent rights. Therefore, rent-seeking behavior is a common practice in the competitive market, meaning a constant search for sources and motivations of profit among competitors.

In cooperation relationships, companies jointly achieve mutually beneficial results via mutual control and coordination. Cooperation can be realized via market transactions, buyer-supplier relationships, resource accumulation, or complementary strategic alliances, which are all interaction processes by which mutual benefits can be achieved (Hung, Lee and Feng, 2002). Thus, cooperation involves cross-organizational and interpenetration activities.

## **(3) Shared Resource Relationships**

When companies concentrate within certain space, they are interdependent in terms of the access to local resources, such as infrastructure, communications and transport, pollution management, technologies, human resources, and information, as well as created cost advantages and agglomeration benefits.

## **3. Organizational Structural Relationships among Industrial Waste Management Institutions**

Inter-organizational relationships in the industrial waste industry are complicated due to a wide diversity of industrial waste sources that waste management institutions work with. In Taiwan, no related classification or analysis has been done yet. This study investigated three aspects of waste management institutions: (1) establishment of vertical relationships, i.e. the position of waste management institutions within the industry organization (upstream and downstream production relations); (2) establishment of level relationships with similar waste management institutions and other institutions sharing the market of waste products (waste disposal institutions); (3) establishment of so-called multi-element cross-border relationships that involve both vertical and level relationships and cross-border organizational connections in multiple aspects.

### **3.1 Vertical Organizational Structural Relationships**

Industrial waste management institutions are those engaged in disassembly or processing of waste products with the use of physical or chemical methods. They have similar operation modes and industrial processes<sup>1</sup>. In the overall organization of the industry, their positions range from the lowest (waste source demand) to the highest level (raw material supply) of the industrial process industry.

Looking at the development of industrial waste management institutions in general shows

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<sup>1</sup>Industrial processes refer to the information industry and other manufacturing industries.

that although the industrial waste industry and the industrial process industry are both technology-intensive<sup>2</sup> and labor-intensive industries, they differ in their characteristics and organizational operation modes. In the high-tech industry, the model of vertical integration and division of labor is often applied to organizational operations with the intention of breaking through the debris of production and sales (Chen, 2007). However, fewer industrial waste management institutions build vertical integration relationships. The reason is that division of labor solely based on the vertical integration model can result in insufficient production capacity (waste volume) in case of industrial waste management institutions. Industrial waste sources are becoming more diverse<sup>3</sup>. Many types of recyclable material can be obtained after disassembling general goods. Therefore, many waste management institutions apply unique recycling and manufacturing models for follow-up waste treatment. Models of vertical integration and distribution of labor for industrial institutions are described next:

### **(1) Organizational Structure with Coordinated Vertical Division of Labor**

Among 180 waste management firms (A and B classes) in Taiwan (EPA, Executive Yuan, 2016), 13 waste management institutions (Table 1) develop coordinated vertical integration relationships (integrated industrial and recycling manufacturing industries). Nan Ya Plastics Corporation can be taken as an example. Its process capacity in the production of plastic goods is the best in Taiwan. Nan Ya Plastics Corporation established an industrial waste management institution in Yunlin Mai-Liao Factory due to a large amount of production residuals;<sup>4</sup> 25 types of waste items can be treated in this institution (EPA, Executive Yuan, 2016). Recycled industrial waste can supply material to the upper-end industrial processes. Apart from alleviating the cost of new raw material, this allows industry to embark on the path of sustainable development, thus, presenting a business model that is profitable for both sides.

### **(2) Organizational Structure with Multi-Element Vertical Division of Labor**

**a. Organizational Structure Involving Wholesalers (Trading Agents):** Wholesale (trading) operations are performed by institutions qualified as governmental and nongovernmental waste treatment and management institutions. Taiwan imports goods and waste products from overseas sources of composite materials (finished or semi-finished products) and waste via purchasing agents. This model is used in organizational operations by 39 out of 180 waste management institutions in Taiwan (Table 1). Apart from imports using the wholesale (trading) model, waste treated in most of these institutions comes from products purchased by Taiwan's upstream waste disposal institutions.

**b. Organizational Structure Based on Contracts and Competitive Bidding:** Hereby, two sources can be distinguished. The first is residual waste from industrial processes. As many waste management institutions do not have coordinated vertical relationships for integrated processing and production, their waste material is often obtained from residual waste from industrial processes. Waste management institutions differ in their approach to the utilization of recycled waste. Many of them sign contracts with cooperating firms, on one hand, achieving stable cooperation by stipulating the total amount and types of waste sources and, on the other hand, saving costs of information collection and supervision for the contract partners. Moreover, after processing of waste sources by waste management

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<sup>2</sup>Technology-intensive industries are industries in which the equipment and manufacturing techniques are based on advanced science and technology, resource consumption is low, technicians make up a large proportion of staff, labor productivity is high, products are technically complex, and improved products are released rapidly.

<sup>3</sup>The six main types of general industrial waste include telecommunications, cleaning and disposal, and gas fuel supply etc. (Environmental Protection Administration Executive Yuan, "Environmental white paper No. 62," 2006:201)

<sup>4</sup>Residual waste refers to industrial waste resulting from manufacturing processes.

institutions for their re-utilization, new raw materials can be provided to the partner, by which the best of both worlds can be combined. However, in most cases, waste material is obtained from public competitive bidding organized by manufacturers.

The second source is waste obtained from waste disposal institutions. Waste management institutions can develop long-term cooperation relationships with upstream industrial process industries and waste disposal institutions via an information platform using contracts or competitive bidding in order to build an organizational structure with multi-element vertical integration.

**Table 1:** Upstream and downstream firms vertically integrated with industrial waste management institutions

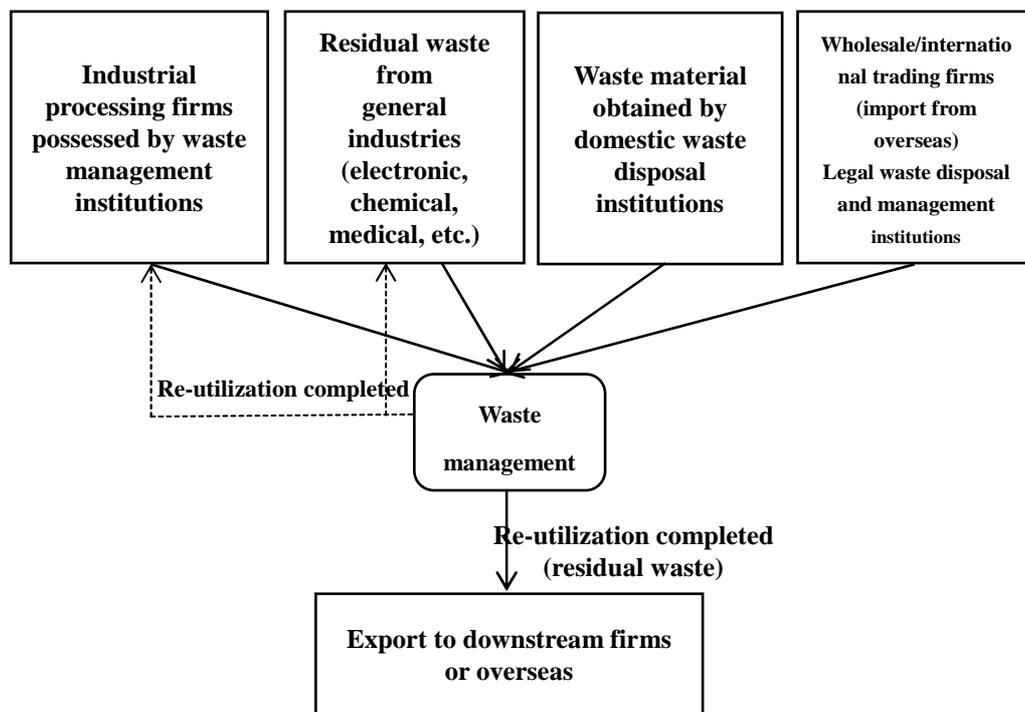
Category	Number of industrial processing firms possessed by waste management institutions	Number of wholesale/international trading firms	Number of recycling firms
Number of firms	13	39	119
Number of firms of each class	Class A: 7	Class A: 21	Class A: 76
	Class B: 6	Class B: 18	Class B: 43

**Data Source:** Collected and summarized by the Environmental Protection Administration, Executive Yuan, through the survey of public and private waste disposal and management institutions.

URL:<http://waste1.epa.gov.tw/Grant/GS-UC60/QryGrantData.aspx>, Last accessed: March 3, 2016.

**Note:** According to the Management Regulations for the Import, Export, Transit and Transshipment of Waste, wholesalers/international trading firms cannot directly import and export waste and can only conduct such operations via public or private waste management and disposal institutions or with the approval from competent authorities (Environmental Protection Administration, 2013).

As shown in Figure 1, upstream-downstream vertical organization relationships are the result of a constant recycling and utilization process.



**Figure 1:** Upstream-downstream vertical relationships in waste management institutions

### 3.2 Level Organization Structural Relationships

The main mechanism of the development of level organization relationships in the industrial waste industry can be analyzed in two aspects: (1) level organization of frenemy partnerships; (2) trans-border investments and strategic alliances.

#### (1) Level Organization of Frenemy Partnerships

Waste management and disposal institutions can be frenemies connected by level organizational relationships. The main work objectives in level organization are to obtain waste sources and re-utilize and resell recycled products. As many sources of waste material are obtained through trade between parallel institutions, this model of organizational division of labor is prevalent in the industrial waste industry.

Waste management institutions work with vertically coordinated waste sources and utilize and resale recycled products. Hereby, utilization of recycled goods is further discussed. Only 13 waste management institutions employ coordinated vertical production. The use of waste sources with different attributes and of different types leads to production of a wide variety of waste material after disassembly, processing, and recycling. Each waste management institution has its own approach to and equipment for recycling of a certain type of waste. Therefore, after disassembly and processing, waste of such a type is retained in the firm for further recycling, while remaining waste is resold to other waste management and disposal institutions or wholesalers for final treatment.

Most institutions among organizations in the industrial waste industry are waste disposal institutions. In Taiwan, there are 3892 waste disposal institutions (EPA, Executive Yuan, 2016). Focusing solely on storage and transportation operations and being spread everywhere across cities and counties of Taiwan, they are closely connected with waste management institutions.

#### (2) Trans-Border Investments and Strategic Alliances

Due to an increase in land costs in Taiwan and staff's requirements toward work environment, many industrial institutions are prompted to change their mechanisms by

shifting investments or implementing strategic alliances. Some waste management and disposal institutions can shift investments using a trans-border model in order to expand the scope of their business operations and strengthen inter-organizational cooperation relationships. In case of trans-border transfer to China, most of the first Taiwanese industrial institutions that transferred to China aimed at its coastal regions. Due to industrial policy reforms in Taiwan during that time (which banned the import of scrap metal into Taiwan), China became the main area occupied by Taiwanese industrial institutions. Later, the main factors considered during transfer were equipment and human resource costs. Recently, Taiwanese institutions have chosen China as their destination because of the convenient access to market information<sup>5</sup>. However, due to a growing caution in the recycling industry and environmental protection regulations of China,<sup>6</sup> preferential advantages of foreign investments have decreased. Therefore, the boss-behind-the-curtain method is often employed when considering a new establishment (firm), which helps to avoid the limitations set by the government of China with respect to foreign investments. Considering the difficulties associated with investing into new establishments in China, another method of business expansion that can be applied is strategic alliances. Inter-organizational level relationships are built for the sake of profit for companies. With the profit of organizations as its objective, such a relationship model is widely used.

### 3.3 Multi-Element Trans-Border Organizational Structure

#### (1) Domestic and Foreign Organizational Connections

Taiwanese industrial institutions provide export only to 13 countries (based on statistics from January 1, 2010, to January 1, 2016) (EPA, Executive Yuan, 2016). One industry's network relations run through vertical and level organizational integration. They connect firms, provide technology exchange, improve production technologies and reveal personal connections. The industrial waste industry of Taiwan uses the trans-border model to create links within itself and form a multi-element trans-border organizational system.

As shown in Table 2, many waste management institutions combine management/disposal and domestic/foreign statuses. According to statistics regarding public and private business institutions as of between January 1, 2010, and August 7, 2015 (EPA, Executive Yuan, 2016), 46 Taiwanese industrial waste management institutions (the same institution is counted once) provide export to a total of 13 countries. Main products exported to the US include sludge, copper, and mixed scrap metal resulting from wastewater treatment after the plating process. Main products exported to Japan are used dry cells and mixed scrap metal. Main products exported to Korea are used dry cells and lead-acid batteries. Main product exported to Malaysia is waste paper. Main products exported to Belgium are used dry cells and mixed scrap metal. Main products exported to the UK are incinerator sediments and waste precious metal catalysts. Main products exported to Thailand are dust and sludge collected through the pollution control used in electric furnace steel-making. Main product exported to China is mixed scrap metal. Main product exported to the Netherlands is waste oil. Main product exported to France is used dry cells. Main products exported to Sweden are cadmium and other metals. Main products exported to Singapore are used printed circuit boards and their cuttings and mixed scrap metal.

While foreign investments and strategic alliances are used by Taiwanese industrial institutions in China, in other countries, only import and export operations are conducted.

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<sup>5</sup>As reported by the United Nations Environment Programme (UNEP), 70% of the world's electronic waste is handled in China (Lin and Lee, 2015).

<sup>6</sup>The promulgation of the Regulation on the Administration of the Recovery and Disposal of Waste Electrical and Electronic Equipment on January 1, 2011 and the Administrative Measures for the Import of Solid Waste on August 11, 2011 began the institutionalization of the environmental protection and recycling industries in China. Implementation of self-protective policies for local industries (local protectionism) has increased the cost of establishing subsidiary companies in China.

Moreover, when exporting same products to the same country, these 46 industrial institutions can cooperate with each other, for example, in the area of container customs, domestic and overseas transportation, or sales. Storage and management of waste sources encourage the development of an expansive network of connections between institutions.

**Table 2:** Firms exporting to overseas

Country	Institution name	No. of institutions
USA	Shin-Ho Environmental Technology Inc.; Jiin Yeeh Ding Enterprise Corp. (Kaohsiung Branch) ; TMC Metal Co., Ltd.; Cheng Jie Co., Ltd.; Precise Skill Corporation	5
Japan	Sus Recycle Technology Inc.; Jiin Yeeh Ding Enterprise Corp. (Kaohsiung Branch); Nikko Metals Taiwan Co., Ltd.; Great Public Praise Enterprise Co., Ltd.; All Right Consultant & Development Co., Ltd.; Tech Waste Management Corp.; Evermore International Environmental Co. Ltd.; SAFC Hitech Taiwan Co., Ltd.; Hai Kwang Enterprise Corporation; Showa Denko HD Trace Corp. (media plant); TINSHFOM Environment Co.; Shin-Ho Environmental Technology Inc.; Green Energy Technology Inc. (Guanyin plant); Chunlan Tech Corp.; Micals Enterprise Co., Ltd.; Yu Tay Vacuum Co., Ltd. (Luzhou plant)	16
Korea	Shin-Ho Environmental Technology Inc.; Evermore International Environmental Co. Ltd.; Lo-Toun Steel & Iron Works Co Ltd. (steel mill); Wei-Guan Enterprise Co., Ltd.; Huan Hsu Enterprise Co., Ltd.; TINSHFOM Environment Co.	6
Germany	Solar Applied Materials Technology Corporation (Huanke plant); TMC Metal Co., Ltd.; TINSHFOM Environment Co.; Chin Hsin Environmental Engineering Co., Ltd.; Huan Hsu Enterprise Co., Ltd.; Ascent Hi-Tech Corporation; Yu Tay Vacuum Co., Ltd. (Luzhou plant)	7
Malaysia	Wei Neng Co., Ltd.; Young Young Co., Ltd.; Sunflower Corporation	3
Belgium	TMC Metal Co., Ltd.; Chin Hsin Environmental Engineering Co., Ltd.; TINSHFOM Environment Co.	3
UK	Great Public Praise Enterprise Co., Ltd.; Solar Applied Materials Technology Corporation (Huanke plant)	2
Thailand	Wei Chih Steel Industrial Co., Ltd. (Kuantien plant)	1

China	Shun Lee Industrial Company Limited; Kai Lun Metals Co., Ltd.; Ta-Kung Environmental Protection Engineering Co., Ltd.; Cheng Rong Co., Ltd.; Nan-Yah Environmental Engineering Inc.; Long Tai Metal Company Limited; Li Wu Enterprise Co., Ltd.; Shang Iue Metal Industry Corp.; Jing Leei Engineering Co., Ltd.; Wei Uniting Enterprise Co.,Ltd.; Shun Lee Industrial Company Limited; Golden Plus E-waste Management Co., Ltd.; Great Public Praise Enterprise Co., Ltd.; Tong Qing Recycling Co., Ltd.; Chou Chern Industrial Co., Ltd.; Kao Ming Waste Clearing Co., Ltd.; Yuan Sheng Industrial Co., Ltd.; Grand Tone Enterprise Company Limited; Glory Trade Corporation Limited; Lin Tian Co., Ltd.; Liang Yu Xing Yeh Co., Ltd.; Chin Hong Recycling Co., Ltd.; Yu Shiuan Industrial Co., Ltd.; Buddha Power Enterprise Co., Ltd.; Jin Tian Enterprise Co., Ltd.; Xinjia Technology Co., Ltd. (Luzhu plant); Xinjia Technology Co., Ltd. (Luzhu plant); Chen Lan Recycling Co., Ltd.; Mei Rong Environmental Engineering Co., Ltd.; Ho Asia Enterprise Company Limited; Da Chi Environmental Technologies Co., Ltd.; Precise Skill Corporation; Kun Chi Enterprise Co., Ltd. (Yunlin branch); Hung Ma Industrial Co., Ltd.; Micals Enterprise Co., Ltd.; Hsin An Enterprise Co., Ltd.	36
Netherlands	Young Young Co., Ltd.	1
France	Evermore International Environmental Co. Ltd.	1
Sweden	TINSHFOM Environment Co.	1
Singapore	Golden Plus E-waste Management Co., Ltd.; Wei Hsiang Science & Technology Development Co., Ltd.; Tech Waste Management Corp.	3

**Data Source:** Collected and organized by EPA, Executive Yuan, via the Survey of Publicly and Privately Owned Waste Management Organizations (2016)

**Note:** Many institutions listed in Table 2 export products to several countries. The total number of institutions without any repetition is 46.

## (2) Trans-Border Organization Model of Export to China

Industrial institutions exporting to China mainly choose Guangdong province (Qingyuan City, Conghua City, Zhaoqing City, Boluo County, Foshan City, Guangzhou City), Jiangsu province, Zhejiang province, Shandong province, Guangxi Zhuang autonomous region, Hebei province, and Liaoning province as their destinations (Table 3). Currently, subsidiary companies of Taiwanese industrial institutions are established only in the Guangdong area.

**a. Cross-Strait Organizational Connection Model:** The market of China has rapidly grown under the influence of globalization. Due a relatively small size of Taiwanese market, many businesses exploit wider foreign markets in order to reduce production costs and improve competitiveness. Taiwanese industrial (waste disposal and management) institutions may use R&D and technological advantage to access human and other resources

of China and use cooperation as a method to construct knowledge spillover via technology transfer and resource complementation and builds the mechanism of cooperation and mutual benefit in order to avoid risks.

Cooperation between Taiwan and China seems to be based only on simple import of waste material. However, inherent and complex changes are a key element of industrial operations. The industrial waste industry with its recycling and reutilization needs entered the Top Ten Revitalization Industries (2011) of China.<sup>7</sup> Under the growing demand for construction of new establishments in China, even if the government of China introduces restrictions regarding types of industrial waste, cross-strait interaction would still continue in secret. Actual operations in cross-strait cooperation can be divided into two aspects. Over the table: under the limitations associated with local protectionism in China, cooperation can be developed only via construction of trans-border organizations and using legal methods (certification). Under the table: the most effective operating model in the industry is a network of personal relations, which provides more fuzzy space for operations between suppliers of waste material and local processing firms and allows non-certified companies to prosper by conducting underground economic activities (cooperation, technologies, and sales) via private channels. This type of model that seems to combine both competition and cooperation is currently widely used in China, and is expected to remain in use in the future.

Methods of Taiwan-China trans-border connections in the industrial waste industry and models of trans-border connections in other industries are almost similar, with the only difference consisting in the fact that the industrial waste industry is conservative and closed. After the system changes in cross-strait industrial waste industry, Taiwanese clothing and shoe firms that were the first to enter the market of China started to occupy coastal areas of China, beginning long-term cooperation via the network of social relationships and mutual connections between local industrial institutions.

Traders in China must operate in compliance with a certain administrative procedure. However, unlike the general industry, the industrial waste industry does not follow rules and regulations accurately. In China, two types of cross-strait connection channels can be distinguished, over the table and under the table. As the restrictions imposed by China's authorities on the industry become more severe, it becomes more difficult for non-certified industrial institutions to operate in China. Therefore, they risk and enter the local market through under-the-table channels, the disadvantage of which is that their products are not inspected and qualified by authorities. The market becomes full of goods of inferior quality, which deeply affects development of the industry.

**b. Mutual Resource Replenishment in Taiwanese Subsidiary Companies:** The industry requires sustainable development that can only be achieved through R&D and innovations. Earlier, R&D in the manufacturing industry of Taiwan was based in Taiwan, while innovations were developed overseas. Owing to the rising awareness of environmental protection in Taiwan, innovations are often hindered by various obstacles (pollution issues). Therefore, many Taiwanese industrial institutions choose to invest into conducting R&D and innovations in China. Their main purpose is to develop the industry using local environment, human resources, materials, and innovation subsidies. In the end, Taiwanese parent companies gain profits from Taiwanese subsidiary companies that are located in China and use its resources.

**c. Import (Export) and Management in Other Taiwanese Industrial Institutions:** In addition to conducting disassembly and processing operations themselves, industrial institutions that have subsidiary companies in China can use their specialization and channels (chartered rights) to help other Taiwanese industrial institutions. They can import

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<sup>7</sup>Data source: The Twelfth Five-Year Plan for National Economic and Social Development of the People's Republic of China. URL: [http://big5.gov.cn/gate/big5/www.gov.cn/2011lh/content\\_1825838.htm](http://big5.gov.cn/gate/big5/www.gov.cn/2011lh/content_1825838.htm). Accessed 2016.04.08.

(export) waste and recycled goods via trading agents for re-utilization depending on the demand of other industrial institutions.

**Table 3:** Industrial institutions importing to China

Province	Firm name	No. of firms
Guangdong	Zhaoqing Jiahua Metal Recycle Limited Company; Qingyuan Yibao Materials Recycling Co., Ltd.; Qingyuan Yiyu Renewable Materials Limited Company; Qingyuan Renewable Materials Industry and Trade Co.,Ltd.; Qingyuan Xinxin Renewable Resource Limited Company; Qingyuan Yuansheng Hardware Plastics Limited Company; Boluo Yuanzhou Metal Smelting Plant; Qingyuan Fengyu Metal Industry Co., Ltd.; Qingyuan Ming Dian Metal & Plastic Co., Ltd.; Qingyuan Jin Tian Enterprise Co., Ltd.; Qingyuan Rui Xin Recycling Material Co., Ltd.; Qingyuan Golden Fortune Recycling Resource Co., Ltd.; Foshan Nanhai Heng Tai Yuan Metal & Plastic Processing Co. Ltd.; Foshan Xiang'ao Feijiu Hardware Processing Liyong Limited Company; Foshan Nanhai Zhongyang Metal & Plastic Products Co., Ltd.; Foshan Nanhai Heng Tai Yuan Metal & Plastic Processing Co. Ltd.	16
Jiangsu	Binhai Nanya Regenerative Natural Resources Co., Ltd.; Lianyungang Tonka Metal & Plastic Co., Ltd.; Lianyungang Debao Metal Industrial Co., Ltd.	3
Zhejiang	Taizhou Xin'an Metal Limited Company	1
Shandong	Yantai Changan Metal Co., Ltd.	1
Guangxi	Wuzhou Wangjin Recycling Resources Trading Co., Ltd.; Wuzhou Kai Cheng Recycling Resources Development Co., Ltd.; Wuzhou Yun Jin Metal Materials Co., Ltd.; Wuzhou Jin Sheng Renewable Resources Co., Ltd.	4
Hebei	Tianjin Fusheng Metal Products Limited Company; Tianjin Weisheng Metal Products Limited Company	2

Province	Firm name	No. of firms
Liaoning	Shenyang Hua Ruifanye Limited Company	1

**Data Source:** Collected and organized by EPA, Executive Yuan (2016)

**Note:** Statistics from between January 1, 2010, and September 5, 2015;

URL:<http://waste.epa.gov.tw/qry/ExpPerm.aspx> Accessed 2016.04.08.

## 4. Inter-Organizational Co-Opetition and Resource Sharing Relationships

### 4.1 Competition

The industrial waste industry is characterized by intense competition. In addition to market competition, Taiwanese industrial institutions are also faced with constrained domestic and foreign relations, as well as competition between non-certified industrial institutions.<sup>8</sup>

#### (1) Market Competition

With regard to market competition, Vietnam, Thailand, and Malaysia have an advantage in terms of the international market demand in the industrial waste industry due to using zero or low tariff rates and cheap labor. In Taiwan, there is intense competition between domestic waste management and disposal institutions and industrial institutions certified in Taiwan.

#### (2) Personal Relations

The sale and acquisition of waste goods in the industrial waste industry rely on acquaintances. Similar waste management and disposal institutions compete with each other for cooperation with foreign manufacturers. Owing to the fixed amount of waste able to be managed by each firm, foreign manufacturers determine the amount exported not only based on annual statistics, but also depending on the relations between them and the industrial institution.

#### (3) Competition between Industrial Institutions

The following types of Taiwanese industrial waste management institutions can be distinguished based on their constitution: (1) local industrial institutions (waste disposal and management institutions); (2) industrial institutions built overseas (e.g. in Vietnam); (3) Taiwanese industrial institutions that establish firms overseas (e.g. in China); (4) industrial institutions importing waste material from overseas; (5) local smelting plants; and (6) various types of traders. This indicates intense competition between industrial institutions.

#### (4) Competition with Non-Certified Industrial Institutions

Industrial institutions illegally entering the market of Taiwan are determined and serious rivals. After successfully importing waste sources, they may apply different strategies to encroach on the entire market. Such institutions succeed in entering the market for the following reasons. First, certified institutions protect non-certified ones. Second, in case of overseas markets, customs are bribed. Their greatest risk is to be inspected and seized by customs. Therefore, once the customs are passed, these institutions become serious competition rivals.

<sup>8</sup> Taichung City Government Environmental Protection Bureau (2016.02.01) assigned a reference number to the waste disposal and management association of Taichung City: 105000007295.

Industrial institutions are willing to enter the market despite intense competition in the industrial waste industry because they form a continuous cycle system. Under the presence of industries, they continue growing and search for sustainable business opportunities and large benefits behind the recycling economy. Under the conditions of such intense competition, industrial institutions remain willing to enter the market competition.

## **4.2 Cooperation**

Looking back on the cooperation relationships built between Taiwanese and foreign industrial institutions, early cooperation was based on the red-envelope culture and the personal relationship model. Moreover, shared use of resources within industrial areas promoted cooperation between firms. Related analyses are provided below.

### **(1) Past: Red Envelope Culture and Personal Relationships**

In the past, Taiwanese industrial institutions that suffered from material deficiency and were willing to enter the Taiwanese market could develop good relationships by giving red envelopes. However, with the changing circumstances and growth of the recycling industry, red envelopes were no long given upon forming a relationship and priority was given to establishing personal relationships, followed by giving red envelopes.

### **(2) Present: Personal Relationships and Contracts**

Recently, if willing to enter the domestic market, industrial institutions have invested effort in building good relationships with local government officials and public figures. With regard to the foreign market (China), as foreign investments became more concentrated in China, cross-strait business operations became more frequent. However, cross-strait personnel and companies differ in their ideas and attitudes regarding waste management issues and need constant negotiation and communication. For this reason, contracts are a key element in subsequent workflow.

## **4.3 Resource Sharing Relationships (Shared Use of Equipment and Information Transfer)**

In Taiwan, local governments have put more effort into developing industrial parks. Industrial institutions started concentrating within certain areas and depending on each other's resources, such as infrastructure, transportation, and information. The cost advantages and agglomeration benefits created in such a way attracted more industrial support. Social networks also promoted technology and information transfer between institutions, resulting in spillover effects. However, many industrial institutions remain to be outside industrial areas and, thus, cannot be provided with appropriate management and planning.

## **5. Conclusion and Suggestions**

This study investigated internal organizational structures of industrial waste management institutions as well as the competitive and cooperative relationships between them using theories of inter-organizational structural and co-opetition relationships. In terms of organizational structure, industrial waste management organizations can develop vertical, level, and trans-border relationships, which constitute a model of multi-element organizational structure. Only 13 out of 180 industrial institutions apply coordinated vertical organizational structure that is based on multi-element and vertical organization and focuses on wholesale (trade) through agents or contracts and competitive bidding. The level organizational structure is built based on frenemy relationships between institutions (waste disposal and management institutions), as well as trans-border investments and strategic alliances. This is the main model of organizational structure applied by industrial institutions. In case of the multi-element trans-border organizational structure, two models can be distinguished, one involving domestic and foreign trans-border connections and one

involving trans-border investments and strategic alliances in China.

Furthermore, the types of competitive and cooperative relationships between industrial institutions include (1) competition from domestic and foreign markets, (2) leverage via personal relationships, (3) competition between industrial institutions, and (4) competition with non-certified industrial institutions. The models of inter-organizational cooperation differ from past to present. The past involved the red envelope culture and personal relationships, whereas the present involves personal relationships and contracts. Finally, resource sharing relationships (shared use of equipment and information transfer) rely on knowledge and technology spillover through concentrated economic and equipment facilities of industrial parks established by the government.

In reality, the most serious opponents for industrial institutions are non-certified institutions that conduct disassembly, processing, and management operations related to industrial waste management. Certified industrial institutions may assist such companies by covering them. Non-certified institutions are characterized by low purchasing prices and unequal quality of professional technologies, which may cause disorder in market prices and quality. Thus, it is suggested that the government strengthens inspections to regulate market order.

With regard to future industry development, the types of products that can be imported and exported will become more limited as environmental protection policies in Taiwan become stricter and other countries begin to take precautions against pollution issues caused by recycling processes. The parallel organizational structure is the most prevalent in Taiwan's current industrial waste industry. While Jacob (1995) also claimed that the level organizational structure would be the future trend, this study asserts that different forms of organizational structures will developed as a result of differences between industries and future changes in policies. Two potential paths are expected to be developed regarding the organizational structure of Taiwanese industrial institutions. First, when many industrial waste management institutions would be unable to export a large amount of products to other countries due to changes in governmental policies, larger manufacturing institutions would need to establish subsidiary waste management institutions to manage produced industrial waste, which would give a rise to vertical organizational structures. Second, in addition to the expansion of self-operated projects (diversified product recycling) by waste management institutions, the promotion of a diversified recycling system in the industrial waste industry would also require the establishment of strategic alliances (strategic organizational structure) among level organizations or the application of outsourcing business models to continue operations (supportive organizational structure).

## References

- [1] T. Duncan and S.E. Moriarty, A communication-based marketing model for managing relationships, *Journal of Marketing*, 62(2) (1998), 1-13.
- [2] J. Mohr and R. Spekman, Characteristics of partnership success: Partnership attributes, communication behavior, and conflict resolution techniques, *Strategic Management Journal*, 15(2) (1994), 135-152.
- [3] M.E. Porter, *Competitive Strategy*, (1980), New York, NY: Free Press.
- [4] R. Jacob, The struggle to create an organization for the 21st century, *Fortune*, 131(1995), 90-99.
- [5] D.M. Lehmann, Integrated enterprise management: A look at the functions, the enterprise, and the environment- Can you see the difference? *Hospital Materiel Management Quarterly*, Rockville, 19(1998), 22-27.
- [6] S.M. Shafer and S.L. Oswald, Product-focused manufacturing for strategic advantage, *The Journal of Product Innovation Management*, 14(3) (1997), 226-227.
- [7] J. McCalman, Lateral hierarchy: The case of cross-cultural management teams, *European Management Journal*, 14(5) (1996), 509-517.
- [8] R.K. Chung, The horizontal organization: Breaking down functional silos, *Business Credit*, New York, 96(5) (1994), 21-25.
- [9] C.J. Hsia, The challenges of Taiwan society in globalization: Trans-border

- production networks v.s trans-border politics, *Cities and Design*, 11(12) (2000), 1-37.
- [10] K. Möller and S. Svahn, Role of knowledge in value creation in business nets, *Journal of Management Studies*, 43(5) (2006), 985-1007.
- [11] G. Anderson, Industry clustering for economic development, *Economic Development Review*, 12(2) (1994), 26-33.
- [12] T.K. Das and B.S. Teng, Instabilities of strategic alliances: An internal tensions perspective, *Organization Science*, 11(2000), 77-101.
- [13] M.K. Perry, Vertical integration: Determinants and effect, In: R. Schmalensee and R. Willing (eds.), *Handbook of Industry Organization*, Amsterdam: North-Holland, 1(1989), 183-255.
- [14] E. Avenel and C. Barlet, Vertical foreclosure, technological choice and entry on the intermediate market, *Journal of Economics and Management Strategy*, 9(3) (2000), 211-230.
- [15] Environmental Protection Administration Executive Yuan R.O.C. (Taiwan), Environmental White Paper No. 62, (2006), URL: <http://www.epa.gov.tw/lp.asp?ctNode=31049&CtUnit=851&BaseDSD=7&mp=epa>, Accessed 25<sup>th</sup> March (2016).
- [16] R.D. Buzzell, Is vertical integration profitable? *Harvard Business Review*, 61(1) (1983), 92-102.
- [17] R. Hernan and P. Kujal, Vertical integration, market foreclosure and quality investment, *Working Paper*, (2006).
- [18] S. Makridakis, The forthcoming information revolution: Its impact on society and firms, *Futures (London, England)*, 27(8) (1995), 799-821.
- [19] West III, G. Page and G.D. Meyer, Communicated knowledge as a learning foundation, *International Journal of Organizational Analysis*, Bowling Green, 5(1) (1997), 25-59.
- [20] G. Klaus, Horizontal organization, *Executive Excellence*, Provo, November (1989), 3-6.
- [21] R.E. White and T.A. Poynter, Achieving worldwide advantage with the horizontal organization, *Business Quarterly*, London, 54(2) (1989), 55-60.
- [22] G.J. Stalk and J.E. Black, The myth of the horizontal organization, *Canadian Business Review*, 21(4) (1994), 26-30.
- [23] C.H. Ching and J.H. Chen, The cross-strait ceramic building material production network- A market-driven production network, *Journal of Taiwan Land Research*, 11(1) (2007), 169-196.
- [24] Z.H. Wang and Z.D. Wen, *Does Family Business Still Matter?* (2011), Taipei: Ju Liu Books Co. Ltd.
- [25] R. Whitley, Eastern Asian enterprise structures and the comparative analysis of forms of business organizations, *Organizations Studies*, 11(1) (1990), 47-74.
- [26] K.L. Kwang and S.F. Fang, On family business and enterprise growth, *Special Economic Zones*, 2(2005), 65-67.
- [27] K.P. Hung, W.R. Lee and Z.Z. Weng, The study on the model of long-term inter firm cooperation: An empirical evidence of information OEM/ODM firms in Taiwan, *Journal of Management*, 19(5) (2002), 781-810.
- [28] D.S. Chen, *Organizational Networks*, (2007), Taipei: Socio Publishing.
- [29] Executive Yuan, Environmental Protection Administration, *Environmental White Paper*, (2006), URL: <http://www.epa.gov.tw/lp.asp?ctNode=31049&CtUnit=851&BaseDSD=7&mp=epa>, Accessed 3<sup>rd</sup> March (2016).
- [30] Executive Yuan, Environmental Protection Administration, Survey of Publicly and Privately Owned Waste Management Organizations, (2016), URL: <http://waste1.epa.gov.tw/Grant/GS-UC60/QryGrantData.aspx>, Accessed 3<sup>rd</sup> March (2016).
- [31] Executive Yuan, Environmental Protection Administration, Practice of Industrial Waste Disposal, Management and Reuse, (2013), URL: <http://www.epa.gov.tw/public/Data/%2F42278564171.pdf>, Accessed 25<sup>th</sup> March (2016).
- [32] C.H. Lin and Y.C. Lee, Waste Management Policies in China, Cross-Strait Environmental Service Industry Communication Platform, (2015), URL:

- [http://www.tesd.org.tw/enp/topic\\_reports\\_seasons.php?siid=4&ec=8&es=49](http://www.tesd.org.tw/enp/topic_reports_seasons.php?siid=4&ec=8&es=49), Accessed 25<sup>th</sup> March (2016).
- [33] Portal site of the Chinese government, The Twelfth Five-Year Plan for National Economic and Social Development of the People's Republic of China, (2011), URL: [http://big5.gov.cn/gate/big5/www.gov.cn/2011lh/content\\_1825838.htm](http://big5.gov.cn/gate/big5/www.gov.cn/2011lh/content_1825838.htm), Accessed 8 April (2016).