

## Chapter 4

# Manufacturing of Mining and Construction Equipment

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### 4.1. Background of the Firm

The Japan-based company under study is a key global manufacturer of mining, construction and utility equipment. These products account for some 90 percent of the firm's production, with the rest comprising industrial machinery and other equipment. The company operates in over 150 economies, with around 50 manufacturing/assembly facilities and 200 distributors located around the world. The company has 179 subsidiaries involved in all manner of goods and services activities. Some of the group companies are fully-owned subsidiaries and some are part of the conglomerate by virtue of equity holdings.

The company has global sales of more than USD 17 billion, in a global market estimated to be worth more than USD 170 billion (Businessvibes, 2013). In descending order of importance, Japan, North America, Latin America and Asia (other than China) represent over 60 percent of the firm's market. China accounts for an additional 9 percent.

According to industry estimates, the world market for the firm's main products has been growing at about 6.5 per cent on average for a number of years, and is set to continue in a range around this rate. Growth is expected to be strong in Asia in the coming years.

The company engages in activities at all stages of the value chain, which include design, manufacturing, assembly, distribution, remanufacturing, and after-sales support services to customers. This case study will follow the value chain for manufacturing heavy machinery from production to sales and post-sales service.

The rest of the study is structured as follows. Section 2 will briefly describe the value chain for manufacturing, selling and post-sales services for heavy machinery. Section 3 will discuss a potential list of services which the company may have recourse to in its value chain and examine the attributes of services in relation to outsourcing, bundling and innovation. Section 4 will discuss policies that affect the firm's value chains, specifically in relation to foreign investment constraints, labor restrictions, customs regimes and re-manufacturing restrictions. Information and data are collected both in interviews with the executives of the company as well as from publicly available information.

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**Figure 4.1. Earth moving, construction and moving equipment**



(Upper left: Bulldozer; Upper right: Wheel Loader; Lower left: Harvester; Lower middle: Mining Equipment; Lower right: Hybrid excavator)  
Source: Courtesy of the firm

## 4.2. Description of the Value Chain

### *Contours of the pre-production and manufacturing in the value chain*

Before the value chain studied here begins, the company must set up assembly plants, distribution centers and sales centers in different economies. In many cases, the parent company's subsidiaries that set up these facilities do so in partnership with local businesses in the markets they intend to serve. A range of professional services, such as legal advices and business consultancy are outsourced to specialists at this stage of the operation.

Where the company's value chain begins with the procurement of raw materials (Figure 4.2), key components – such as engines, hydraulic valves and motors. – will have been manufactured in one of the company facilities from metal, plastic, chemicals and other necessary inputs. These parts are usually technologically advanced components which define the cutting edge of machine capabilities. As a good deal of proprietary technology is involved, the company often prefers to manufacture in Japan. There is also the question of precision engineering and the need to guarantee the highest quality, which also militates in favour of in-group fabrication. It is estimated that plants in SE Asia import 30 percent of their inputs from Japan (excluding key components). The other parts may be sourced from third-party suppliers as well. All inputs are transported by logistics services providers to assembly plants and stored in nearby warehouses.

Assembly then takes place in manufacturing plants that put together the parts and build the machines. Their fundamental policy is to assemble where there are big markets. Key services, such as quality control of raw materials, quality control of goods, warehousing and storage, production administrations and other manufacturing supporting services enter the value chain at this stage.

### *Post-manufacture sales-related activities*

After assembly of the machines is completed and products have passed quality control inspections, they will be dispatched to distributors. The company under study maintains three different channels of distribution around the globe. In mining economies such as Australia, Chile and South Africa, the company owns and operates distributors, which allows them to better meet the needs of large mining corporations, who are their major customers. In North America, Europe, and China, the company has regional headquarters which oversee manufacturing operations and sales activities by regional distributors. In the other areas, the company appoints local companies as distributors and sells the machines to them directly from its global production facilities. Market size and the nature of the customers determine the model of operations.

Sales arrangements can be customized for different buyers. Some customers may purchase the machines outright. Others may enter into various financial arrangements offered by the finance arm of the company. Across the range of these financial options, ownership may pass to the customer over time (for example, through hire purchase), or the company may retain ownership.

### *After-sales services*

The value chain of the company does not end at product delivery. After-sales services and maintenance are important parts of the value chain and make a key contribution to the revenue of the company. Most mining and construction equipment manufactured by the company in recent years is equipped with remote monitoring systems. These systems record and transmit important operating information to the company's control centers through a satellite/mobile phone system. The company can support essential maintenance and support services to customers with up-to-date information, as well as key information for the optimization of operations. The latter information addresses such matters as load factors, fuel consumption and machine operation status. The field information acquired through this continuous operational communication also helps the company to improve the design of its products.

### *Re-manufacturing*

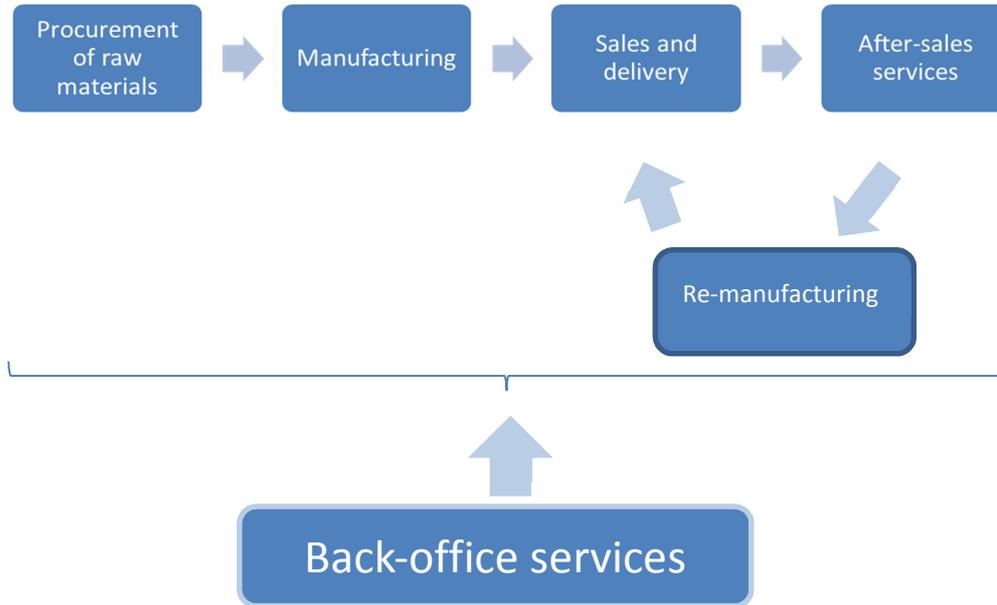
A special node in this value chain is re-manufacturing. In re-manufacturing plants, the company will dis-assemble old components, and restore and upgrade parts, with strict observance of the company's production standards. A warranty comparable to that on new parts will be offered to customers who buy these re-manufactured components at a discounted price. Re-manufactured products are distributed through the companies' normal distribution channels. Re-manufacturing is not only good commercial business, it also saves finite natural resources and benefits the environment.

### *Back-office functions and group-wide offerings*

In a complicated value chain, centrally supplied back-office services are essential to the efficient functioning of the value chain. One of the key services in this context, provided at the pre-manufacturing stage of this value chain, is research & development (R&D). The company spends more than USD 500 million per year on improving existing models and developing new ones with new technology. The GPS satellite monitoring system described above is an example of group R&D.

Other back-office functions listed in Table A.5 below include finance, managerial services, legal services, advertising and the provision of utilities. These services are supplied at various and different stages of the value chain.

**Figure 4.2. Brief Overview of the Value Chain**



### 4.3. Services, Outsourcing, and Bundling

The tables in the Appendix A attempt to disentangle the value chain into six stages, namely pre-establishment, pre-manufacturing, manufacturing, post-manufacturing/delivery, back-office and after-sales. A non-exhaustive list estimates that no fewer than 74 services are supplied as inputs onto the value chain. As can be observed in Appendix A Tables A.1-A.6 (third column), these 74 services can be further disaggregated into around 90 service categories.

Among the 74 product categories, back-office services account for one-third of the total, the manufacturing stage for one-fifth, the pre-manufacturing stage and post-sales stages for 14 per cent each, and the establishment and the post-manufacturing stages for 9 per cent each. These shares do not give us any sure indication of which value chain segment is the most costly in terms of services inputs, but one of the most costly is likely to be the pre-production segment, as it includes R&D. The importance of the back-office services segment in terms of the number of services involved attests to the complexity of an internationalized capital goods global value chain.

#### *Outsourcing*

Outsourcing is a key aspect of the value chain. Among the 74 identified services, it is estimated that more than half of these services (52) are outsourced or partially outsourced to third parties outside the group. There are typically three reasons for outsourcing in this value chain.

First, a lack of expertise or specific equipment is one of the reasons. For example, maintaining a satellite system and transmission through ground radio or orbit are hardly tasks in which a company manufacturing construction and mining equipment would be specialized. This represents a fixed cost argument for outsourcing. Even as the company monitors around 400,000 machines around the world

with satellite/mobile phone connections, the initial investment and fixed costs of owning and operating the systems may still be too high for in-group provision. This may be characterized as an internal economy of scale consideration.

A second reason for outsourcing relates to external economies of scale, sometimes referred to as economies of agglomeration. Some services, such as security services for factories or IT specialist services, are commonly outsourced because third-party firms dedicated to these skill sets are located in the proximity of the lead firm. Cost savings and efficiency gains can accrue to the lead firm from taking advantage of the specialization characteristics of third-party suppliers.

Third, some outsourcing services are required by laws and regulations derived from them. Services in this category include auditing and conformity assessment or inspection procedures associated with government standards (technical regulations). These standards cover a range of public policy objectives, such as health, safety and the environment. These government services confer social value and may be considered additive with respect to private sources of value. But if the services are not provided in an efficient manner, they may also impose a negative value (cost) on firms. The company in the present case study did not report particular difficulties at the interface with public policy.

### ***Bundling***

The bundling phenomenon, where firms put together a packet of products as a composite market offering is commonplace along value chains. Bundling can achieve three major purposes (Cheung, Low and Sit, 2014). The first is related to efficiency gains associated with the joint supply of a variety of products, be they goods or services. Frequently, when an enterprise buys what is billed as a single product, it is in effect buying a suite of bundled products, many of which are likely to be services. The end product of after-sales services in this case, for example, is the repair and maintenance of machinery over its useful life. But a range of goods (replacement parts and lubricants etc.) and services (transport, insurance, financing and many others) go into the provision of the end-product.

Second, firms may bundle their offerings in the marketplace to acquire more value added and distinguish what they supply from what competing suppliers might offer. Successful product differentiation of this kind increases profits by creating temporary barriers to entry in a competitive market. The product differentiation engineered through bundling is also often a source of innovation and productivity growth.

Third, a by-product of bundling services with goods is that if some of those services were to be supplied separately, they could not be traded. Packaging services, for example, only enter trade if the goods that are packed in the supply of the services enter trade. The package services alone cannot travel across frontiers. This means that with bundling, an economy's trade potential can be increased.

The company in this study puts bundling at the center of its business model. The company offers customers not only machinery and equipment, but many goods and services besides. These include, for example, after-sales services including warranty, maintenance, genuine spare parts and consumables, tools, information services, technical support and sometimes financial arrangements for hire purchases. The contracts for the sale of these products are often bundled with these services even if the company is transferring ownership of the machinery by selling it outright. The firm's bundling strategy embodies features of all three of the considerations mentioned above.

These bundled services constitute a significant part of the company's revenue. The value of after-sales services along the 20-30 years service life of the machines may be higher than the price of the machines themselves. When all is said and done, according to one executive of the company, services might count for over 50 per cent of costs, and therefore of added market value.

## **4.4. The Impact of Policy on the Value Chain**

In principle, all services (and goods) entering the value chain will be affected, however, tangentially, by the policy frameworks of the jurisdictions in which they work. Attempting a comprehensive coverage of these interfaces would be a near impossible task. For this reason, only a selection of issues is covered in each of the case studies and the selection is based on what firms in the case studies believe to be the most worthwhile issues to raise. In this case ownership and investment restrictions, labor market restraints, trade costs associated ports and customs, and issues involving re-manufacturing activities are covered.

### *Foreign ownership restrictions and investment constraints*

Investment constraints restrict foreign capital participation in many sectors. Although manufacturing is often open to majority foreign ownership, service sectors are usually more restricted. This pattern is well observed in the present value chain and consequently the company provides many of its services needs off-shore, often relying on in-group enterprises.

In many of the East Asian economies, manufacturing sectors are opened to full foreign equity ownership. However, investment constraints are rather widespread in wholesale and other distribution services, as well as in a range of professional services. For example, the newly enacted residential Regulation No.39 of 2014 of Indonesia restricts foreign equity control in wholesale and distribution sectors to 33 per cent of the equity. The company also reported that the Thai government restricts foreign equity ownership in their distribution subsidiary to 40 per cent.

In some economies there might be no formal restriction on foreign equity ownership but informal restrictions and barriers to establishing, owning and operating enterprises hinder value chain operations. Excessive documentation requirements, uncertain and unpredictable regulatory frameworks, and protective policies in local governments are reported to occur with relative frequency in several developing economies. These limitations cost companies time and resources.

In order to comply with the investment constraints, the company is sometimes obliged to seek local partners when entering new markets. Much depends on being able to find reliable and committed partners. When this is possible firms are often happy to enter into joint ventures as local partners can add considerable value to the company's value chain by their local expertise, knowledge, linguistic capabilities and connections.

### *Foreign labor restrictions*

Foreign labor restrictions are common in many economies. While there is doubtless a case for protecting local employment and nurturing skills, barriers to work permits for foreign technical staff may actually hinder these objectives. This can occur for a number of reasons. First, foreign companies may invest less in the face of what they may consider an undue risk in terms of cost and reputation if they are unable to work out the optimal mix of local and foreign labour market participants at any point in time.

Second, where firms are already established, the inefficiency implicit in relying on inexperienced or under-qualified labor may reduce output, damage sophisticated machinery that requires key skills to output, and crimp employment opportunities. Third, on-the-job training for local employees who could certainly fill the jobs in question will be in shorter supply.

Similar restrictions also exist in distribution, sales and after-sales services in some South East Asia economies. In Thailand, for every foreign employee, the company has to employ four locals. In addition, not more than 10 foreigners can be employed unless the company has paid three million Baht or more in corporation tax in the previous fiscal year, operates an export business and brought in more than 30 million Baht the previous years, or has 100 or more Thai employees (Mayer Brown JSM, 2008).

The company is active in adapting to labor requirements. In addition to sending engineers from Japan headquarters for setting up new plants, overseeing factory operations and providing technical guidance, the company has set up local training centers to nurture local engineers, sales and support staff. The company has also promoted locals to top management, including in China, Indonesia and Thailand. Companies often point to the relative cost of hiring foreigners as opposed to locals and point to this as a significant incentive to go local where possible.

### *The customs regime and efficiency*

A large body of research has demonstrated what the immediate costs and adverse knock-on effects are of inefficiency in entry ports and customs services (see, for example, Wilson, Mann and Otsuki, 2005, and Engman, 2005). Complicated and inefficient customs clearance procedures have caused delay to the company's daily operations from time to time. The company often needs to ship spare parts from one economy to another for the maintenance of machines. Customs clearance services in some South East Asian economies may take few days, if not weeks, before the parts can arrive. One experience cited from one economy was that it took three days for an urgent component to pass through customs, causing a delay in the delivery of vital services to customers.

Another issue that arises in many economies in the APEC region is that the authorities sometimes insist that customs agents or brokers are officially licensed and they must be used to manage customs clearance procedures for firms wishing to import goods necessary for their operations. Where licenses are restricted to a few operators, this will tend to raise the costs of dealing with customs. On the other hand, some companies may find it convenient to outsource customs administration procedures in order to facilitate the transactions.

The recently agreed Agreement on Trade Facilitation in the World Trade Organization requires that "[W]ithout prejudice to the important policy concerns of some Members that currently maintain a special role for customs brokers, from the entry into force of this agreement Members shall not introduce the mandatory use of customs brokers." (Article 10.6:1). In Section II of the Agreement dealing with special and differential treatment, specific provisions are laid out for the timing and conditions of compliance with various provisions in Section I.

### *Trade restrictions in re-manufacturing goods.*

Re-manufacturing goods are often subject to heavy regulation and restrictions on trade. USITC (2012) highlighted common trade barriers encountered by heavy duty off-road equipment (HDOR equipment) manufacturers. Some of these difficulties include the lack of international standards to distinguish between new and used manufacturing products, limitations and even bans on trade in re-manufactured HDOR equipment and parts, a cumbersome registration system for re-manufacturing businesses, complex paper-work, unfriendly customs regulations, and a preference for (higher-priced) local production.

The company in this case study has experienced some of these difficulties in their re-manufacturing business in Asia. One Asian economy, for example, prohibits the importation of parts from used engines and cars for re-manufacturing and has imposed very strict regulations on imports of used and re-manufactured machines. Li (2012) suggested the policy intentions were to protect domestic customers

from low quality products, and prevent the export of electronic waste to the economy under the guise of used products. However, these policies frustrate the worldwide operation of the company's re-manufacturing business, and oblige the company to sell its remanufacturing parts in fewer economies. Considering the potential resource and environmental advantages of re-using materials and machines that still possess a useful life, this is an issue that merits closer attention and discussion.

**Table 4.1. Summary of Certain Policies Affecting the Value Chain**

<b>Government policies/services</b>	<b>Authority(ies) in charge</b>	<b>Details</b>	<b>How the policy affects services in the value chain</b>
<b>Customs procedures</b> <ul style="list-style-type: none"> <li>• Inefficiency in customs clearance</li> <li>• Compulsory customs agents</li> </ul>	Customs	The company is required to clear the parts and goods with customs	Inefficient customs procedures raise costs and cause delays
<b>Foreign ownership restrictions – formal restrictions</b> <ul style="list-style-type: none"> <li>• limitation on share of foreign equity</li> </ul>	Ministry of Commerce / Ministry of Investment	Regulations limit the share of equity owned by foreign companies to a certain proportion. Some economies prohibit foreign ownership in specific sectors.	The company is restricted by regulations on foreign equity in wholesale and distribution sectors. Local partners are found to get around this issue.
<b>Foreign ownership restrictions – informal barriers</b> <ul style="list-style-type: none"> <li>• Uncertainty in policy regimes</li> <li>• Excessive requirements in documents</li> </ul>	Various government departments	Uncertainty as to the content and implementation procedures of regulations, especially at local government level. Over-complicated requirements on documents adds cost and time to value chain	Extra cost and time on dealing with government policies.
<b>Foreign labor restrictions</b> <ul style="list-style-type: none"> <li>• Quota on work permits</li> <li>• Forbidden sectors for foreign workers</li> </ul>	Ministry of Labor	Work permits for foreign labor may be restricted by quantity or through other means. Some sectors may only be open to local employees.	May experience difficulty in acquiring enough skilled labor. The company in this case gets around the issue by training local staff
<b>Trade on re-manufacturing goods</b>	Ministry of Commerce/ Ministry of Trade	Importation of re-manufactured parts/products is prohibited	The company in this case may not be able to provide re-manufactured products which are more cost efficient to their customers and environmentally friendly, thus sales may be affected.

## Appendix A

**Table A.1. Establishment phase**

Stage/ Category	Service	Central Product Classification (CPC) Ver.2 Code	Outsourced or in-house/in-group provision
1. Government services (licensing etc.)	1. Business liaison services (for example, services from trade development centres or SME centres)	Class of 9113 - Public administrative services related to the more efficient operation of business	Outsourced. Local consultants, business partners and trade facilitation organizations provide business liaison services.
	2. Company registration and licensing services	91138 - Public administrative services related to general economic, commercial and labour affairs	Outsourced. Government services.
	3. Information and statistical services	Class of 9113 - Public administrative services related to the more efficient operation of business	Outsourced. Business information usually provided by trade facilitation organizations and national statistical organizations.
	4. Visa and immigration services for foreign investors/ employees	91290 - Public administrative services related to other public order and safety affairs	Possibly outsourced. Many companies hire local agents to help with foreign work permit issues.
2. Other services (professional etc.)	5. Business consultant services	Class of 8311 - Management consulting and management services	Outsourced. Consultants are required in some economies for new market.
		83129 - Other business consulting services	
	6. Banking and finance services	71121 - Deposit services to corporate and institutional depositors  71135 - Non-mortgage loan services for business purposes	Partially outsourced and partially in-group. Banking services would be required for setting up new business. In-group finance company may also provide financial arrangements.
7. Legal services	82130 - Legal documentation and certification services	Possibly both in-group and outsourced. The company has in-group legal department, but may possibly need local legal expertise.	

**Table A.2. Raw-materials, input/pre-production stage**

Stage/ Category	Service	Central Product Classification (CPC) Ver.2 Code	Outsourced or in-house/in-group provision
1. Procurement of raw materials	8. Procurement agent for raw material sourcing	85999 - Other support services n.e.c.	Possibly in-house. The company manages direct business relationship with suppliers.
	9. Customs-related services for raw materials imported	85999 - Other support services n.e.c.	Outsourced. Customs brokers must be third-party entities in some economies.
	10. Quality assurance services (of raw materials)	83441 - Composition and purity testing and analysis services	Mostly in-group.
2. Logistics	11. Freight transportation services (of raw materials) by road, rail, sea or air	Division: 65 - Freight transport services	Partially outsourced and partially in-group. The company has an affiliate in logistics.
	12. Repair and maintenance for fleets	87143 - Maintenance and repair services of trailers, semitrailers and other motor vehicles n.e.c.	Possibly Outsourced.
3. Storage	13. Storage of raw materials – general storage	67290 - Other storage and warehousing services	Possibly In-house. Must be located near factories.
	14. Storage of raw materials – tank farm	67220 Bulk liquid or gas storage services	Possibly In-house. Must be located near factories.
4. Research and Development	15. Conception and design of product	83920 Design originals	In-house. The company houses industrial design and engineering centres.

	16. Patent acquisition	83960 Trademarks and franchises n/a	In-house. The company houses industrial design and engineering centres.
	17. Product development/ R&D for new technology	81129 - Research and experimental development services in other engineering and technology  81400 - Research and development originals	In-house and outsourced. In addition to in-house development teams, the company work with research institutes and universities in research.

**Table A.3. Manufacturing stage**

Stage/ Category	Service	Central Product Classification (CPC) Ver.2 Code	Outsourced or in-house/in-group provision
1. Production administration	18. Production Administration - Production management	83115 - Operations management consulting services	Possibly in-house. Subsidiary in each economy has authority in production planning.
	19. Production Administration - Quality assurance and compliance with ISO	83441 - Composition and purity testing and analysis services	Possibly in-house. Subsidiary in each economy has authority in production planning.
2. Services supporting factory daily operations	20. Cleaning services of factory	85330 - General cleaning services	Possibly in-house
	21. Engineering Services	83310 - Engineering advisory services	In-house. The company's engineer team provides engineering services.
		Class: 8332 - Engineering services for specific projects	
	22. Gardening services for factory lawn	85970 - Landscape care and maintenance services	Possibly in-house
	23. Security guards for factory and warehouses	85250 - Guard services	Possibly outsourced. Specialized security firms enjoy network effects with
	24. Sewage water treatment services	94110 - Sewerage and sewage treatment services	Outsourced. Infrastructures are provided by host economies.
	25. Repair and maintenance services of machines and equipments in the factory	87156 - Maintenance and repair services of commercial and industrial machinery	Both in-house and outsourced. Outsourced maintenance is required when in-house engineers can't solve the issues arising.
26. Waste collection and recycling services		Class: 9421 - Collection services of hazardous waste	Outsourced. Infrastructures are provided by host economies.
		94229 - Collection services of non-hazardous recyclable materials, other	

		94239 - General waste collection services, other	
3. Services from government regulation requirements	27. Government inspections on fire prevention, health hazards, environmental protection and other aspects.	91133 - Public administrative services related to mining and mineral resources, manufacturing and construction  91290 - Public administrative services related to other public order and safety affairs	Possibly in-house and outsourced. Government provides inspection services. Company may have to prepare documentation for inspection from time to time.
4. Worker- related services	28. Catering services for workers	63393 - Other contract food services	Possibly in-group and outsourced. In some economies (such as United Kingdom) the company runs catering subsidiary. It is common to outsource canteen services.
	29. Dormitory for factory workers	63220 - Room or unit accommodation services for workers in workers hostels or camps	Possibly in-group. Japanese large companies may offer dormitory for factory staff.
	30. Medical services	93121 - General medical services	Possibly outsourced.
	31. Recreational facilities and services for workers	96520 - Sports and recreational sports facility operation services	In-house. The company provides sports facilities for workers on site.
	32. Transportation services for employees	64114 - Local special-purpose scheduled road transport services of passengers	Possibly outsourced to local transportation companies.

**Table A.4. Delivery and sales/post-manufacturing stage**

Stage/ Category	Service	Central Product Classification (CPC) Ver.2 Code	Outsourced or in-house/in-group provision
1. Delivery to wholesaler/retailer	33. Land transport of vehicles to distributors	65112 - Road transport services of freight by semi-trailers	Partially in-group and partially outsourced. In-group logistics arm arrange deliveries.
	34. Sea transport of vehicles to distributors	65219 - Other coastal and transoceanic water transport services of other freight	Partially in-group and partially outsourced. In-group logistics arm arrange deliveries.
2. Sales services	35. Retail trade services - By distributors	Group of 621 - Non-specialized store retail trade services	Partially in-group and partially outsourced. Distributors in major markets are subsidiaries. Some are third- parties.
		Group of 622 - Specialized store retail trade services	
	36. Retail services on a fee or contract bases	Group: of 625 - Retail trade services on a fee or contract basis	Partially in-group and partially outsourced.
	37. Retail Administration Operation management	83115 - Operations management consulting services	Partially in-group and partially outsourced.
		83116 - Supply chain and other management consulting services	
38. Storage and warehousing services for machineries at distributors	67290 - Other storage and warehousing services	Partially in-group and partially outsourced. Distributors stores machineries.	
39. Hire purchases and financing services for customers	71140 Financial leasing services	Partially in-group and partially outsourced. In-group finance company provides financial arrangements in some economies. Third party distributors also help customers of the company in financing.	

**Table A.5. Back-office, utilities and general services**

Stage/ Category	Service	Central Product Classification (CPC) Ver.2 Code	Outsourced or in-house/in-group provision
1. Finance	40. Auditing on financial accounts	Group of 822 - Accounting, auditing and bookkeeping services	Outsourced as required by legislations. In-company accounting department assist in preparing documents for auditing.
	41. Financial services	71121 - Deposit services to corporate and institutional depositors	Partially outsourced and partially in-group. Financial institutions and in-group financial company may both provide financial services to the company.
		71313 - Group pension services	
		71701 - Services of holding equity of subsidiary companies	
	42. Internal auditing (including audits of financial accounts and corporate governance)	Group of 822 - Accounting, auditing and bookkeeping services	In-group.
		83118 - Head office services	
43. Insurance services for machinery used in factory	71334 - Other property insurance services	Partially in-group and partially outsourced. In-group company assisted in insurance policy.	
44. Insurance for staff	71321 - Accidental death and dismemberment insurance services	Partially in-group and partially outsourced. In-group company assisted in insurance policy.	
	71322 - Health insurance services		
2. General Management	45. Business and management consultancy services	Class of 8311 - Management consulting and management services	In-house.
	46. Company secretary services	83990 - All other professional, technical and business services, n.e.c.	In-house. As listed company, it employs its own company secretary.

	47. Corporate communications, marketing and public relationship	83114 - Marketing management consulting services 83121 - Public relations services	In-group corporate communications department responsible for corporate communications and marketing.
	48. Courier, postal and local delivery services	Group of 681 - Postal and courier services	Outsourced.
	49. Estate management	72112 - Rental or leasing services involving own or leased non-residential property	Possibly in-group and outsourced.
	50. Human resources management	83113 - Human resources management consulting services	In-group human resources department.
	51. Human resources management -Personnel search and referral services	Class of 8511 - Personnel search and referral services	In-group human resources department. Agents might be needed to recruit locally.
	52. I.T. and information system management, consulting and support, with webpage development	Class of 8313 - Information technology (IT) consulting and support services Class of 8314 - Information technology (IT) design and development services Class of 8316 - IT infrastructure and network management services	Possibly in-group and outsourced. In-group IT department maintains the computer system. Possibly outsource some of the tasks to third parties.
	53. Safety and security services	85230 - Security systems services 85250 - Guard services	Possibly outsourced. Local security firms enjoy network effects and connection with legal enforcement.
	54. Telecommunication services	Group: 841 - Telephony and other telecommunications services 84210 - Internet backbone services 84221 - Narrowband Internet access services	Outsourced. Host economies provide telecommunication services.

		84222 - Broadband Internet access services	
	55. Uniform -Design and alternation	83919 - Other specialty design services	Possibly outsourced.
	56. Uniform -Laundry	97130 - Other textile cleaning services	Possibly outsourced.
3. Legal	57. Legal services	82120 - Legal advisory and representation services concerning other fields of law  82130 - Legal documentation and certification services	In-group and possibly outsourced. Legal department exist within corporate structure. Possibly outsourced to local legal experts in some economies.
4. Advertisement	58. Retail Administration-Advertising	83611 - Full service advertising	Partly in-group and partly outsourced. In-group company handles publication and publicity. Outsourced advertisement agencies are often required for production of advertisement materials.
	59. Advertisement – advertisement agencies services	83611 - Full service advertising 83620 - Purchase or sale of advertising space or time, on commission	
	60. Advertisement – designers’ services	83611 - Full service advertising	
	61. Advertisement – cameramen, directors, photographers and models.	83611 - Full service advertising	
3. Utilities	62. Electricity supply	Class of 8631 - Support services to electricity transmission and distribution	Outsourced. Supplied by host economies.
	63. Gas supply	86320 - Gas distribution services through mains (on a fee or contract basis)	Outsourced. Supplied by host economies.
	64. Water supply	86330 - Water distribution services through mains (on a fee or contract basis)	Outsourced. Supplied by host economies.

**Table A.6. Post-sales services**

Stage/ Category	Service	Central Product Classification (CPC) Ver.2 Code	Outsourced to third-parties
1. Sales/After-sales Customer services	65. Customer services – complains and compliments handling	85931 - Telephone call centre services	Partly outsourced. Both the company owned and third-party distributors resolve customer complains
	66. Customer services – Technical support	85931 - Telephone call centre services	Partly outsourced. Both the company owned and third-party distributors resolve customer complains
2. After-sales information support	67. Information services for customers	Class of 8315 - Hosting and information technology (IT) infrastructure provisioning services	In-house. IT department maintain the information service system which customer can access by Internet.
	68. Satellite services for remote monitoring system	84140 - Private network services (provision of satellite facilities for the exclusive use of the customer)	Possibly outsourced.
	69. Data center services for remote monitoring system	83159 - Other hosting and IT infrastructure provisioning services	Outsourced to MNC telecommunication services providers.
	70. Ground radio communication services for remote monitoring system	84131 Mobile telecommunications services - access and use	Outsourced to MNC telecommunication services providers.
	71. Global Positioning System (GPS) services	67990 Other supporting transport services n.e.c. (radio navigational aid locating services, such as GPS (global positioning system) provision)	Outsourced. GPS satellite system provided by U.S. Government
3. Repair and maintenance	72. Repair and maintenance of machines for customers	87156 Maintenance and repair services of commercial and industrial machinery	In-house and outsourced. Distributors (may or may not be subsidiary, differed economy-wise) may help customers to repair machines. The company also sends in-house engineers when required.

4. Remanufacturing services	73. Buy back services to buy used parts and machines from customers	62587 - Retail trade services on a fee or contract basis, of mining, construction and civil engineering equipment and components.	In-house and outsourced. Distributors, both in-house and outsourced also handles buying back from customers
	74. Remanufacturing and refurbished services	Class of 4446 - Parts for the goods of classes 4441 to 4444 (Machinery and equipment for special purposes)	In-house. The company operates 10 re-manufacturing factories across the globe.

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