

Chapter 3

Industrial Welding Services in Thailand

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3.1. Firm Background

The parent company of the firm under study is a global leader in the production of welding consumables; the design and manufacture of sophisticated welding equipment; and the provision of welding services. Due to a history of innovation their products are market leaders and are protected by a significant portfolio of intellectual property rights. The parent company operates in over 150 economies and has majority shares in 30 subsidiaries.

The group's dual role as both manufacturer and service provider, and moreover as a service provider that relies on its manufacturing activities to gain competitive advantage, has impacted the geographic distribution of its subsidiaries. Traditionally, manufacturers invest in production facilities in locations that allow them to take advantage of factor prices, ease of trade, low transportation costs and possibly the local supply of certain inputs. Production is then concentrated in these areas to take advantage of scale and network economies. The goods may then be exported to meet demand globally. The movement of labour however is generally far more restricted than the movement of goods, and thus an *in situ* service provider must generally establish multiple local subsidiaries in order to compete in multiple markets, each of which must operate at a smaller scale.

Regionally, the parent company has worked with these conflicting constraints and incentives by creating a network of Asian service centers that also act as: i) distributors of both the high-value welding equipment and consumables the group produces in Europe and the low-value welding consumables it produces in Asia; and ii) a specialized producer of one of the firm's low-value products such as low-alloy cored wires, electrodes or wear plates to take some advantage of scale economies in production. Intra-group trade then supplies each subsidiary with the inputs they require for their service operations.

The subsidiary under study, located in Thailand, thus participates in three distinct but related value chains. Like most group members, it acts as: 1) a welding service provider; 2) a distributor of welding wires and machines; and 3) a manufacturer of a range of the group's trademarked wear plates, which are exported globally. This specialization was selected due to Thailand's mature steel industry, which are core inputs in the production of the wear plates. Thailand also has a mature cement industry, which is a big user of the firm's products

The firm is a small, relatively capital-intensive company. Roughly half of its employees work in production and engineering, and half in administration and sales. The small number of staff and the range of the firm's activities mean that the three value chains are managed by the same individuals and make use of many of the same resources. Though the three deliverables are non-bundled and share only a few physical inputs, this resource sharing synergy minimizes cost and allows the firm to focus its present activity on whichever market displays robust demand.

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3.2. Basic Operation of the Value Chain

This case study focuses on the value chain associated with the *in situ* provision of welding services, which accounts for approximately 70 percent of the firm's revenue, and determined its classification as a Tier Two Service Provider upon its registration with the Thai Board of Investment. The *in situ* welding services most commonly supplied by the firm are cladding and hard facing. These are surface welding operations designed to increase industrial components' resistance to abrasion and corrosion through the application of alloy metals. There are two basic physical inputs for an *in situ* cladding or hard facing operation (welding equipment and welding consumables) and two basic service inputs (engineers and technicians, and logistics and project management).

Figure 3.1. Cladding under way



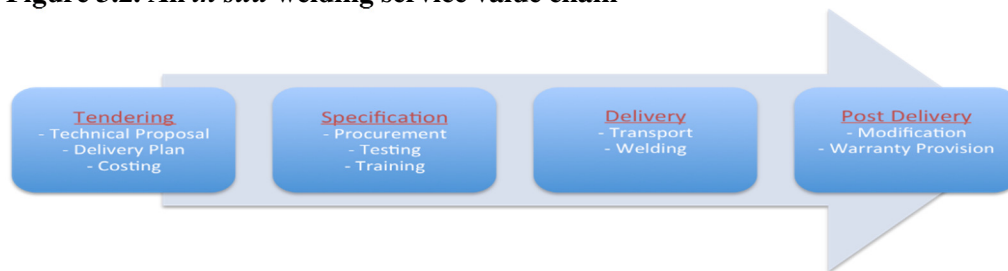
Source: Courtesy of the firm

Other corporate members provide the physical inputs. All tasks associated with the production of the welding equipment necessary to the firm's operations are outsourced to group members in Europe and imported by the firm. This includes stock equipment for which the firm keeps an inventory, and bespoke equipment required for a specific contract. The key welding consumable is a product called flux cored wire. It represents the method for delivering the alloy to be fused to the surface under operation into the welding device. The production of the wires is outsourced to a group member in Malaysia and imported by the firm; again, this includes both inventories of common varieties and the production of novel alloy wires for unusual contracts. The production bases in Europe and Malaysia not only produce customized versions of their products at the firm's request, but also design and test them based on the client's requirements as communicated by the firm. The firm is not involved in the research and design process.

The service inputs, as the firm's core business competencies, are provided in-house. The engineers and welding technicians who complete the *in situ* welding itself are all full time employees of the firm. This is partly because the firm uses its own equipment and thus welders must be trained in its use, and partly as a quality control measure. The firm's engineers complete the technical aspects of project management themselves, and the administrative staff handles the logistical elements. The ownership and driving of the trucks used to transport the firm's equipment and technicians however is outsourced.

We will define the value chain as beginning with the firm's decision to tender for a specific project, and as ending with any repairs the firm is obliged to provide under their warranty. For ease of analysis the value chain may then be divided into the following stages.

Figure 3.2. An *in situ* welding service value chain



Source: Fung Global Institute

Tendering

While clients may simply invite the firm directly for small routine jobs, large contracts involve a tender, open to pre-qualified companies. This usually takes the form of a one-time blind auction, where contractors submit delivery plans including technical specifications, timelines and prices and one is then awarded the job. The firm's key corporate partners in Europe and Malaysia may need to come on board at this stage if it is clear that customized machinery or unusual cored wires will be required for the job. If so their advice will be needed in the writing of the technical proposal.

In some cases the tender takes the form of a bidding contest, where contractors are aware of the prices their competitors are offering and are given the opportunity to undercut them. Bidding contests are more common in technologically simple jobs where price is the client's key determinant in awarding the contract. The firm is not competitive in this market, due to its capital intensity and highly trained personnel. Rather, it tenders for complex jobs that require a degree of equipment and process customization and a high level of technological sophistication. In these cases the quality of the technical plan is the key determinant and so the tendering mechanism is designed to produce detailed technical plans rather than fierce price competition.

Specification

Upon being awarded the contract the firm's plan undergoes a series of tests, the results of which are discussed with the client. Before these tests can be completed other group members must construct any bespoke equipment or alloy wire and local staff must be trained in its use. Mock-up test results are then examined by the firm's in-house metallurgic laboratory, and process inspections carried out by the client. Throughout this process results are shared with the client and the price continuously negotiated as the client requests process and/or input adjustments based on the test results.

Delivery

Once the client is happy with the product and a price has been agreed the welding operation itself begins. Because the firm uses its own machinery and its own engineers and technicians this often involves a substantial logistics operation. The equipment, personnel and welding consumables must be transported to the site, housed for the duration of the project and returned to the firm's factory on completion.

Post-Delivery

Upon the delivery of the service the firm will adjust its process and its machinery's software in consultation with the client. Though these are usually minor adjustments the firm believes they are

important in developing its reputation and network of clients, with whom repeated business is crucial for growth. The firm also provides a warranty for its welds. Inspection is the responsibility of the client, but upon the identification of an issue the firm redeploys a team to address it.

3.3. Services along the Value Chain

From the preceding discussion of the value chain it is clear that there are a substantial number of service inputs required in the fulfillment of a welding contract. If we extend the analysis one stage further upstream then the number expands dramatically for two reasons.

The first is that automated welding equipment and cored wires are highly knowledge-intensive goods. Each requires substantial amounts of scientific and engineering research, both into the product itself and into the method of fabrication, as well as legal support in obtaining intellectual property rights. As they are often customized for a specific job, further research and testing are required on an ongoing basis. This means that their value is largely constituted by services entering into their production.

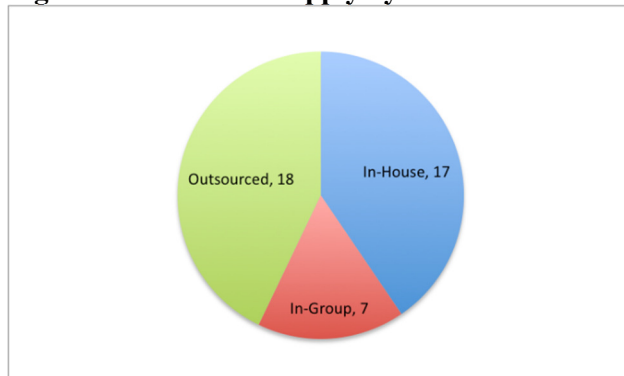
The second is that the welding technicians themselves are the product of a number of service inputs. Some of these, such as basic training, are necessitated by the technical nature of their work, however heavy government regulation of services and industry standards add to the number of service inputs required in the creation of a ready-to-work welding technician. These might include the design and administration of professional examinations, licensing procedures and health and safety inspections. Even getting onto their client's approved vendor list, which allows the firms to tender for a job, requires technical inspections and audits.

Thus a value chain consisting fundamentally of two physical and two service inputs is revealed to involve large numbers of distinct services when the production of these four inputs is taken into account. A total of 38 services were identified as being involved in the provision of an *in situ* welding application, as documented in the Appendix A Table A.1.

Outsourcing and Bundling

The figure below shows that of the 38 services entering the value chain 25 are at least partially outsourced; 7 to other group members and 18 to independent contractors.

Figure 3.3. Modes of Supply by Number of Services



Source: Fung Global Institute

The elements outsourced to independent contractors fall into categories that are widely acknowledged as profitable outsourcing opportunities; back-office functions, professional services, low value services and the ownership of certain physical assets. The key motivations for outsourcing these elements was cost minimization and legal obligation.

The cost minimization achievable by outsourcing is primarily generated in one of three ways; the spreading of investment costs; the increased efficiency gained by specialization and experience; and the efficiency associated with buying a bundle. One classic example is that by outsourcing the ownership and operation of the trucks used in the firm's transport operations the firm avoids incurring an investment cost for underutilized assets. A specialist trucking firm will be able to use its trucks more efficiently and cover its investment costs more quickly than one which owns the trucks for occasional use. This is an economy of scale effect brought about by spreading the fixed costs of production over a larger quantity of output.

On the other hand, the outsourcing of customs-related services to forwarding agents is made profitable by the time savings implicit in their network of relationships and detailed knowledge of procedures. As the agent increases output these relationships are cemented further, the agent becomes more efficient in navigating the regulatory landscape and transactions costs may also fall. This is also an economy of scale effect but is brought about through the agent's production function displaying greater dynamic efficiency increases than the firms. It is also worth noting that as the practice of outsourcing customs-related tasks is widespread this may be considered a form of an external economy of scale.

An example of a service being outsourced due to the attractiveness of a bundle is the firm's contracting of an independent logistics firm to handle its international freight requirements. Importing the cored alloy wires from Malaysia requires the coordination of multiple transport stages with customs procedures and related delays. Rather than dealing with a trucking firm in Malaysia, a Malaysian customs agent, a shipping company, a Thai customs agent and then a Thai trucking company, it is much more convenient to buy a bundle from a contractor who can simply guarantee delivery.

Bundling is much more fundamental to the firm's business model than this sort of 'outsourcing for convenience' however. Though a service provider, the firm's competitive advantage is gained primarily through its use of sophisticated welding equipment and bespoke cored alloy wires, neither of which it produces nor is capable of producing. As mentioned previously, the firm is not price competitive when it comes to run-of-the-mill welding contracts, but rather competes for complex jobs that require technological sophistication and often a degree of product customization. The firm is only able to supply these thanks to its ability to outsource the design, testing and production of bespoke manufactured goods to its corporate partners. This is an example of a service firm that gains much of its value through its use of a specific set of manufactured goods, which it imports bundled with technical advice and R&D.

It would not do the situation justice to invert the analysis and think of the parent firm as outsourcing the use of its equipment to the subsidiary in the hope of simplifying matters; the relationship is too deep for that. The firm maintains a well-trained staff of technicians, some of whose training is provided by the parent firm specifically in the use of its machinery. Simply outsourcing the equipment to independent welding firms would not provide clients the same level of value as the firm is currently offering them. Furthermore, if local independent contractors were more comfortable using competitors' equipment the parent might lose market share. The solution to this is an intimate relationship with a local service provider; it's subsidiary.

This analysis reveals the heavily bundled nature of the final deliverable, a sophisticated welding service. Strategic bundles can give firms competitive niches where the impersonal outsourcing of input manufacturing or post-production services could not. This is a testament to the parent firm's business model, which creates synergistic outsourcing relationships between group members, but with sufficiently complete contracts there is no reason this model could not be emulated outside corporate structures.

More generally, it reveals that the disaggregation of a final deliverable's value into the contributions made by goods and services components may not tell the whole story, as the disaggregated value contributions may not sum to the value of the final deliverable. The residual is in part a measure of the synergy created by the bundling of the goods and services.

3.4. Policies Affecting Services along the Supply Chain

The firm is registered with the Thai Board of Investment (BOI) as a tier two services firm. This status gave them a corporate tax holiday for 7 years, which has now ended, and allowed their parent firm to take a majority position in the firm's ownership. This would not have been legal for a services firm in Thailand otherwise. Their BOI status also exempts them from import duties on the goods they import from corporate partners in Europe, or on those they import from the group member in Malaysia (though due to the ASEAN Economic Community these would not be taxed regardless of the firm's BOI status).

Though no doubt partly due to these exemptions, the firm believes that import duties would not substantially alter their supply chains were they obliged to pay these charges. What minimal frustrations the firm did express regarding trade in goods regulation was process-based. For example, the firm explained that in general shipping the cored wires they import from Malaysia is slower but significantly cheaper than trucking them. Nevertheless, there are times when trucking is favorable, as the wires might be needed urgently. The firm does this less often than it would on a purely cost-determined basis, however, because the two-day delay in Singapore as trucks bringing the wire from the Malaysian firm are unloaded and reloaded onto ships correlates perfectly with the time taken for the necessary paperwork to be approved by customs. When trucking the whole way the cargo is simply held up by this two-day administrative delay, and thus the extra cost incurred for the sake of speed is partially wasted.

Of far greater concern to the firm is the regulation of labour movement, which is quite severe. A foreign worker must obtain both a work permit and a non-immigrant visa; these require the submission of eleven supporting documents, are processed slowly and are ultimately awarded on a discretionary basis. The conditions relate the number of foreign workers a firm may hire to the firm's registered paid up capital, tax payments, and number of local workers employed; a 10:1 ratio being required. As welding is a protected industry, even if the formal requirements are met, the permits may not be granted due to the discretionary nature of the process.

Overall the foreign worker permits make it difficult to the point of impossible to bring in trained technicians from other group members in order to meet spikes in demand. The firm cannot outsource such work to local technicians, as they are not trained in the use of its equipment. As the demand is for sophisticated services, which local firms may not be able to deliver, this generally results in the demand going unmet rather than in local welders being employed to meet it. Even ASEAN regulations, which allow 30-day tourist visitations, do not make short-term work permits more easily obtainable. In a recent government initiated policy consultation the firm highlighted this issue as its primary obstacle to local expansion.

Regional expansion is made even more difficult by the fact that neighboring economies do not recognize Thai government-issued licenses or safety inspections. In Thailand, welders must pass a professional exam based on the industrial standards laid out by the International Institute of Welding (IIW). On top of this, welders must be trained in Thai OH&S (occupational health and safety) practices, which require several days worth of man-hours and an equipment audit.

Overall, these processes represent a significant opportunity cost to the firm. Though some neighboring economies also use IIW standards, they do not recognize each other's government licenses, OH&S

training or equipment audits. The firm cannot afford to send its welders and equipment away to repeat the licensing and OH&S processes and thus its capacity to operate in neighboring economies is severely limited. Internationally consistent industrial standards, along with mutual recognition of licenses and safety training based on these standards, is regarded by the firm as the policy reform that would most facilitate additional business through trade.

Interestingly, this reveals that the greatest obstacle to trade in welding services is not trade regulations as such, but the lack of harmonization or mutual recognition in domestic industrial regulations. Even if worker permits were easily obtainable, licensing barriers would remain. It is also significant to note that registration with the BOI, which has all but eliminated tax-related barriers, does nothing to alleviate these difficulties, which have not been the focus of policymakers.

A tabulation of these policy interfaces can be found in the Appendix A Table A.2.

Appendix A

Table A.1. Services entering the value chain and their outsourcing status

Establishment Stage

Service	CPC Code	Mode of Supply			Nature of Contractor	Reason for mode of supply
		In-house	In-group	Outsourced		
Government liaison services	Division 9113 – Public administrative services related to the more efficient operation of business	✓		✓	Thai Board of Investment	The Thai Board of Investment acts as a facilitator of the firm's interactions with various government bodies
Company registration and licensing services	91138 – Public administrative services related to general economic, commercial and labour affairs	✓				
Visa and immigration services	91290 – Public administrative services related to other public order and safety affairs	✓				
Professional training/exams	92919 – Other education and training services	✓		✓	Industrial Standards organizing body	Necessitated by law
Safety standards and inspection	91290 – Public administrative services related to other public order and safety affairs			✓	Government agency	Necessitated by law
Personnel search and referral services	85112 – Permanent placement services, other than executive search services	✓				

Pre-Production Stage – Services relating to physical inputs

Service	CPC Code	Mode of Supply			Nature of Contractor	Reason for mode of supply
		In-house	In-group	Outsourced		
Procurement agent	85999 – Other support services n.e.c.	✓				
Customs-related services	85999 – Other support services n.e.c.			✓	Customs agent	Time and cost savings brought about by specialization
Quality assurance (of raw materials)	83441 – Composition and purity testing and analysis services		✓		Group members	Bundled with the supply of physical inputs
Freight transportation	Group of 65 – Freight transport services			✓	International logistics firm	Time and cost savings brought about by specialization
Storage of raw materials	67290 – Other storage and warehousing services	✓				
Design of welding equipment	81129 – Research and experimental development		✓		Group members	Technical capacity
Design of welding consumables	81129 - Research and experimental development services in other engineering and technology		✓		Group members	Technical capacity

Production Stage – Services used directly in production

Service	CPC Code	Mode of Supply			Nature of Contractor	Reason for mode of supply
		In-house	In-group	Outsourced		
Welding process design	83920 – Design originals	✓	✓		Group members	Certain process design is started by other subsidiaries and later shared with the rest
Intellectual property acquisition	83960 – Trademarks and franchises n/a		✓		Group members	Bundled with the supply of physical inputs
Quality assurance	83441 – Composition and purity testing and analysis services	✓	✓		Group members	The firm provides quality assurance for its own welds, but the quality of the alloy produced by group members is assured by the producer
Compliance management	83190 – Other management services, except construction project management services	✓				
Testing and trialing including laboratory testing	83449 – Other technical testing and analysis services	✓	✓		Group members	The firm does metallurgic testing as part of its testing regime, the research process of creating a bespoke alloy wire is carried out by the group member producing these wires
Cleaning services (factory and warehouse)	85330 – General cleaning services			✓	Independent cleaning contractor	Cost savings
Security services	85250 – Guard services			✓	Independent security contractors	Cost savings
Waste treatment	Group of 942 – Waste collection services			✓	Independent waste treatment firm	Cost savings and technical expertise

Services in Global Value Chains: Manufacturing-Related Services

Repair and maintenance services of machines and equipment	871 – Maintenance and repair services of fabricated metal products, machinery and equipment	✓				
Logistics	85519 – Other transportation arrangement and reservation services n.e.c.	✓				
Truck hire	660 – Rental services of transport vehicles with operators			✓	Independent trucking company	Cost savings
Welding services	8332 – Engineering services for specific projects	✓				
Utilities	Group of 863 – Support services to electricity, gas and water distribution			✓	Local utilities providers	Cost savings and technical expertise
Work gear design	882 – Textile, wearing apparel and leather manufacturing services			✓	Specialized work gear manufacturers	Cost savings and technical expertise
Laundry services	97130 – Other textile cleaning services			✓	Independent laundry contractors	Cost savings
Accommodation services	632 – Other accommodation services for visitors and others			✓	Independent hotels	Cost savings

Back-office

Service	CPC Code	Mode of Supply			Nature of Contractor	Reason for mode of supply
		In-house	In-group	Outsourced		
Auditing services	Group of 822 – Accounting, auditing and bookkeeping services			✓	Accounting firm	Necessitated by law
Insurance services	Group of 713 – Insurance and pension services (excluding reinsurance services)			✓	Insurance firm	Cost savings and risk assurance
Accounting services	8222 – Accounting and bookkeeping services	✓				
Banking services	71121 – Deposit services to corporate and institutional depositors			✓	Bank	Cost savings and risk assurance
Legal services	82120 – Legal advisory and representation services concerning other fields of law			✓	Legal partnership	Cost savings and technical expertise
General management	8311 – Management consulting and management services	✓				
Communications and marketing	82130 – Legal documentation and certification services		✓		Group members	
Estate management	72112 – Rental or leasing services involving own or leased non-residential property			✓	Owners of the industrial estate on which the firm's factory is located	Cost savings and legal benefits of locating on a designated industrial estate
IT and information system management	8316 – IT infrastructure and network management services	✓				

Source: Fung Global Institute

Table A.2. Government Policies and Services Affecting the Supply Chain

Government Policy/Service	Authority(ies) in charge	Details	How the Policy Affects Services in the Value Chain
Worker safety – Occupational health and safety licenses and inspections	Provincial Labour Office under the guidance of the Department of Labour Protection and Welfare	Inspections are carried out on the basis of an undisclosed annual planning system or on receipt of a complaint. They consist of two stages, a general conditions inspection and then OH&S inspection. SMEs may self-report by filling in a 50 question survey. Inspections are only carried out if less than 70% of the answers indicate compliance	The process is costly enough that the need to do it repeatedly for different regulatory regimes acts as a barrier to international expansion.
Foreign worker permits	Ministry of Labour	Foreign workers must apply for “non-immigrant visa B” and foreign worker permit. This requires the provision of proof of education, blood type and medical fitness as well as official applications forms. Also requires exiting Thailand to activate on re-entry.	As there is no exemption despite BOI registration, even for workers employed by another corporate partner, the firm finds it very difficult to meet spikes in demand as it cannot outsource work to local welders due to specialized training requirements.
Professional Standards	The International Institute of Welding has an Authorized National Body in Thailand, which is responsible for monitoring Approved Training Bodies, such as the Thai Institute of Welders.	The IIW-IAB Qualification System is recognized by the ISO under 14731 – Welding coordination. The oversight of industry standard compliance is the responsibility of the Thai Industrial Standards Institute. The system involves the training of all personnel, the auditing of equipment and ongoing safety procedure compliance.	Meeting these standards is considered very costly by the firm as it requires not only travel expenses and man hours but represents an opportunity cost as machinery must be out of action while being audited. The process is too costly to carry out multiple times and thus prevents international expansion.
Customs Clearance Process	Thai, Malaysian and Singaporean Customs Authorities	Standard border customs processing procedures	At-the-border measures had a minimal impact on the firms operations. However there were cases of transport methods being

			chosen on the basis of correlation with administrative inefficiencies which caused delays in the supply of imported inputs.
BOI Exemptions	Thai Board of Investment	Thailand limits foreign investment in the services sectors through the Foreign Business Act of 1999 (FBA) and other sector-specific legislation. Currently, foreign investment in most services sectors is subject to a 49% equity cap (with only a case-by-case provisional exemption). The BOI provides exemption from these laws however on a discretionary basis.	The crucial impact of BOI support was that it allowed the formation of the company in the first place.
Industrial estate	Industrial Estate Authority of Thailand	The firm is located on a registered Industrial Estate managed by a private firm.	The Industrial Estates allow the firm to benefit from network economies and bundles. The clustering of industry into estates ensures that utilities are efficiently and reliably supplied and that good road access can be ensured. For their fee the firm received not only the right to locate themselves on the estate but received waste removal services, security services, electricity and water supply bundled into the cost

Source: Fung Global Institute