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JAPANESE KNOWLEDGE TRANSFER VIA TRAINING IN MEXICO'S AUTOMOTIVE INDUSTRY

Abstract:

The automotive industry has been considered a source for development because of its impact on employment, knowledge transfer capabilities and backward and forward linkages with other industries. However, only a handful of developing countries have achieved an internationally competitive automotive industry. This might be attributable to the industry requiring not only skilled labor but also a strong supporting industry able to provide from 20,000 to 30,000 parts and components. In an ideal setting, supplier firms and assembly plants work interconnected creating positive externalities to each other, but for developing countries, it has been shown that this is difficult to achieve. The case of Mexico stands out as a country that has successfully attracted major automotive assemblers but has not been able to develop a solid supplier base. Despite the increasing presence of Japanese firms in Mexico, local firms have not been able to enter automotive chains primarily due to the inability to meet technological and quality requirements. This study analyzes specific cases of knowledge transfer to local firms under a training project from the Japan International Cooperation Agency (JICA). The results show improvements in quality and productivity measurements of participating firms. The knowledge acquired through training was internalized and diffused within the firm allowing for industry-specific certifications, market growth, and market diversification.

Keywords:

Knowledge Transfer, Training Programs, Automotive Industry

JEL Classification: M53, L62, O19

Introduction[1]

The automotive industry has been considered a source for development because of its impact on employment, knowledge transfer capabilities and backward and forward linkages with other industries. However, only a handful of developing countries have achieved an internationally competitive automotive industry. Hosono (2015) argues that this might be attributable to the industry requiring not only skilled labor but also a strong supporting industry able to provide from 20,000 to 30,000 parts and components. In an ideal setting, supplier firms and assembly plants work interconnected creating positive externalities to each other, but for developing countries it has been shown that this is difficult to achieve[2].

The case of Mexico stands out as a country that has successfully attracted major automotive assemblers but has not been able to develop a solid supplier base. Despite the increasing presence of Japanese firms in Mexico, local firms have not been able to enter automotive chains primarily due to the inability to meet technological and quality requirements (Guzman-Anaya, 2016; Tokoro, 2006). Also, according to JICA (2017), this has been in part due to insufficient labor and technology. This in turn hampers the possibility of Mexican automotive supplier to enter global production chains due to insufficient technological and quality capacities. On the other hand, there is also the argument that Japanese firms impose high entry barriers to local firms and favor procurement from suppliers that form part of the same business group or "*keiretsu*". Irawati (2012) argues that Japanese *keiretsu* follow a global-local type of interlinked network or what is regarded as a network in the network that limits linkages with local firms.

In this sense, Japanese automotive assemblers have incentivized other Japanese companies to establish in Mexico primarily in the Tier-1 level of procurement with an increasing presence in the Tier-2 level. This behavior is reflected in Japanese Foreign Direct Investment (JFDI) statistics, where almost 70% of investment flows are concentrated in the automotive industry. Also, there is a spatial concentration of automotive JFDI in the western region of Mexico including the states of Aguascalientes, Guanajuato, Jalisco and Queretaro. This region has provided favorable conditions in terms of competitive production costs, qualified labor and infrastructure. Also, despite that production is established in the region for export purposes, the internal market has been expanding creating an increasing demand for automotive products. Finally, as mentioned by Lugo-Sanchez (2018), the state and local governments have set forward favorable

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[2] The case of Thailand stands out as a success story for the development of a competitive and inclusive automotive industry where local firms acquired technological capabilities and there was an increase in the pool of skilled labor required for the industry. See Yamashita (2004).

policies to attract Japanese firms to the region by the form of favorable labor conditions and fiscal incentives.

Despite the glooming scenario for Mexican firms entering Japanese automotive production chains, there are opportunities for local firms to increase their presence in the Tier-2 and Tier-3 levels of procurement since more than half of the inputs required in the country are imported. To achieve this goal, Mexican companies need to reduce the technological gap with their international counterparts by improving their quality and productivity indicators. This may be achieved by the transfer of knowledge and technology via training. In particular, institutions for instance government agencies are capable of increasing technological levels of local firms at the micro-level using training. This study presents six case studies of Mexican Tier-2 firms and three case studies of Japanese Tier-1 firms that participated in a training project implemented by the Japan International Cooperation Agency (JICA) from 2012 to 2015. The interviews were carried out in 2018 to analyze the benefits achieved from training.

The paper is organized as follows: the next section presents a contextual framework regarding Japanese automotive presence in Mexico and JICA training programs. Section three cites the literature review regarding training program effects at the macro and micro-level. The fourth section shows the methodological strategy implemented. The fifth section produces the empirical case studies of this study. The final section concludes.

Literature Review

Previous studies from Japanese FDI in the automotive industry have shown that Japanese industrial organization models are able to adapt to local conditions (Nonaka et al., 2000; Fujimoto, 2007). Also, it seems that Japanese firms equip themselves with more advanced technology when they settle in a developed country compared to developing countries. This however, might not be disadvantageous for developing countries, since a wide technological gap might limit the absorptive capacity of local firms to internalize the new knowledge. In other, words, if Japanese firms establish in a developing country with their cutting-edge technology may limit technological transfer to local firms due to the knowledge gap. However, Japanese firms also establish in developing countries to take advantage of lower labor costs and make use of labor-intensive technology; in some cases, this might be not entirely the firm’s choice but also the process of agreements with local governments to comply with employment quotas and receive fiscal incentives.

Knowledge transfer from Japanese subsidiaries seem to depend on the characteristics of the investing firm and if the investment is realized in a developing or a developed country. For the case of developed countries, the knowledge transfer phenomenon appears to be bi-directional (Branstetter, 2006); for developing countries the transfer is regarded as one-directional, from the Japanese subsidiary to the local firm (Blalock, 2001).

Previous literature on knowledge or technological transfer has focused on FDI and the impact to local firms. It is believed that knowledge flows from foreign subsidiary firms located in the host country to local firms through imitation (learning-by-doing), competition (pressure on local firms to use their resources more productively), business linkages (relationships with local supplier firms "backward linkages" or flow of parts and components to local customer firms "forward linkages"). However, there is still no clear consensus on the existence of benefits or "spillovers" associated to FDI presence in a host country. Blomstrom and Kokko (1998) argue that the mere presence of foreign firms does not automatically generate positive impacts on the host country or local firms.

In this sense, knowledge transfer studies associated to FDI can be classified at the macro, meso and micro-level. At the macro-level it has been documented that national characteristics related to the absorptive capacity of the host country including education and human capital levels (Glass and Saggi, 1998), presence of developed financial markets (Carkovic and Levine, 2002), openness to free trade (Balasubramanyam et al., 1996) and relative backwardness or technological gap between host and home country (Findlay, 1978; Glass and Saggi, 1998; Romer, 1993) influence the knowledge transfer process. Meso-studies focus on industrial characteristics and the nature of the product (Lall, 1980; Dunning and Cantwell, 1986; Kokko, 1994).

For the case of micro-level studies, these can be divided in terms of characteristics of the foreign firm (source of the knowledge), features of the local firm (recipient of the knowledge) or nature of the relationship. The qualities of the foreign firm have focused primarily on the corporate strategy and organizational structure of the multinational firm (Blomstrom and Sjoholm, 1999; Rodriguez-Clare, 1996). Regarding the features of the local firm, emphasis has been set on absorptive capabilities (Cohen and Levinthal, 1990). Finally, for the relationship perspective, studies have included time to build relationships (Aitken and Harrison, 1999; Kiyota et al., 2008) and the existence of transfer mechanisms between foreign and local firms (Branstetter, 2006).

A body of literature has focused on training as a knowledge and technology transfer mechanism. It is believed that training may transfer both tacit and explicit knowledge, however, the Japanese production system favors the transfer of tacit over explicit knowledge (Urata, 1996). Also, Rivera (2002) mentions that technological and knowledge transfer take place via formal and informal channels. Formal mechanisms are those that include the leasing or contracting of technology through licensing, patents, packages, trademarks, turn-key plant and consulting or technical services. The informal mechanisms include reverse engineering, personal contacts, academic and private corporation study groups, involuntary leakage of technical information and training of employees and local suppliers. For developing countries, it is believed that informal mechanisms have larger impacts on local firms since formal mechanisms impose a series of financial restrictions and usage barriers that endogenous firms are not able to overcome.

Several empirical studies have evaluated the impact of training on local economies. According to Mikami and Furukawa (2014), the literature has followed an inter-disciplinary approach from areas including labor economics, business administration and development studies. From the labor economics approach, studies have emphasized on the employee-firm interaction and the general costs from training. There is a general agreement that workers increase their human capital stock via training impacting their productivity; however, a conflict of interest arises between the trained employees whom are incentivized to leave the firm for better job positions after training and the firm that paid for their instruction. In this sense, trained employees might be seen as a common good, that creates incentives for free-riding to competing firms. Labor economic studies seek to find the optimal training levels and equilibrium scenarios (Acemoglu, 1997; Acemoglu and Pischke, 1998; Boom, 2005).

From the development perspective, studies have focused on the donor-lending angle for developing countries. This literature attempts to evaluate the efficiency and effectiveness of training, specially of high-level technical and managerial skills in the public sector along with the brain drain problem of local and international trained civil workers (Tessema, Winrow and Teclezion, 2012).

Business administration studies seek to explain the outcomes from training at the organizational level. A body of work focuses on the internal and external conditions that enable training to be effective (Nikandrou et al., 2008); another approach centers on the improvements after training in terms of firm performance and innovation (Bartel, 1994; Huang, 2001; Almeida and Carneiro, 2009; Dumas and Hachane, 2010; Chen, Hsu and Huang, 2013).

Japanese Training Programs

According to the UNCTAD (2014), developed countries offer financing support, matching services, partnerships and alliances, support for purchase licensing and equipment, and training through their development agencies abroad. According to a survey to 41 agencies, 19 of them offered training programs and 4 of them implemented their training programs in developing countries with the purpose of training local workers. For the case of Japan, the study mentions that the Japan International Training Organization stands offers international workers to undergo training in Japanese companies for up to one year.

Similarly, the Japan International Development Organization offers equity participation and loan facilities for joint ventures between Japanese and local firm. The projects supported are valued in terms of their long-term, social and environmental impact. Newly formed firms are expected to use advanced and proven technology.

Also, the Japan International Cooperation Agency (JICA) is responsible for technical cooperation within Japan’s Official Development Assistance (ODA) program. JICA has the goal to transfer knowledge and technology to developing countries seeking to stimulate socio-economic development by offering assistance programs in the form of technical cooperation, investment cooperation and grants. Technical cooperation trains and transfers knowledge at the management, technical and academic levels in local countries.

JICA is considered the world’s largest bilateral aid agency with presence in 150 countries and ranks fourth in terms of net contributor of ODA. A major part of JICA’s ODA is offered in the form of technical cooperation training to developing countries. Since joining the Colombo Plan in 1954, JICA has trained over 310,000 people in 198 countries (JICA, 2017). According to Mikami and Furukawa (2014), JICA conventionally had the goal to influence trainees at the individual level; however, since 2012 the agency seeks to impact via training at an organizational level.

Empirical studies have documented the impact of Japan’s ODA for developing countries. Sahoo and Bishoni (2016) study the impact from Japanese transport infrastructure investment in India. The results show that Japanese ODA investment have changed the urban landscape and improved living standards by reducing trade costs and increasing employment and income. Similarly, studies have analyzed JICA’s training program effectiveness. Nakano et al. (2015) measured the productivity gains from JICA training in rice cultivation technologies in Tanzania. The overall results indicate productivity enhancements from trained farmers and knowledge spillovers to non-trained farmers through social networks, observation and imitation that resulted in further productivity gains. Kijima (2018) analyzed short and long-term spillover effects from lowland rice farming training in Eastern Uganda. The analysis found short-term technological and knowledge spillovers to trainees that were transferred in the long-term to the community resulting in a net increase of total rice production of trainee and non-trainee households. Mikami and Furukawa (2014) studied the impact of JICA training of public servants on their dispatch organization. The results indicate that the presence of efficient bilateral communication between the public servant and their organization during the training plays a key role in achieving the transfer of individual-level learning at the organizational level.

Bishoni (2016) analyzed a JICA training program for the automotive industry in Pakistan. The project sought to develop local suppliers needed for the industry by offering technical support and training from Japanese experts. The results show that local trained firms were able to improve their quality, productivity and competitiveness as auto part suppliers. Similar results are shown for a JICA project launched in conjunction with South Africa's "Automotive Industry Development Centre".

Mexico ranks among the top ten countries receiving JICA training assistance since 1970 (JICA, 2016). The Mexico-Japan Economic Partnership Agreement (EPA) sets industry promotion as a top priority area within the country assistance program set forward for Mexico where JICA plays a key role. JICA's ODA assistance program in Mexico has focused on increasing the pool of skilled engineers required for the automotive industry and also improving the quality, productivity and competitiveness of automotive supporting industry local firms (JICA, 2017).

JICA has promoted several projects to strengthen the Mexican automotive industry since 2012. Among these, the "Project for Human Resource Development for the Automotive Industry in El Bajio of Mexico", the "Project for Automotive Cluster Promotion in Mexico" and the Project for Automotive Supply Chain Development in Mexico" (hereafter PASCDM). The PASCDM was conceived with the purpose of developing local automotive suppliers by improving their quality, productivity and competitiveness through training. These benefits were expected to allow trained firms become suppliers of Japanese automotive companies established in Mexico.

The PASCDM was carried out from November 2012 to November 2015 in the states of Queretaro, Guanajuato and Nuevo Leon. The states were selected since they represent key locations for Japanese automotive production. Japanese Tier-1 firms were consulted to determine the 30 tier-2 participating local firms. The project trained local suppliers in *Kaizen*[3] philosophy to improve their quality costs and delivery times. Also, the training extended to government officials in charge of industrial policy to help them understand Japanese production systems, business practices and particularly *Kaizen* philosophy.

Methodology

The study follows a qualitative research method to analyze the knowledge transfer obtained from training. In this sense, case studies are employed to better understand the

[3] The term "*Kaizen*" refers to a process of continuous improvement that involves all the organization. It is considered a concept that reflects the best Japanese management practices that help boost Japanese firms after World War II to world class competitiveness levels during the 1980s. For further information see Imai (1986).

knowledge transfer mechanisms. The case study approach is adequate when the topic in hand is too complex to understand through quantitative research methods. Case studies allow to better understand the knowledge transfer process using descriptive details of the firms that participated in the PASCDM.

Nakano et al. (2015) mention that impacts of training programs should be analyzed in the medium or long term, in other words, a few years after the implementation, to fully capture the spillover effects from training. The case studies were conducted three years after the completion of the PASCDM.

Specifically, six local firms that participated in the PASCDM were chosen from the state of Guanajuato. Also, three Japanese firms that have business relations with the trained firms were included as part of the study. The field work consisted of semi-structured face to face interviews with key actors in each firm (owners, directors, managers, engineers). The firm visits were carried out from January 22 to January 25, 2018. All visits were conducted in the production plants of the firms to observe the production layout changes made after training. From the six local firms, five were plastic injection oriented and one produced bolts, screws and special fasteners. In order to comply with privacy requirements, the names of the firms were changed.

The interviews were centered around three main topics: positive changes observed after the PASCD, negative aspects after training and knowledge transfer acquisition channels and knowledge internalization appropriation and diffusion. The results from the case studies are presented in the next section.

Empirical Case Studies

Firm A

The interview to firm A was conducted with the Chief Executive Officer (CEO) of the company. The firm may be considered a family corporation since the CEO’s father is the founder of the business and family members are in management positions throughout the company. Firm A was originally established as a supplier for the medical industry, ten years later the firm transitioned to the automotive industry as a Tier-2 plastic injection supplier of a Japanese Tier-1 firm that we shall name “J1”.

According to the CEO, the JICA project gave the firm tools to implement 5’s methodology and helped them reduce their Parts per Million defective rate (PPMs) and time needed to change their molds (known as “Single Minute Exchange of Die” (SMED)). The company acknowledges that the JICA training gave them the knowledge to understand the expectations from Japanese firms and better utilize their existing resources prior to major investments. The firm before the project thought that their processes and quality was acceptable but realized that they were not competitive in international terms. The firm had difficulties in internalizing the knowledge from the TP since they experience high labor rotation and workers that benefited from the training left the company. The firm decided to correct this shortcoming by documenting all their processes and seeking several certifications.

After the training the firm expanded production to three production lines (before there were only two) and went from four to twelve plastic injection machines. Currently, two production lines are for the automotive industry and one for the medical industry. They also increased the number of work shifts from two to three and from a five-day to a seven-day work week. They are now suppliers of not only J1 firm but also of another Taiwanese Tier-1 automotive firm. The firm also changed the organizational structure introducing middle-management positions and the production layout allowing a better flow of information.

The exponential growth of firm A is unquestionable, especially for the automotive industry. In 2016, this market represented 87% of their total sales and in 2017 the figure increased to 94%. The firm originally produced parts for only one OEM through J1 firm but now they make parts for five OEMs (four through J1 firm and one through the Taiwanese firm). In terms of production molds, in 2012 they worked with only one mold, in 2013 they had two, in 2014 they increased to four and between 2015 and 2016 they worked with seven molds.

Despite the positive outcomes, firm A mentioned that they are also facing fierce competition and several challenges. They point out that labor shortage and high labor rotation is a major issue, since resources are wasted in training new workers. Also, they point out that their main client J1 has pushed them for excessive cost reductions and implemented the “peso policy” where fluctuations in the exchange rate that result in increments of production cost has to be absorbed by firm A

Firm A mentioned that certifications such as ISO 9001:2015 and VDA 6.3 have helped them maintain competitiveness and this has opened doors to other clients. Also, they have increased (or worsen) their PPMs with their expansion, they used to have them at zero but increased to 50 after 2015 when they started introducing new molds, changed the organizational structure and production layout, requiring new training methods. The executive mentioned that with growth, they had to face new difficulties.

The firm argues that due to the “peso policy” and other demands from J1 firm, the long-term relationship might be in jeopardy, so they are currently expanding their relationship with the Taiwanese firm and are in search for new customers. They also see their medical business line as a back-up business in case of future difficulties within the automotive industry and are seeking to further expand in this market. The firm mentioned that diversification is an important strategy and that they are trying to evolve from the Tier-2 to the Tier-1 level of procurement where they see major utilities.

The overall result from the visit to firm A was that the company benefited from JICA's TP. The firm is growing and expanding their business relations in the automotive and medical industry. The firm has internalized and appropriated the knowledge by documenting their processes and has obtained certifications such as ISO 9001:2015 and VDA 6.3. Interestingly, the knowledge acquired has spilled-over to their medical lines where they also report improvements in their production process. The firm A executive had kind words and fond memories from the training facilitator and were eager to continue training from JICA in the future. They indicated that the firm is very different now to the one that was trained in the PASCDM and therefore face new challenges.

Firm B

Firm B is a joint venture firm with global partners (mainly Taiwan), but the company is family owned. The firm has two divisions, the first division arrived in Mexico via FDI to sell machinery and produce shoes in Mexico. The second division was a transition from the production of shoes to auto parts since they already had the plastic injection machinery and also from an invitation from J1 firm to become a supplier back in 2007. The interview was conducted with the human resources manager of the company that is a family member of the owner of the firm; the manager mentioned that despite the Taiwanese origin of the capital, the firm is considered a Mexican company. The manager mentioned that this firm was the first local supplier of J1 firm and after observing success, J1 company decided to continue developing local suppliers.

The manager mentioned that participating in the PASCDM gave them appropriate training to improve their quality control systems. The 5s and *Kaizen* philosophies have been applied within the firm. Similar to firm A, this firm has appropriated the knowledge with the use of information diagrams and manuals to avoid losing information with employee rotation. The knowledge acquired has diffused throughout the firm to all of their business operations. In the beginning stages of their automotive industry venture they used to receive audits and revisions every four months, along with technical support from J1 firm; however, after the training program this was no longer required. They maintain their internal and external PPMs in less than 1% and are pursuing to reduce them; however high production volumes and external factors (mainly dealings with J1 firm) have impeded them from achieving this goal.

Despite the positive results from the PASCDM, total sales and profits have dropped between 2014 and 2017 by almost 50%. The manager mentioned that this is due to an increasing difficult relation with J1 client. They argue that the company outrivals competitor in service and quality of production, in internal and external PPMs and time needed to react to problems, all skills developed through the training program. However, they believe that their costumer (J1 firm) is no longer valuing these traits and are pressing only for low prices. Originally they started off with only three molds for the automotive industry, and in 2014 they were working with 23 molds; however by 2017 the figure dropped to only 16 molds, all for client J1. The main reason is the closing of projects from J1 customer due to molds being sent to competing firms. The manager mentioned that J1 firm invested in a joint venture with a Tier-2 Korean firm in 2015 that shifted the procurement chain and reduced the number of orders. Also, according to firm B there is high pressure from J1 firm for cost reductions that are seen as unfair and that hamper their possibilities for growth. This firm has also been affected by the “peso policy” where they may only suffer loses for exchange rate fluctuations. Firm B mentions that the “peso policy” is set directly from J1 firm and not from the OEM. The firm considers itself as one of the main suppliers of J1 firm but is evaluating ending their business relations.

Firm B mentioned that they are currently facing other challenges. The main obstacle is fierce competition among local Tier-2 firms; for example, the manager mentioned that in 2014 there were only three suppliers for J1 firm and by 2017 there were ten suppliers; currently within a 1 km radius from firm B there are now four suppliers of J1 firm. There are also worries that other foreign Tier-2 firms with more advanced production technologies are planning to invest in the region and this might further increase competition.

The firm mentioned that their main mistake was to concentrate all of their business efforts for the automotive industry and to client J1. For example, their shoe production sales only represented 3% of total sales in 2016. They are currently trying to revert this trend; the firm is working in developing their plastic injection household products market; in 2017 they acquired a major customer in this segment and automotive parts now represent only 60% of total sales. They expect to have shoe and household products represent 90% of sales and the remainder for the automotive industry in the next two years. They are searching for new customers in the automotive industry but have failed to close any orders due to quality and cost requirements. Also, firm J1 has demanded for supplier exclusivity, but firm B no longer feels loyalty with this customer.

In terms of further training, the manager mentioned that they are currently receiving technical support and new machinery from a Taiwanese firm. This firm is apparently also family-related to firm B. The firm did not express any interest of participation in further JICA training programs.

Firm C

Firm C was established in Mexico City and after a period of growth the company decided to start plastic injection activities first in Queretaro and afterwards in Guanajuato. The company is 100% nationally owned and the Guanajuato branch is solely focused in producing auto parts for one Japanese customer (firm J1). The interview was conducted with the production manager and the operations manager of the Guanajuato plant, both of them were not part of the company when the firm participated in the PASCDM. The managers mentioned that the training participants were no longer employed in the firm.

According to the production manager, JICA's training gave them the skills and expertise to reduce the time needed to change their molds. They now use magnetic platens in two of their four machines and this has reduced the changing mold times by 50%. There are plans to extend this technology to another machine in the future. Also, from the PASCDM they became apt to increase their business ventures with J1 firm. Different from firm A and B, firm C seems to have a growing and healthy relation with firm J1. The mangers mentioned that they have an annual 3% cost reduction target established by firm J1 and seem confident to achieve this goal. They also mentioned that they used to operate with an external PPM target of 30% before the PASCDM and they now have this figure under 10%, complying with J1 requirements. The firm appropriated the training program's knowledge via manuals, operation sheets and checklists. The managers interviewed were not employed in the firm during the PASCDM but were clear in the learning and results achieved from the project. They also mentioned that having the knowledge within the firm is important, but they have the issue of transmitting it to their personnel and having trained workers leave the firm 20 days later.

During the last five years, firm C has seen an important growth. The firm went from two to four plastic injection lines. Five years ago, the firm worked from 10 to 15 molds, currently they work with 35 molds. Sales have been steadily growing at a 15% annual rate during the last three years. This growth gives them high expectations for the future.

The company mentioned that they are facing fierce competition in the plastic injection industry. To cope with the competition, the company's strategy has been to invest in cutting-edge technology that improves the quality of their products. They expect to also further improve their productivity by maintaining the 5s and *Kaizen* principles in the firm. Also, firm C is thinking of diversifying to other customers by investing in a new plant that would allow them to increase their production capacity and increase their participation in the automotive industry. The company has acquired the land for this new plant and expects to be at his new location by the end of 2018; the plant would host 10 additional plastic injection machines. The firm also is planning to enter the aerospace industry in the Queretaro plant.

Another problem mentioned in the interview was personnel shortage and high employee rotation. The managers mentioned that this same problem was experienced at the Queretaro plant 20 years ago and that in Guanajuato due to the shoe industry traditional system of production and of piecework labor it has been difficult for workers to learn and adapt for the automotive industry style of production.

Currently, they are only receiving training and technical support from their machinery suppliers and from J1 firm. Their customer J1 firm helps them with benchmarking courses and with the development of new projects. As mentioned earlier, the workers that participated in the training program were no longer employed in the firm and this hampered the possibilities of expansion of the benefits from training. Different from firm A and B's results, firm C does not seem to have been able to diffuse the knowledge to other business ventures of the firm. There are still vestiges of JICA's training in the firm, but since the current managers did not experience the training first hand, they do not seem interested in acquiring further training benefits from JICA. The new plant is expected to be functional with an adequate lay-out but not necessarily following the *Kaizen* or 5s philosophy.

Firm D

Firm D was established in the late 1980s as a family-owned company dedicated to plastic bottle production. After a period of growth during the 1990s and 2000s the firm decided to expand its operations to plastic injection for manufacturing industries. The firm currently produces plastic parts for the food, automotive and general industry. The interview was conducted with the CEO and owner of the firm and the engineering and quality managers.

The firm mentioned that the PASCDM sought to implement continuous improvement, reduce the time needed to change their molds and increase equipment efficiency through the *Kaizen* philosophy. The results obtained from the training program were that the firm adopted 5s methodology in all areas of the firm. They now have standardized their work flow instructions and have hourly reports that feed their quality control alerts. The firm values the benefits of continuous training and has designed worker-specific training using a skills matrix. Firm C also has internal and external process and product audits and preventive maintenance that has impacted their quality standards. They have achieved time reductions in changing their molds. Overall, the firm improved their Key Performance Indicators (KPIs) and seems committed with further improvements and growth of the firm. The knowledge has been internalized in manuals and by documenting all of their processes, using checklists and measuring their internal and external PPMs; similar to other firms the knowledge acquired has impacted all their other business areas (food containers and general industry products).

The firm mentioned that the *Kaizen* impact is undeniable. They were able to implement 30% of improvement proposals in 2015, 68% in 2016 and 93% in 2017. The time needed to change their molds in their plastic injection production went from 240 minutes in 2014 to 67 in 2015, 5 in 2016 and 4 in 2017. For their blow molding operations, the time needed improved from 480 in 2014, to 210 in 2015, 105 in 2016 and 90 in 2017. The knowledge has been transmitted to all areas of the organization, especially in their other business ventures such as plastic bottle production.

Firm D mentioned that they are currently searching to diversify their customer portfolio. They are starting production of auto parts for another foreign Tier-1 company and have been contacted by another Tier-1 Japanese firm through referrals of other customers. The CEO mentioned that when contacted by the new Japanese Tier-1 firm, the company highlighted their participation in JICA’s project and this increased the confidence in the potential customer, they are now in the process of developing the first product trials. *Kaizen* is a central part in their diversification strategies, where the tools, skills and knowledge acquired has spilled-over to their different business ventures. The firm affirms that the *Kaizen* philosophy is now ingrained in the company’s culture.

Despite the positive results, firm D also faces some challenges. The quality manager pointed out that they are working with firm J1 and receive their production molds from this company, however, due to bad planning there is a lack of maintenance for the molds that causes defects on the final products and directly affects their quality standards. According to the manager there is a great business opportunity area in the mold maintenance activity in Mexico, including the technicians that are able to provide the maintenance. The CEO mentioned that there is fierce completion in the automotive industry, notably with the arrival of Tier-2 firms from the U.S., Spain, Germany, Korea and Taiwan. This has pushed the firm to diversify their component production in the automotive industry; they produce interior and exterior parts, suspension and illumination components for six clients (four Japanese, one Canadian and one of Mexican-Spanish capital). In other industries, they lost a client that impacted negatively in their sales and number of employees. For example, the number of employees in 2014 was 165 workers and this figure dropped to 107 in 2016. Firm D also mentioned that their relationship with J1 firm is currently “tense and stressful”, they have grown their business relations from one to eleven molds since the PASCDM, however, the cost reduction requirements are unrealistic according to the managers.

Firm D is looking ahead to confront their challenges by market diversification. They value employee training and see the importance of their human capital to optimize resources and improve their productive processes. They are planning to extend their facilities, acquire new equipment and increase their production capacity. Also, they are pursuing the ISO 9001:2015 certification. The PASCDM gave the firm confidence to establish business ventures with Japanese firms, currently a Japanese firm has contacted them to be suppliers of their U.S. operations and they believe that despite the cultural and language barriers, their products, hard work and quality allows them to further grow their business linkages with Japanese Tier-1 firms.

Firm E

Firm E was founded in 1960 as a family-owned and operated manufacturing company dedicated to plastic injection activities and to the design and fabrication of molds for this industry. The interview was conducted with the owner and CEO and his two sons, one in charge of sales and public relations and the other conducts activities as the general manager of the company. The company originally produced plastic parts for other industries but transitioned to the automotive industry in part due to their ISO certification.

This company seemed better organized and technologically advanced then the previous visited. The company is not only a producer of plastic injection goods, but also designs, develops and produces molds needed for the industry. During the time of the visit they were working with over 150 molds (seven for the automotive industry) with 37 employees. According to the general manager some Japanese Tier-1 companies use their mold maintenance and repair services. Company E is certified in ISO 9001:2008 and is currently transitioning to the 2015 version and also on International Automotive Task Force (IATF) certification. They believe that their main strength is precision in their manufactured parts and innovation activities.

JICA’s training helped firm E improve the time needed to change their molds and materials, which enabled them to now accept small orders. Before the PASCDM the firm had an average time of one to four hours for mold change and from six to twelve hours for machine cleaning; after the PASCM the time was reduce to 90 minutes for mold change and only one hour for machine cleaning. Similarly, before the PASCDM the time needed to change materials was registered at over 200 minutes for simple materials and over 700 minutes for complex materials and this was improved to 24 minutes for simple materials and 54 for complex materials after the training. The firm divided all of their processes in several stages as part of JICA’s recommendations; they introduced checklists for all of their processes that helped them have uniformity and better control. The introduction of these tools has boosted firm E to maintain their external PPMs at 0. Their sales increased by 2.3 times between 2012 and 2017 and the share of the automotive industry in total sales increased from 6% to almost 20% by 2017.

Firm E pointed out that *Kaizen* training enabled them in a first stage to improve their quality and processes which in turn helped them to reduce costs. In a second stage, they improved their know-how in the usage and operation of difficult resins, helping them cover a wider array of markets. In a final stage, they received support in the mold workshop, improving their elaboration, maintenance and repair activities, which has provided them with firmness for their internal needs and has allowed them to offer these services to other firms.

The knowledge acquired from the PASCDM was replicated and diffused in other areas of the organization. The company has used the documentation of their processes in all their areas to have the information available to be transmitted to existing and new workers. Overall, errors were reduced, and the firm considers itself open to outside revisions and self-critical for further improvement. The firm has invested in newer and more precise machinery for the automotive industry to maintain competitiveness.

Firm E also mentioned that it faces fierce competition. They mentioned that foreign Tier-1 firms have a misconception of Mexican Tier-2 firms, believing that local firms will not meet their quality and capacity requirements. For this firm, convincing Japanese Tier-1 suppliers that they may be reliable suppliers has been a difficult task. Specifically, they had an encounter with a Japanese firm (J2) five years ago, and it took them three years to establish their first orders; firm E was not able to establish major orders until they were contacted to resolve a problem J2 was facing with one of their plastic injection machines, firm E delivered and a solid relation among the firms flourished. They have gained J2's trust and have been introduced to and worked with a J2 sister company in the U.S.

Firm E is also a supplier of J1 company. They have received an on-time delivery and quality award from J1 firm and expect to receive it again in the future. However, the relationship with firm J1 was recently brought to a halt when they lost almost all of their molds they were working with without any apparent reason. The instability with firm J1 has pushed E firm to try to diversify. They were contacted by another Japanese Tier-1 firm in 2016 and took them almost two years to develop a working relationship; at the time of the interview they were completing their first orders with this new client.

Another problem mentioned during the interview was employee rotation. They pointed out that it is difficult for them when employee rotation is present at the Tier-1 client firm, especially in key areas such as purchasing. It was mentioned that the treatment with Japanese firms is cordial, but it takes a long time to develop these relationships and when a new employee arrives at the purchasing department they seem to have to start from scratch (new quotations, new process and quality verifications).

Since the PASCDM, the company has expanded to a number of industries such as construction, food, cosmetics; also, there is currently a project with a Japanese OEM to produce specific and precise plastic parts for a truck. They have invested in five new plastic injection machines and have refurbished another 2. The interviewees acknowledged that profits are larger for the commodities industries rather than the automotive industry, but see the latter as a more stable and long-term business that provides them with financial stability. Nevertheless, they plan to maintain market diversification and not depend solely on automotive sales; they have seen an important growth in their other business ventures and expect to enter new markets such as shoe machinery support and maintenance.

Firm F

Firm F is a family owned and operated company dedicated to the production of bolts, screws and special fasteners. They have been in the market for 45 years attending different industries, including electrical, appliances and automotive. The interview was conducted with the sales director, the production coordinator and the planning manager of the company. Interestingly, the planning manager is also the son of the founder of the company and the father of the production coordinator.

The firm is a supplier of J2 company. The interviewees mentioned that at the beginning of their business ventures, the relationship was complicated since it took time for firm F to understand J2's work philosophy. The firm received the on-time delivery and zero defects awards from J2 company for the years 2016, 2017 and 2018.

Before the PASDCM the firm had internal PPMs registered at 20 and after the project this was reduced to 1.92 and currently they report it at 0.2. JICA's project changed the company and through the training they have acquired higher flexibility allowing for the distribution of their products at a 300 km radius in the nearby states of Guanajuato, Puebla, Jalisco and Mexico State. They argued that they are 100% committed with the *Kaizen* learning and have transmitted this knowledge to other companies from the same business group. They mentioned that after the project, they increased their commitment with quality and now have both ISO 9001:2015 and IATF16949 certifications and are compliant with Japanese, U.S. and international quality standards. They said to be very proud of participating in JICA's project.

According to the sales director, the knowledge acquired from the training project was horizontally transmitted to their other product lines. They pointed out that he *Kaizen* philosophy seems engraved in the firm and has been internalized and disseminated to all the workers across the company. They also have worked with the adoption of the 5s methodology and expect to further develop this knowledge in the near future, improving the time needed for tool changes. They are working on an internal personnel training program to better transmit the knowledge to new workers. The firm sends its managers to visit their client companies and better understand their requirements and receive feedback that may further improve their quality, productivity and time-delivery.

Firm F is facing some challenges. They have seen the arrival of a German competitor that has patents for specific special fasteners that are used by their Japanese clients. Since firm F is not an owner and may not lease the patents, they have to rely on “threads” or proxies that may be functional and adequate to their client’s specifications. They also mention that most of the business negotiations with prospective Japanese firms is done from Japan, limiting their possibilities to find new customers. However, they point out that after 2017 the supplier localization policies of Japanese firms have changed with the inclusion of local Mexican suppliers in the production chain with possibilities of long-term business relations.

To face their challenges, firm F has tried to expand their client base through referrals. They rely on their quality of their products and have a firm policy of 3% annual cost reduction for the next three years. They quote their inputs and their products in U.S. dollars to avoid exchange rate fluctuations. The firm has also invested heavily in new machinery (new die rolling machines, product certifiers, electrical sorters, four-stage machine) and their product development department. Firm F acquired the adjacent land (almost twice the size of their current layout) and are planning to expand the company. They are seeking market diversification, alliances with foreign firms and are also searching for technological transfer from local cluster associations. The firm attempts to stay current by visiting suppliers’ auto-shows and learning about new products, technology and machinery.

Currently, Firm F has seen a drop of production between 2016 and 2017, but it was indicated that this decrease is due to a change in production focused on projects that result in higher profits. They are producing at 35% of their installed capacity with 40% of total production in the automotive industry, 20% in electrical, 19% in appliances and the rest of production is shared among several other industries.

Overall, it was mentioned that the Mexican automotive industry presents business opportunities in die casting and stamping. Different than previous visited firms, this firm argued that personnel rotation is not a major issue since the majority of workers live in a community near the company location and they have treated their labor force as part of the family; in some instances, they have seen a grandfather, father and son working for firm F.

Firm J1

Firm J1 is a Japanese Tier-1 company that established in Mexico in the late 1990s. It is currently a supplier for three OEMs in Mexico. It employs over 1,600 workers and the company expanded by opening a second plant to cover increasing demand in the sector. The interview was conducted with the company president, the plant director, several managers in charge of engineering, quality, purchasing and sub-directors of human resources and purchasing.

From the interview, it was noted that Firm J1 also faces the problem of employee rotation; however, the human resource manager mentioned that monthly employee rotation for the company is registered between 1.4% and 2.5%, while the region experiences an average monthly rotation rate of 9%. The company explains their relative low rotation rate by their long tradition in the state, a strategic location and special care with their employees.

The company recently inaugurated a labor training center to transmit the *Kaizen* philosophy to their workers. It was argued that workers recently hired use the tools that they know but not the ones they need, and that without a full understanding of their work they will not be able to implement the *Kaizen* knowledge. The problem that arises is that fully trained operators are sometimes offered higher wages from U.S. companies and leave the firm. They have found better results in employing a higher proportion of women in the production line, because of their motor skill abilities and their loyalty to the company.

During the interview there was emphasis in the high Tier-2 local content of 82% in J1's products. However, there is no clear distinction between endogenous or foreign Tier-2 suppliers in this calculation. The company ranks all of its suppliers on an A to Z scale where quality is evaluated throughout the process with regular visits to plants, audits, quality supplier development programs, defective parts measurement and KPIs. Other important supplier criteria are the QCDDM (Quality, Costs, Delivery, Development and Management) indicators that are also considered for the supplier rank. Overall the perception of firm J1 is that there is still room for large improvement for local suppliers. The company sets a target of 10 external PPMs for all of its plastic injection suppliers of interior and exterior parts. One executive mentioned that sometimes companies with over 100 PPMs are used but they require them to be lowered. Each supplier receives a scorecard every month and this information is used for future orders. There are also targets set for cost reduction to each supplier, continuous production-line-walks and benchmarking between suppliers to set individual targets from J1 firm.

Firm J1 has employed Tier-2 firms B, C, D, and E. According to JICA officials the Japanese company J1 was a deciding factor for these firms to participate in JICA's project. As mentioned earlier, firm J1 ranks its suppliers on an A to Z scale, and as reported by the president of the company, the supplier firms that participated in the training program experienced the following change in their internal rank:

Table 1. Supplier Rank from firm J1.

	Mexican Supplier Firm							
	B		C		D		E	
Japanese Firm	Before	After	Before	After	Before	After	Before	After
1	C	D	C	B	D	D	F	C

Source: Author's elaboration from firm interviews.

The president also gave some specific feedback on several firms. Firm A has grown from a small to a medium size firm taking advantage of government financing, they have been open to adopt new technology and have seen a turnover growth of over 40% between 2015 and 2016. Firm B is regarded as a small supplier that is used for smaller orders of firm J1. The firm is developing with the assistance of firm J1 and has seen a growth of 15% in orders since beginning their business ventures. It was mentioned that the firm has overall good QCD levels and that with extra training it can further improve. Firm C is considered a reliable and good supplier that exhibits reasonable costs; it has seen its business increase due to improvements in its competitiveness. Despite this, business with this firm has stagnated due to the firm's production capacity; there is expectation for growth in orders.

For the case of firm D, it was argued that this firm is reluctant to technological change, it is working with old machines and the firm is not competitive due to high fixed costs. This same issue was experienced for the case of another local firm as stated by the purchasing director; these suppliers are no longer used by firm J1.

According to the president of the firm, in 2012 they employed from 15 to 20 suppliers; however, this has been reduced to only 12. The firm has kept those firms willing to grow, most of them Mexican companies. Firm J1 says that it is committed to develop their suppliers by providing technical guidance and support in several areas, for example:

- They work with their suppliers to help them investigate the root cause of quality issues.
- The company organizes a supplier annual meeting to bring to light the suppliers' previous results in QCDDM and start planning upcoming projects.

- Firm J1 routinely implements *Monozukuri* and production-line-walks to help suppliers keep on track; this is emphasized with suppliers that require special attention.

The firm mentioned that firms participating in PASCDM improved their understanding of *Kaizen* and 5's philosophy. However, it was noted that despite the need for specific type of suppliers to develop 5's, there is a requirement for them to be trained in *Monozukuri* and more advanced tools than 5's. This firm considers that 5's is basic and somewhat antiquated to the industry's present needs. The firm expects to change its local procurement strategy to increase the supplier base and sees local firms with technological, financial and cost competitive traits as future partners. Overall, firm J1 seems committed with local supplier development, and the firm mentioned that there is an interest in suppliers to transition to "partners" of the firm, with opportunities in the fabrics and clothes industries as well as internal paint and chrome plating industries.

Firm J1 mentioned that it expects to continue working alongside JICA in upcoming projects and there is particular interest in participating in the "Project for Automotive Cluster Promotion in Mexico" and the "Project for Human Resource Development for the Automotive Industry in El Bajio of Mexico". The Cluster Project will take place from 2018 to 2023 in the states of Aguascalientes, Guanajuato, Queretaro and San Luis Potosi with the participation of Mexican companies and the training of consultants in automotive related industries. The Human Resources Project is promoted alongside with the National College of Professional Technical Education (CONALEP in Spanish) in the states of Aguascalientes, Guanajuato and Queretaro from 2015 to 2020; it attempts to deal with the labor shortage problem while training workers with the skills and abilities demanded by the industry.

Firm J2

Firm J2 is a Tier-1 Japanese supplier firm that established its operations in Mexico back in 2008. The firm employs 22 domestic suppliers from the Tier-2 and Tier-3 level of procurement. The firm registers 75% of local content and plans to establish strategies to increase the figure to 90%. The interview was conducted with an employee in charge of purchasing and translations.

According to Firm J2, the PASCDM has improved their dealings with Mexican companies that participated in the project. They have business relations with firms E & F. Firm F is considered a "major" supplier and firm E a "regular" supplier. In terms of quality, costs, delivery and overall ranking, both firms are considered "A" or highest level suppliers. The main advantage for the Mexican suppliers is the geographical distance, where closeness plays an important role in the usage of both companies.

There is a long relation with firm E and they are currently the suppliers of 50% of the parts and components produced by this firm. The other 50% is supplied by a Japanese supplier that has been gaining ground on firm E according to the interviewee due to "nationality". It seems that there is a preference for the Japanese supplier over firm E, due to factors not necessarily related with the competitiveness of both firms. The interviewee signaled that firm E has invested in improvements in their installations but this has not been reflected in quality advancements, their external PPMs is close to zero but the goal is to be at zero.

For the case of firm F, this is the only plastic injection supplier of firm J2 and the business relation extends to three years; however there has been a decline in the volume of orders from this company. In part, firm J2 mentioned that this was due to the fact that firm F failed to deliver an important order arguing that it was during the holiday season. This reduced the confidence on firm F. Also, there is a tendency from firm J2 to move to in-house production of all of the plastic injection parts, attempting to eliminate outside suppliers.

The firm mentioned that it maintains a close relationship with all of its suppliers. Audits and cost reduction requirements are set yearly. They set a 2% cost reduction goal on all of their projects for an average life-span of five years. It was mentioned that for firm J2 their clients demand yearly cost reduction schemes that range from 2% to 7%. Supplier firms that struggle to meet demands face monthly audits and evaluations in terms of quality and costs with strict requests of solutions to avoid recidivism.

New suppliers are analyzed following strict selection criteria; when a company reaches the minimum requirements, there is a physical visit to the plant to confirm prerequisites are met. Statistics are gathered and analyzed showing installed capacity, inventory days available, quality control and distance. Firms must also be certified in IATF. Afterwards quotations and samples are sent to Japan, if they are approved there is a transition to the negotiation phase.

Firm J2 mentioned that it faces several challenges. Although there was a steady sales growth between 2012 and 2017, during the first months of 2018 there was a significant drop of 10% that is attributed to the "Trump Effect" where several of their OEMs clients are reducing production expecting a drop of demand from the U.S. and Canada and a slowdown of the internal market. According the interviewee, several OEMs have suspended production lines or moved them to other countries in South America. Another problem is related with employee rotation that is affecting the region. It was mentioned that there seems to be a lack of commitment and loyalty from local workers that are on the lookout for higher wages; on average 20 new employees are hired daily and after a few weeks, only two or three remain.

The firm is interested in continuing work with JICA, especially in the joint work of human resource development. It is suggested that there are cultural differences between Mexico and Japan and this gap has to be a reduced by teaching trainees of the Japanese business and work philosophy. This is regarded as a fundamental base to be able to establish *Monozukuri* techniques, reduce rotation problems and improve worker loyalty.

Firm J3

Firm J3 is a Tier-1 company that established in Mexico in 1998, and it recently opened a second plant in the Bajio region. The interview was conducted with the general director and the engineering and sales director.

Regarding the PASCDM, the firm mentioned that the project helped them trust local suppliers and increase their local content as required by their OEM client. Firm J3 mentioned that their Japanese customers are currently demanding higher local content of parts and components. Before, the firm worked with a U.S. based OEM that did not have these requirements. In this sense the JICA project was of great help for them, since local suppliers are increasingly important, they were able increase from 50% to almost 70% of local content in their products after the PASCDM.

The company currently works with a nucleus of 4 local Tier-2 companies, where one is a Mexican owned firm. This Mexican firm did not participate in the PASCDM but seems to be open to learn through training. Firm J3 worked on a one-year project in developing this supplier by teaching about mold maintenance and improvements in the production floor that had significant changes at all levels. They currently hold four planned visits to the plant to plan new activities for improvements. These programs are only for the Mexican company since the other three are mature firms that do not require this support. The firm was regarded before as a level C-D supplier and moved up to a B-level supplier with major improvements in quality and delivery but with still room for advancement in costs. The firm understood that it had to evolve to survive; they adopted *Kaizen* philosophy and became a “thinking” entity.

The company is facing several challenges. Firm J3 is currently searching for additional local suppliers to increase local content but believe that Mexican firms still need help in developing the required levels to fit their needs. The company takes into consideration for prospective suppliers’ aspects such as production facilities, equipment, PPMs under 100, production capacity, company policies and the overall functioning of the production system to avoid stoppage times. It is also experiencing the human capital shortage problem, especially in the area of highly qualified workers with knowledge of the Japanese culture and language. The company director mentioned that OEMs are breaking the harmony in the labor market in the region by offering high monthly wages of $50,000 pesos (about $2,500 U.S. dollars). There are plans to develop a human resource platform to attract Japanese workers with the before mentioned abilities. A JICA representative mentioned that through their volunteer program they have identified over 300 Japanese workers that might be matched with Japanese Tier-1 companies in Mexico with specific needs and proposed to help this company in funneling prospective candidates to them.

There was also a mention about the Mexican education system, where the professors and researchers seem to have no real knowledge of the demands from the industry, specifically how the production floors work and operate. According to the company director, Mexican workers and companies need to understand the principle of "*Genba shugi*" which portraits the idea that no work is beneath anyone and that all workers of the company must work sometime in the production line to fully understand the production process through direct experience, this in turn will help build camaraderie and burst new ideas for improvements.

Conclusions

Knowledge transfer is a process that depends on several factors, especially when there is a considerable knowledge gap between recipient and donor entities. This is noticeable for developing countries that have struggled to develop their supporting industries due to a lack of skilled labor and technological deficiencies. In this sense, training may serve as a direct line to transfer knowledge in developing countries. Training has the virtue of transmitting tacit and explicit knowledge and it has been argued that for the automotive industry, tacit knowledge transfer or learning-by-doing is crucial for organizational development.

Japanese automotive firms may have limited linkages with local firms due to their organizational characteristics that favors a global-local interlinked network with supplier usage from companies from the same business group. This may become more evident when there is a considerable knowledge gap, and when quality, costs and delivery times are unsatisfactory. This issue seems to be currently observable in Mexico, where there are still entry barriers for local firms to establish business relations with their Japanese counterparts. This study argues that training may help Mexican firms improve their endogenous capabilities in the short-run and if this knowledge spills-over to other firms it may impact the industry or institutional levels in the long-rung

In this study, interviews were carried out with six participating Tier-2 firms and three Tier-1 Japanese firms of the PASCDM. The case studies were carried out using semi-structured face-to-face interviews to analyze the impact of the training project and the mechanisms employed within the organization to internalize and diffuse the acquired knowledge.

The current analysis provides evidence that government agencies may ease the knowledge transfer process at the micro-level via training. From the individual case studies, the evidence shows that the PASCDM successfully transferred knowledge to local firms. Particularly, the project was able to transmit tacit and explicit knowledge relevant to quality, production and organization systems. The *Kaizen* “know-how” improved quality and productivity indicators.

Explicit knowledge for all cases was internalized, absorbed and diffused; however, only half of the firms internalized tacit knowledge due to high employee rotation. In general, firms observed intra-firm knowledge spillovers and one firm was able to transmit the *Kaizen* knowledge to a sister company. This has allowed firms to expand production to new customers, industries and countries. The better understanding of Japanese customers and the JICA training certification also increased confidence for potential customers in future business transactions.

However, despite the benefits local firms are facing several challenges. The main external threat is the increasing competition in the industry by the expanding presence of local and international firms. This has brought disruptions in the labor market increasing employee rotation and higher labor costs. Internally, although the training program allowed the firms to improve key quality, costs and delivery indicators, there is still the need for further training in more advanced techniques such as *Monozukuri* and the inclusion in markets including plastic mold maintenance services, fabrics, internal painting, chrome plating, die casting and stamping. Further development must include activities with higher value added related to design and innovation.

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