

## Chapter 7

### 7. Conclusions and Recommendations.

This research project achieved its purpose which was to develop a model of technology transfer applicable to Mexico, in order to eliminate the method of trial and error which many companies use to transfer new technologies without knowing the problems they are going to face in this country.

Throughout this research, the concept of technology transfer was extensively defined and the main steps in the TT process were described, from the theoretical and practical point of view. A general model was proposed, so the technology transferor could identify the most crucial factors involved in each phase of the TT process and take them in consideration for a successful assessment, implementation and diffusion of the technology transferred to a Mexican plant.

The model was illustrated in company “X”, which is a very good representative for the Mexican Automotive Industry. The case study gave a small insight of the reality in firms belonging to this branch. Technology transfer is a very complex process and in big companies it is a very difficult task to track it down, because there are many areas and people involved in the process. The analysis made was for a big multinational. If further research was done with SMEs, the analysis could give different results.

For the specific case of “X”, the knowledge which was positive for working with laser welding was the previous training and the experience the workers had with running automated installations for the preceding car model. The default skills needed to use laser welding installations are basic knowledge in computer programming, electric and pneumatic knowledge. Some positive attitudes in this TT project were the challenge to work with a new technology, the capability to work under pressure and in a team. The ability of analysis and to continuously improve their performance was seen as a great motivation. The people involved in the project had to learn to be more methodical and

controlling, which leads to a stronger prevention culture. The importance and the degree of influence of the geometry of the parts were realized while working with laser welding. It is important to mention that the personnel involved in the transfer project was very carefully selected according to the profile needed.

For a TT project to be successful there has to be an excellent cooperation between technology suppliers and technology buyers. This could be reached through good communication tools. Through access to real-time information misunderstanding can be prevented and the final outcome will be closer to what is expected. In the case of “X”, communication between the Mexican and German personnel was a big issue. The language barriers were and still are the most difficult to overcome and this leads to a communication deficiency.

The most important factor for successful TT is most definitive training and education. Through this, the consequences of the lack of experience in the usage of new technologies can be minimized. It is of vital importance that companies recognize that their workers are their most valuable assets. Most Mexican workers are not well trained. Many in small firms receive no formal training. Larger firms provide more formal training, but most of it is for professionals, technicians, managers and executives. Mexico should develop workforce skills at all levels. Training is not to be seen as an end itself, but as a mean to implement workplace change. With more training, workers find further learning easier and are better able to adapt to new technologies, processes and even organizational structures. It should be taken into consideration; too, that training is more effective when it is quickly reinforced by the job.

Cultural characteristics make it difficult to implement at 100% reliability all the global company standards. Mexican workers still haven't fully accepted that all the extra work they have to do during the TT process is nothing more than time-investment to later obtain better work conditions that will make their lives easier and their jobs much better. German suppliers feel superior to Mexicans in many ways, but during the project they learned to be open-, broad-minded, flexible and patient, given that things do not work the

same way in Mexico as in Germany. In general, it was more difficult for the foreign suppliers to adapt themselves to the new situations involved in the transfer than for the Mexicans.

As much as a company invests in new technologies, it has to invest both time and money into understanding how its workers feel, live and think, both inside and outside its facilities in order to find a better and more efficient way to implement their corporate culture and new technologies, harmonizing with the local ones as well.

TT requires clear goals and motivation as a precondition for success. Funding is critical. At minimum, adequate funding is necessary for organizing and managing projects, providing expert consultants and communication.

“X” did not take in consideration the social and cultural factors proposed in the TT model. If they had, a lot of time could have been saved, and time in any kind of industry equals money. With the ideal preparation for the technology transfer process, many barriers encountered could have been eliminated and misunderstandings and wasted time could have been avoided. In general, the cost of the project raised 30%. This percentage includes all the technical problems they had and failure to rapidly overcome language and cultural barriers.

During this research it was noticed that the people in contact with the new technology are not clearly aware of the core technology components and the region-specific components of the technology. Luckily, the technology transferee was, and they developed the technology transferred to easily blend into the place where it is supposed to in terms of ease of operation, inspection, maintenance and to fit the physical characteristics of those who were going to operate it. Failure to seek participation from users or local people in technological adaptations can lead to sub-optimal utilization or even complete failure in the use of the technology.

TT can work remarkably well. The global economy has emerged with advanced communication and information access, experts trained internationally and strong incentives for cooperation. Globalization is pushing everyone to be more competitive, to be everywhere in the markets, to be the best at what they do and to beat everyone else. But there still is a great need to recognize the value of regional characteristics. That can not be forgotten because otherwise, no globalization attempt will ever work.

Finally, it is important to evaluate technology transfer projects on an ongoing basis to determine their success and to incorporate lessons learned in future activities. Measuring the results of technology transfer activities should be an important component of TT projects. WE learn from both successes and failures encountered during the course of a project. Some people say a transfer is successful only when it becomes a profitable process. Others claim a transfer is successful when the technology is at least reviewed for possible use by another person or organization. TT is successful when the technology is fully used for what it is intended for and everyone around it understands its principles and functions. TT does not happen from dusk till dawn, so everyone involved in the process should prepare themselves for a rather lengthy process.

Table 7.1 General failures and successes on the “X” research case

<i>Success</i>	<i>Failure</i>
Equipment successfully installed in the plant and functioning.	Communication deficiency between technology suppliers and technology buyers.
Good quality of product (able to compete globally).	Cultural characteristics make it difficult to implement at 100% reliability all the global company standards.
People involved with new technology were trained.	Not able to overcome social and cultural barriers.
Positive attitudes: challenge to work with new technology, the capability to work under pressure and in a team.	
Induced a stronger prevention culture.	