


## Chapter 40

# Role of Human Resources, Production Process, and Flexibility on Commercial Benefits From AMT Investments

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## ABSTRACT

*Advanced manufacturing technologies (AMT) acquisition by maquiladoras (foreign-owned manufacturing companies) is a tendency that allows these companies to maximize their commercial benefits. However, it remains unclear how the AMT implementation impacts on their performance. In addition, this research studies 383 responses to a questionnaire about the AMT implementation in the Mexican maquiladora industry and reports an analysis with four latent variables associating obtained benefits after the AMT implementation—human resources, flexibility, production process, and commercial benefits—where their relationships are evaluated through six hypotheses using a structural equation model (SEM). Finally, the outcomes demonstrated that AMT benefits for human resources have a direct effect on flexibility, production process, and commercial benefits. However, the direct effect from human resources benefits, knowledge, and experience on commercial benefits are acquired through indirect effects, using flexibility and production process as mediator variables.*

DOI: 10.4018/978-1-6684-3873-2.ch040

## **INTRODUCTION**

In 1965, the Mexican government launched the Border Industrialization Program (BIP), where a specific kind of manufacturing companies were born: maquiladoras. In addition, Mexican maquiladoras are usually foreign-owned companies that are established in the northern border of the country (García-Alcaraz, Maldonado, Iniesta, Robles, & Hernández, 2014); they import high levels of raw material and equipment on a tariff-free basis, as well as export the assembled or processed goods overseas (Hadjimarcou, Brouthers, McNicol, & Michie, 2013).

Moreover, in its beginning, the BIP were focused on solving the problem of increasing unemployment along the Mexico-US border. However, with the North American Free Trade Agreement (NAFTA), this maquiladora program became attractive for both American and Canadian companies (Cherniwchan, 2017). Additionally, the NAFTA guaranteed the importation of raw materials on a tariff-free basis, as well as their exportation at preferential tariffs among these countries, as a result, American and Canadian companies could benefit themselves from assembling their products in Mexico with a low labor cost and a qualified work force.

In a specific and regional context, Ciudad Juárez - El Paso is the largest binational metropolitan area in the Mexico-US border, in fact, it is the seventh manufacturing center of North America (AMAC, 2013). In addition, with 326 maquiladoras in Ciudad Juarez (Mexico), the city owns 67.23% of the state's total and 6.42% of the country's total manufacturing industry (AMAC, 2013), since there are 5,074, where the manufacturing sector in Ciudad Juarez offers 222,040 direct jobs, representing 62.24% of the state's total and 9.90% of the country's total (AMAC, 2013). Also, most maquiladoras in Ciudad Juárez are automotive manufacturers (29%) and electric/electronics (25%) factories (AMAC, 2013).

Furthermore, the importance of studying the manufacturing industry in Ciudad Juárez can be justified by three facts. First, many studies about the growth of the Mexican maquiladora industry predict that by 2020 Mexico would provide 7.8% of the global gross domestic product (GDP) (García-Alcaraz et al., 2014). Second, this city yearly imports \$22.6 USD billions in raw materials and exports \$43 USD billions in assembled products. Third, maquiladoras are subsidiary factories owned by parent companies overseas, where there is a complex process of raw material importation and finished products exportation.

Those maquiladoras are equipped with adequate technological capacity at first, but eventually they will be provided with more machinery, equipment, and updated production methodologies, such as commonly known as advanced manufacturing technologies (AMT), which can be divided into different categories according to their applications as well as five categories by Small and Chen (1997):

- Design and engineering
- Processing, fabrication, and assembling
- Automated material handling
- Automated inspection and test equipment
- Information

As a matter of fact, maquiladoras and partners invest in AMT because they may obtain certain benefits along with the production system. Similarly, AMT may have a far-reaching impact on *Human resources*, commercial and marketing aspects, materials handling, *Flexibility*, as well as on the *Production process*; however, Jack and Laura (1994) indicate that the main benefit from AMT is the competitive advantage.

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