

# Chapter 46

## Implementation of Rapid Manufacturing Systems in the Jewellery Industry in Brazil: Some Experiences in Small and Medium-Sized Companies

**Juan Carlos Campos Rúbio**

*Universidade Federal de Minas Gerais, Brasil*

**Eduardo Romeiro Filho**

*Universidade Federal de Minas Gerais, Brasil*

### ABSTRACT

*This chapter presents the rapid prototyping and manufacturing concepts applied as means to reducing time between jewellery designs and manufacturing process. Different processes on jewellery modelling production are presented. Nowadays, the use of technologies as CAD/CAM - Computer Aided Design and Manufacturing in high production companies are very disseminated. However, the implementation of these resources at the design and manufacturing processes of jewels and fashion accessories, in small and medium size businesses, is still insipient. As reference, is presented the situation observed in small and medium companies located in Minas Gerais, Brazil.*

### INTRODUCTION

This chapter presents an analysis of the use of CAD/CAM systems (Computer Aided Design and Computer Aided Manufacturing) aiming to improve the connection between design and production in small and medium size jewellery

companies located in the state of Minas Gerais, Brazil. In addition to that, the changes caused by this technology in the professional relationships are also discussed. The principal point is related to the influence of the use of CAD/CAM system on the designers' skill (competence) and design methods in an interactive design process and a Rapid Manufacturing (RM) system implementation.

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In a global and highly competitive market, it is critical for the companies to develop distinctive products, joining aesthetic features with the effective control of the production processes, in order to ensure improved results. Within this scenario, the designer's activities are becoming more important for the jewellery industry; nevertheless, the design process is frequently regarded as an artistic activity dissociated to the industrial process. Improvements in jewel manufacturing process are extremely important, because the jewels and fashion accessories presents a high aggregate value. It is most important when raw material is abounding too. Brazil is a precious metal and stones products country, namely gold, silver, diamonds, emeralds, etc. Thus, better products imply in leadership of the market and consolidate designer's names in global market.

The intensive use of rapid manufacturing and CAD/CAM systems brings new opportunities to the integration between design and manufacturing process. Through a better assessment of the products during the preliminary phases of the project it is possible to predict mistakes that could result in additional labor, as well as increased production time and cost. In spite of technological advances and the use of machines at several stages of the industrial production of jewels (conception and execution of the first model), the process still maintains essential handcraft features. The intrinsic limitation of the manufacturing processes used in this phase for designer and goldsmith, results in mistakes which are transferred to the next phases, impairing process control and manufacturing phase. This is an important aspect to be considered in the product development, especially in small and medium size companies, which are typical of the jewellery industry in Brazil.

Changes in the communication methods and technical tools, such as CAD/CAM systems, must be carried out simultaneously with changes in the designers work method, aiming to adjust their projects to the needs of other production sections (including the goldsmith), with the purpose of

obtained a finished product with the required quality. The RM concept can be used when the development of moulds or tools for moderate volume parts or products is required. Among the various RM processes, computer numerically controlled (CNC) machining is recognized as the technology most widely used in industry for the application of CAD/CAM systems. The production of jewels is based on the investment-casting process, in which the moulds and casting pattern can be produced in plastic or wax using an RM technology, thus reducing time and cost as well as ensuring the production of goods with high quality.

Different researches (as Rocha, 2007, Fernandes et al., 2005 and Han Boon et al., 1992) indicates that the use of Computer Integrated Manufacturing (CIM) systems can offer a substantial assistance to the solution of issues related to the interface between design and manufacture of jewels. However, some drawbacks associated mainly with the lack of qualified professionals (especially designers) were identified (Siu & Dilnot, 2001). The use of these technologies is only possible by employing three-dimensional CAD systems and trained professionals able to handle this task are currently not available in the jewellery industry. Moreover, the application of these tools alone is not enough to ensure the satisfactory integration of all phases of the project.

In jewels international market the Brazilian designer and manufacturer are traditionally competitive at producing small stones fashion jewellery and their skills in gem setting. These products attend the needs of its customers in terms of originality, creativity and fashion. However, the Brazilian Jewelers needing to search for ways to increase the efficiency and improves the productivity. Thus, this Chapter is concentrated on study of the rapid manufacturing innovative technique and their use in jewellery production for Brazilian small-size companies.

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