Chapter 22
The “Madame Butterfly” Robot: A Case Study in Product Design and Development

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ABSTRACT

“Madame Butterfly” is an industrial robot produced by Euroimpianti Spa. It is the result of the unusual cooperation between a cutting-edge robot factory and Fontanatelier, an unconventional architecture studio. Although it had all started as a common machinery project, and it was almost at the end of its development phase, the need for an iconic design led the designer to involve the architect Luisa Fontana in the project. The contrasting opinions between the engineers and the architect forced everybody to change points of view, in such a complicated and challenging field as robot production. The final design conveys a strong image of the product, very uncommon for the automation industry, maintaining the functionality of a standard robot, with improvements for some specific usage.

INTRODUCTION

Nicknamed “Madame Butterfly”, the robot “Skilled 604” was first presented to the public in April 2008 at the Düsseldorf INTERPACK, the world’s most important fair for the processing, packaging and line automation industries.

It was produced by Euroimpianti Spa of Schio (Vicenza), which has been a leading company in this sector for 35 years. Combining high quality design and performance, the articulated robot arm is used for stacking pallets.

It has four interpolated axes and has a work radius of 360°. Weighing 2.140 K, it can move up to 750 Kg. The result is a robot which houses cables, working mechanisms and a core structure in a flowing shape, inspired by the wings of a butterfly.

This innovative design seems to be taken out of a science-fiction comic strip: its shape, however, underlines the strength and flexibility of the aluminum structure shaped around the operating system of the machine. “Madame Butterfly” is
The “Madame Butterfly” Robot

unique in modern day robot construction. A true synthesis of function and beauty, it is certainly destined to influence the future development of robot design and production.» (Luca M.F. Fabris, 2008, p. 16)

BACKGROUND

Machines are simulations of the organs of human body. The lever, as an example, is an extension of the arm. The lever has an amplified ability of raising weights, while all the other features belonging to an arm are neglected. (Vilém Flusser, 2003, p. 43)

The palletizer Skilled 604 can be considered as an extension of the human arm, that allows the stacking of product layers on a pallet for logistics or transportation, for the purpose of boosting human abilities. It is the ultimate evolution of the humble lever mechanism and has many other functions to help the worker. The top performances and the great design of the robot increase both productivity and labour standards in workplaces.

Machinery Design

Since the first assembly line developed by Ford Motor Company in 1913, machinery design has focused on the efficiency of tools to optimize the production process. Mechanical engineers focused on the increase of manufacturing speed and reduction of costs to boost productivity on the assembly line. This is the main reason why it is difficult to find examples of user-centered design applied to machinery. During the development of robotics for industrial productions, the machines were coupled to the human worker’s body in order to copy the repetitive movements. For example during the car painting process, the automatic painter arm could learn and memorize the movements of the worker that it was going to be replace. However this “anthropomorphic approach” was never used for the proper machine design.

For this reason we must go back to previous historical examples to discuss the background of anthropomorphic machines.

Automata

Early examples of anthropomorphic machines can be found in the history of architecture and technology. Since the Classical Greek period and in the Arab culture, automata were mechanical devices based on hydraulics or pneumatics, used for ritual purposes, such as measuring time through a regulated flow of liquids, or for entertainment. In the Western culture since the Middle Ages until the French Revolution, anthropomorphic machines played an important role in the experimentation of technological innovations, such as the spring mechanism (Losano, 1990).

Despite the Catholic Church’s opposition, the production of anthropomorphic robots became a testing ground for many scientists who were later involved in industrial production. Jacques de Vaucanson, the author of the *Anatomies mouvantes* mentioned in the *Encyclopédie* by Diderot...
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