

# DiFac: Digital Factory for Human Oriented Production System

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## Abstract

*This brief document aims at describing the DiFac project approach and framework. Digital Factory is a future vision for the manufacturing sector. Nevertheless the giants have new technologies available easily, the technology could be really expensive for SMEs. DiFac targets a new flexible approach to the Virtual/Augmented Reality use in industrial environments for training, product design and production development.*

**Keywords:** Digital Factory, Virtual/Augmented Reality

## 1 Introduction

DiFac is a research project funded by the European Commission within the 5<sup>th</sup> call of the 6<sup>th</sup> Framework Programme. It aims at the development of an innovative collaborative manufacturing environment (CME) for the next generation of Digital Factory in order to support SMEs competitiveness.

A digital factory is a persistent community where a rich virtualized environment, representing a variety of factory activities, will facilitate the sharing of factory resources, manufacturing information and knowledge and help with the simulation of collaborative design, planning, production and management among different participants and departments.

## 2 Foreseen results

The DiFac CME will be used as a framework to support group work in an immersive and interactive way, for concurrent **product design, prototyping and manufacturing**, as well as **worker training**. It will provide support for data analysis, visualization, advanced interaction and presence within the virtual environment, ergonomics analysis, and collaborative decision-making.

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A list of foreseen results of DiFac research project is described below:

### **2.1 Group Presence Modeller**

In a factory different groups of workers have to interact in a sort of collaborative environment for creating the product. The workers are not aware of different duties of various stages in production process. The Group Presence Modeller will model various capabilities, qualifications and allocations for different tasks. The visualization of such an environment will deal with the software aspect related to the visualization, perception and interaction

### **2.2 Immersive Integrator**

An integrated solution for an effective collaboration area among all the work groups is foreseen to realise a hardware integration layer, a VR interaction metaphors toolset for the developers of the DiFac application components and an integrated environment with the Group Presence Modeller.

### **2.3 Collaboration Manager**

Group decision-making and collaborative knowledge management will be designed taking individual intentions, attitudes and behaviours into account. Personal intentions are to be captured, analysed and directed according to the collaboration pattern and action plans for a common, joint manufacturing task.

Knowledge is, however, an essential benefit for manufacturing collaboration. It will be also collected, standardized and managed for an effective evaluation, control, coordination and implementation of the group work within a virtualised manufacturing environment.

### **2.4 Prototype Designer**

The Prototype design phase is mainly a group action: the 3D product model or process session can be shared, modified, refined, and used by any authorized factory agent who needs it and works on it. The DiFac tool will provide the functionality for a web-based collaborative product and process design evaluation.

The requirements of the customers can be easily and quickly understood in real time under an immersive collaborative working environment by diverse dispersed work groups who represent various lifecycle stages of a product.

### **2.5 Factory Constructor**

DiFac will provide the simulation of a complete virtual plant that will have the capability to completely emulate the real factory operations.

The Factory Constructor will consist of two components:

1. A Factory Planning Environment will be designed and realized that will support the design of factory layout, material flow/logistics, workplace, and human workers behaviour, in manufacturing engineering activities.
  2. The Factory Immersive Environment will be a distributed VR user interfaces for tasks of manufacturing engineering.
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## 2.6 Training Simulator

Training can be one of the most expensive and, in the same time, essential action for a company. In order to train new workers and to retrain experienced workers who will work in a new or reconfigured group or with new facilities, the Training Simulator component will be linked to the real plant for on-line training, or used in a simulation mode, using human behaviour simulation components for remote training.

The training tool will provide also training on the use of previous developed components as the factory constructor components (for special classes of users at expert level), such as factory management, or human workers team management and so on.

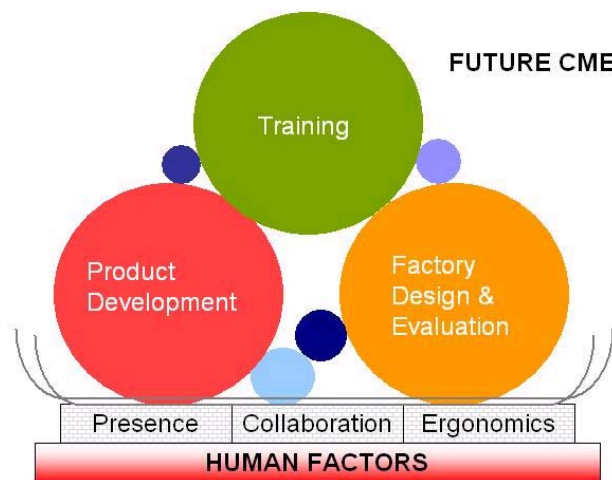


Figure 1. DiFac Framework.

## 3 Industrial benefits

Numerous benefits are foreseen for industrial sector obtained by the application of the Digital Factory paradigm. Here is a list of the most evident and important ones.

The use of these new technologies will definitely reinforce competitiveness of the European industry and help in solving societal problems since the “Digital Factory” will provide the following benefits:

- **Increased Efficiency.** Team members will be able to collaborate anytime, making faster decisions and gaining approvals instantly.
- **Reduction in Complexity.** The employees will be able to seamlessly work together, and extend communication and collaboration beyond their organizational boundaries.
- **Reduction of Physical Mock-ups.** The DiFac environment will allow testing ideas on digital (virtual) configurations, employing advanced paradigms of immersive interaction and collaborative work without having to rely on large numbers of physical mock-ups or experiments. This will also result in a significant reduction on materials and processes necessary for the physical prototypes production, thus reducing their impact on the environment.

- **Enhanced Organizational Intelligence.** The information will be collected and organized in a single place. New members will be able to start working with the other members in shorter time, improving productivity.
- **Stronger Relationships.** The project will be an opportunity to improve cooperation and to develop strong relationships between SMEs, research centres universities, software vendors, the business community and the general public.
- **Highly Skilled Employment.** The novel methods and tools to be used in the DiFac environment will require highly qualified jobs that will support the intelligent design procedures, the high-end simulation technology and knowledge-based approaches to decision making, instead of semi-empirical methods and physical testing.
- **Better working conditions.** Employees will have the opportunity to work with advanced supporting tools that will make their lives easier and safer.

#### **4 References**

DiFac Consortium (2005): *Description of Work*.

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