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جامعة بغداد  
كلية الهندسة الخوارزمي

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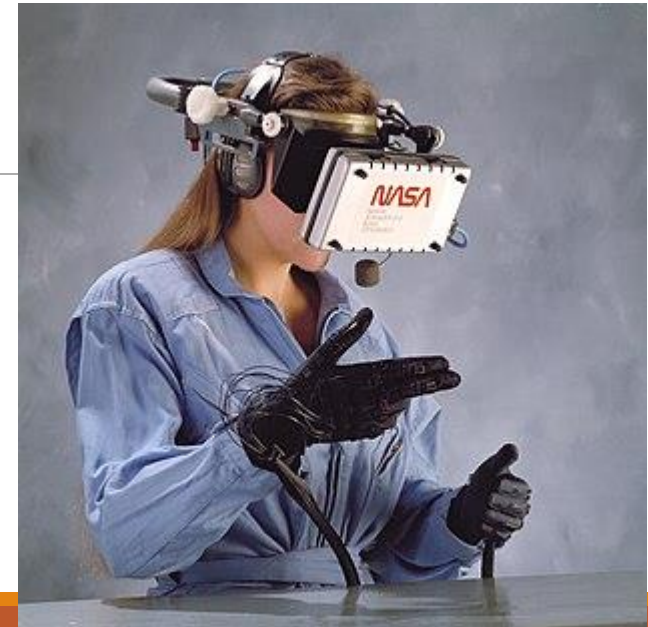
## Manufacturing Process in Virtual Environments

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# Manufacturing Process in Virtual Environments

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**Virtual Manufacturing (VM)** is a simulation-based method that supports engineers to define, simulate, and visualize the manufacturing process in a computer environment as shown the following figure (Fig.1). By using virtual manufacturing, the manufacturing process can be defined and verified early in the design process.

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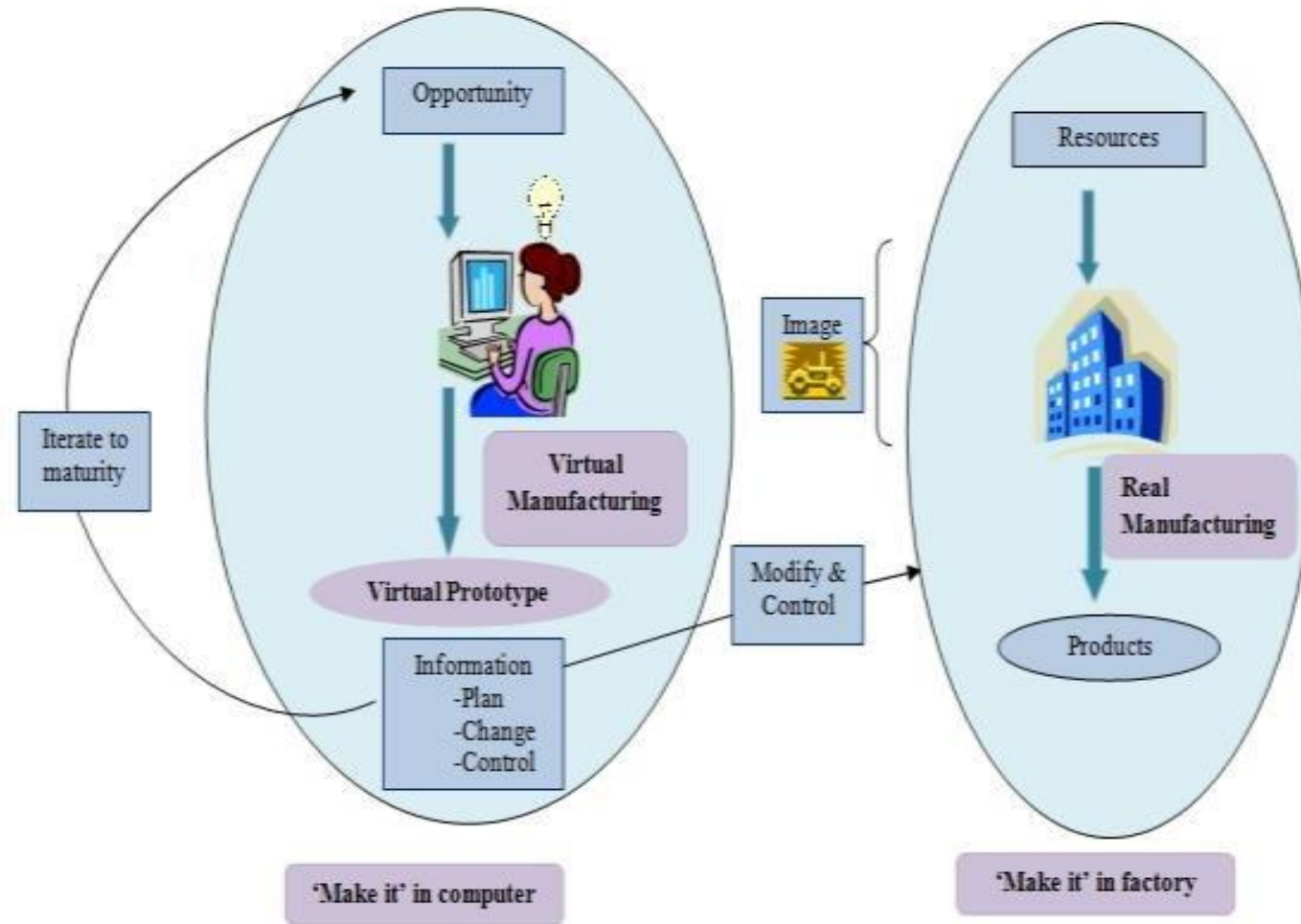


Fig.1\_ Virtual Reality with Manufacturing [1]

# VM has various applications, all of which are transforming the industry [2];

In design and prototyping, virtual reality enables users to explore multiple facets of a product before committing to any form of physical production (see Fig.2);

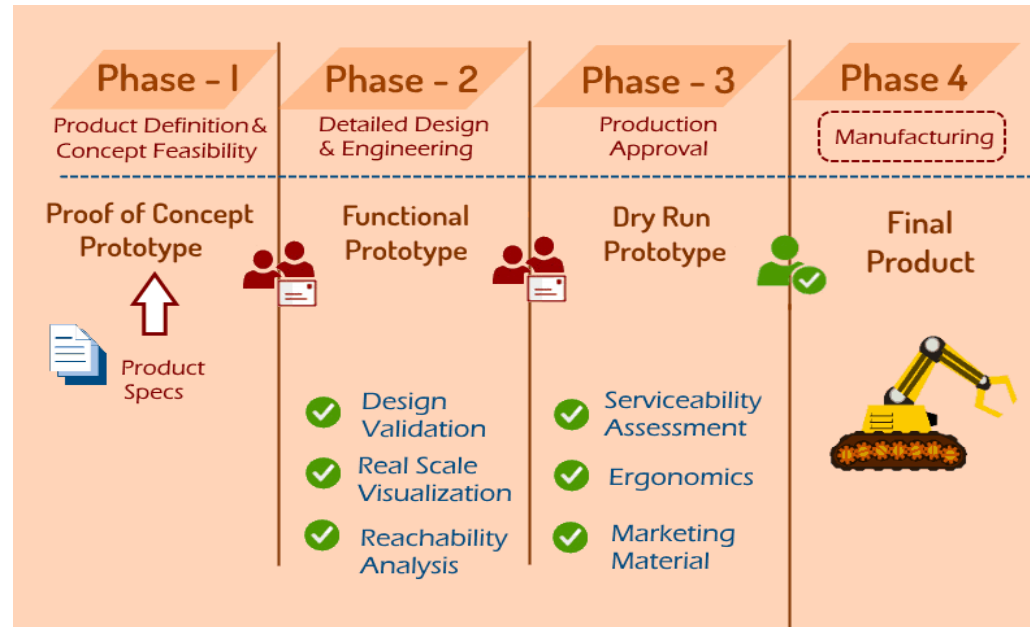


Fig.2\_ Virtual Reality in design & prototyping [3]

# VM has various applications, all of which are transforming the industry [2];

Virtual reality provides valuable, advanced information about ergonomic requirements for workers manufacturing specific parts and products (see Fig.3);

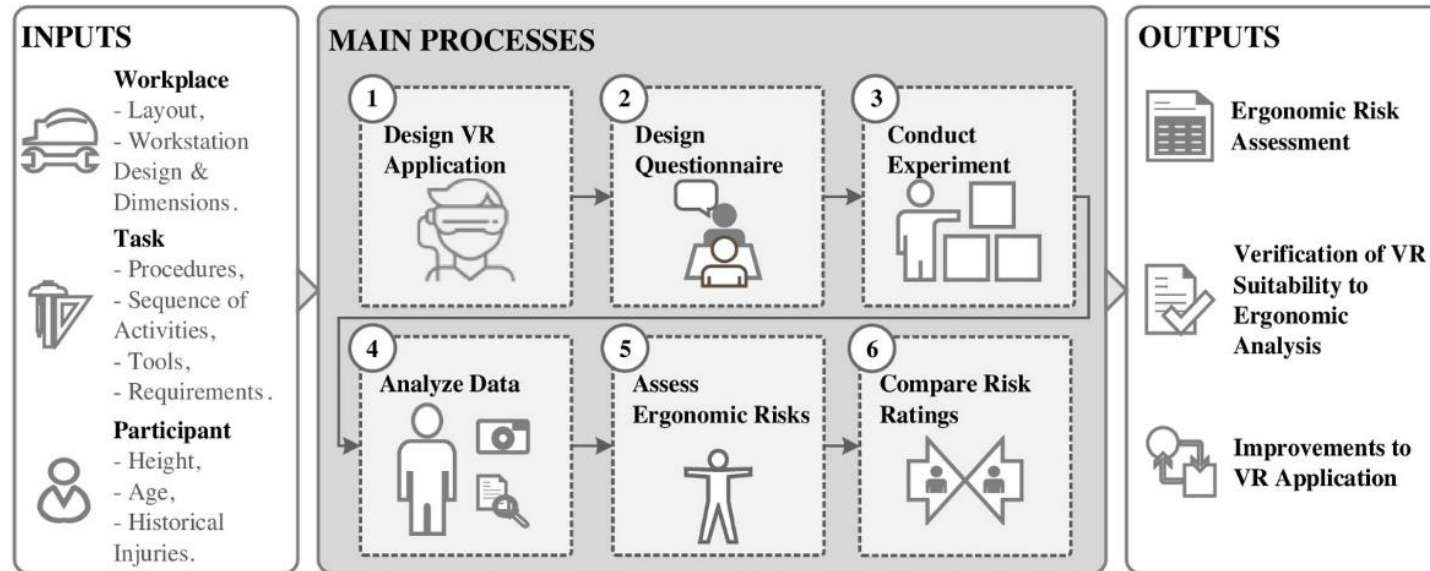


Fig.3\_ Virtual Reality in provides valuable, advanced information [4]

# VM has various applications, all of which are transforming the industry [2];

It is a sophisticated, real time training tool for production lines, simulating a broad range of environments and processes.(see Fig.4);

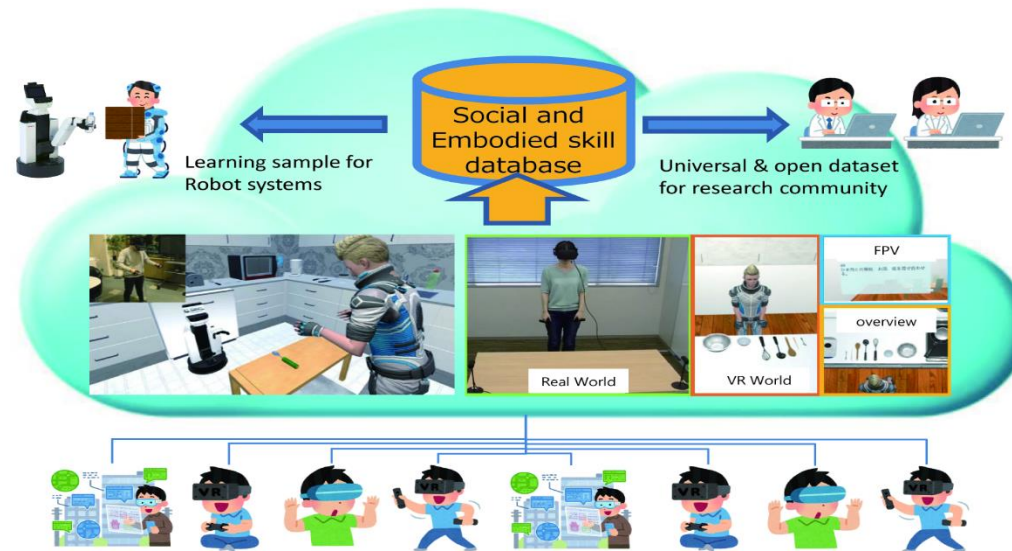


Fig.4\_ Virtual Reality for real time training tool [5]

**VM has various applications, all of which are transforming the industry [2];**

**Virtual reality has the power to accelerate the whole manufacturing process, enabling products to be launched much more rapidly (see Fig.5);**



**Fig.5\_ VR for power to accelerate the whole manufacturing process [6]**



# The virtual environment for prototyping should include [7];

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Functionality: the virtual prototype should be clearly defined and realistically simulated to address product functionality and dynamic behavior.



Human interaction: the human functions involved must be realistically simulated, or the human must be included in the simulation.



Environment: an offline computer simulation of the functions can be carried out, or a combination of computer offline and real time simulation can be carried out.

# Main types of virtual reality are [8];

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- a) Non-immersive; this type of VR typically refers to a 3D simulated environment that's accessed through a computer screen. The environment might also generate sound, depending on the program. The user has some control over the virtual environment using a keyboard, mouse or other device, but the environment does not directly interact with the user. A video game is a good example of non-immersive VR as shown in Fig.6, as is a website that enables a user to design a room's decor.



**Fig.6\_ Non-immersive of VR [9]**

- b) Semi-immersive. This type of VR offers a partial virtual experience that's accessed through a computer screen or some type of glasses or headset. It focuses primarily on the visual 3D aspect of virtual reality and does not incorporate physical movement in the way that full immersion does (see Fig.7). A common example of semi-immersive VR is the flight simulator, which is used by airlines and militaries to train their pilots .



**Fig.7\_ Semi-immersive of VR [10]**

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- c) Fully immersive. This type of VR delivers the greatest level of virtual reality, completely immersing the user in the simulated 3D world. It incorporates sight, sound and, in some cases, touch (see Fig.8). There have even been some experiments with the addition of smell. Users wear special equipment such as helmets, goggles or gloves and are able to fully interact with the environment.

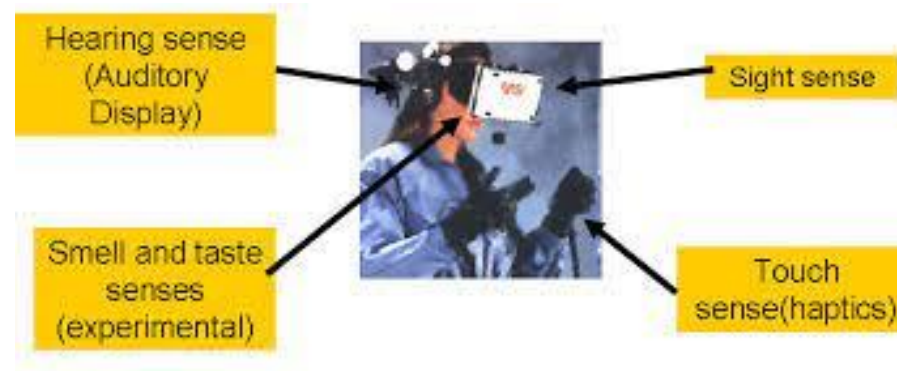
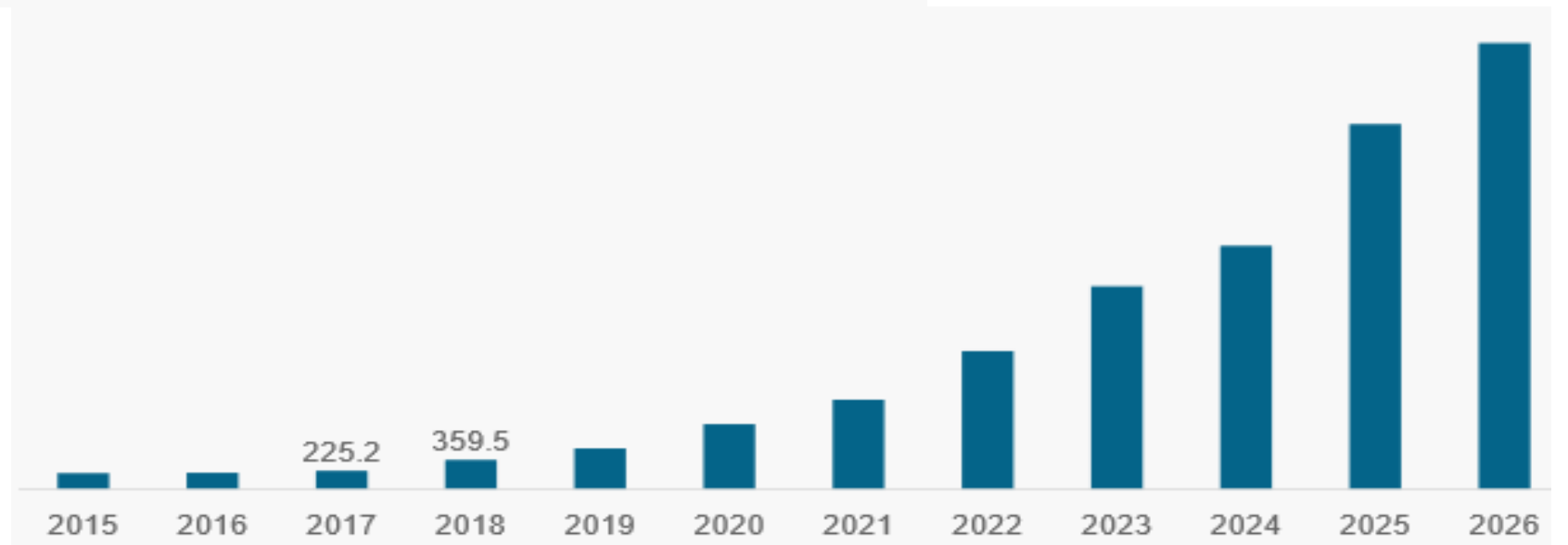
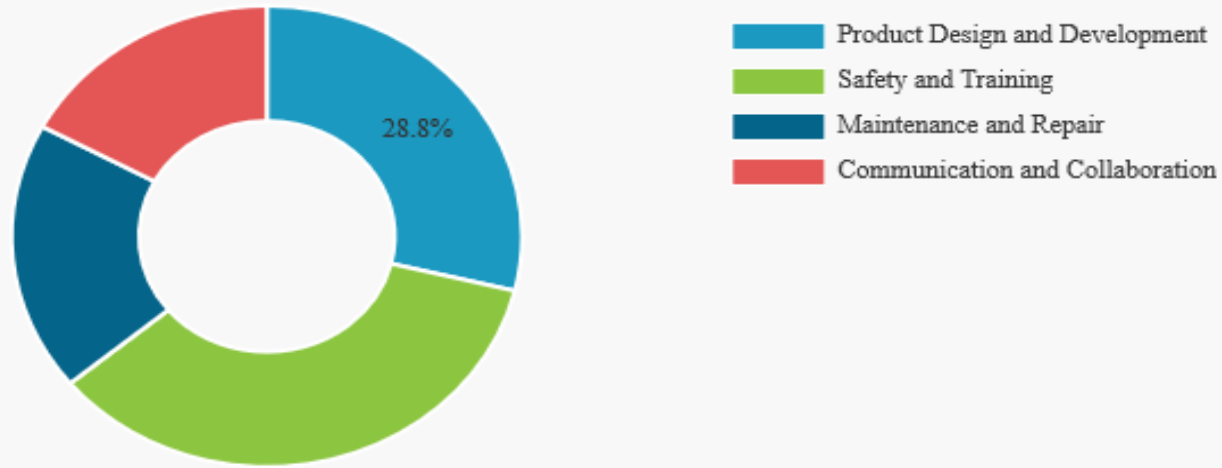


Fig.8\_ Fully immersive of VR [11]

**Global Virtual Reality in Manufacturing Industry Share, By Application, 2018**



**Fig.9\_ application of VR**

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**Thanks for listening**

