

Chapter 69

Industry 4.0 in Cultural Industry: A Review on Digital Visualization for VR and AR Applications

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ABSTRACT

This chapter enlightens how Industry 4.0 is gradually implemented in Cultural Industry. Even though Industry 4.0 started from manufacturing, it soon expanded to less technologically consuming industries, such as the Cultural, creating new opportunities especially in the field of Virtual Reality and Augmented Reality technologies. Taking into account existing research on Industry 4.0 and its main technologies and existing research and projects on Cultural Heritage's aspects related with the 4th Industrial Revolution, the chapter investigates how Industry 4.0 is implemented into Cultural Sector from a technological point of view, but moreover to investigate its potential role.

INTRODUCTION

The 4th Industrial Revolution, also known as Industrial 4.0 has already made its presence noticeable. It gives its signs through a growing tension of digitizing everything, alongside with technologies that aim to effectively capture and quickly analyze amounts of real-time data, in order to deliver various types of meaningful information. Following this, technological research targets on developing accurate, easy to

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implement/use and cost-effective technologies, such as artificial intelligence, analytics, internet of things' technologies, automation, machine learning and others (Liao, Deschamps, Loures, & Ramos, 2017).

As a result of its ongoing evolve it is difficult to give a widely accepted and holistic definition of what Industry 4.0 will become. At present, it seems more like a "marriage" between the physical world/sciences with digital technologies. Digital technologies offer new ways of interconnection with "physical", effective data collection and wise systems capable to interpret the gathered data for a more holistic, informed decision making (action back to the physical world). This procedure is challenging the current way that professionals and scientists think, work and use data, to provide added-value services/ products and new business models. From the other hand, the physical world is not only the use case of digital technologies but moreover an endless source of inspiration for creating virtual worlds or to augment the physical one (Roblek, Meško, & Krapež, 2016).

Even though Industry 4.0 has started from manufacturing, soon has been expanded to several areas, such as supply chain, resources' industries and energy, transportation, healthcare, and more others. Even cultural sector, usually a less technology consuming industry, has already started to implement Industry 4.0 technologies, such as Augmented Reality (AR) and Virtual Reality (VR) technologies, which have rapidly emerged the last years creating a dynamic environment with great opportunities in "3D reconstruction" of cultural monuments and historical cities, that do not longer exist or have been modified (merely or totally).

Taking into account that back in 2000, 3D visualization of cultural content was just a tool to digitally replace physical (e.g. damaged or missing) artifacts (Novitski, 1998), it is notable that digital technologies have nowadays developed enough sophisticated tools to create realistic objects and environments (Ch'ng, 2013) in order to offer a much richer user experience. The idea of visualizing three-dimensional (3D) context is gaining pace from both technological and cost-developing aspect, while a wide range of usages is now established. From research and educational orientation to entertainment and business purposes (Greengrass & Hughes, 2008), 3D models can visualize historic artifacts but moreover can "time-travel" users to historical places/cities/ buildings.

Virtual Reality and Augmented Reality technologies can embody users in a specific historic period delivering a feeling of how daily life was, in various aspects from walking to the city, or visiting a temple, to more complex tasks such as politics and war. The interesting on such approaches and technologies is revealed from a series of research projects funded from the European Union the last 15 years. These projects mainly focused on three distinct areas of interest:

1. archaeological excavations where the public access is limited and there is limited physical content to Be Actually viewed,
2. historical places that do not longer exist or have been modified and
3. Monuments, sculptures and artifacts with limited access or no longer existing.

Existing research coming from these projects reveals a growing interest in model developing for existing and a smaller for non - existing cultural heritage's artifacts/monuments/ buildings. The main target is to create Virtual Reality or Augmented Reality objects for presentation (Münster & Koehler, 2016), while a more holistic approach is needed to converge with Industry's 4.0 philosophy.

Current research aims (a) to expand cultural sectors' personnel on "Industry 4.0" by presenting its general framework (Background Section). In order to understand the existing impact of "Industry 4.0" on the cultural sector (b) the most used technologies will be discussed and (c) a series of already

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