Journal of Cultural Heritage xxx (2017) xxx–xxx

Available online at
ScienceDirect
www.sciencedirect.com

Elsevier Masson France
EM|consulte
www.em-consulte.com/en

Original article

Improving sustainable cultural heritage restoration work through life cycle assessment based model

Davide Settembre Blundo [a,*], Anna Maria Ferrari [b], Alfonso Fernández del Hoyo [c], Maria Pia Riccardi [d], Fernando E. García Muiña [a]

[a] Department of business administration (ADO), applied economics II and fundaments of economic analysis, Rey-Juan-Carlos University Campus de Vicálvaro, P. Artilleros s/n, 28032 Madrid, Spain
[b] Department of sciences and methods for engineering, university of Modena and Reggio, Emilia Via Amendola, 2, 42122 Reggio Emilia, Italy
[c] Department of marketing, Comillas Pontifical university, Madrid–Spain Calle de Alberto Aguilera, 23, 28015 Madrid, Spain
[d] Department of earth and environmental sciences, university of Pavia Via Ferrata, 1, 27100 Pavia, Italy

ARTICLE INFO

Article history:
Received 27 March 2017
Accepted 15 January 2018
Available online xxx

Keywords:
Sustainability
Cultural heritage
Life cycle assessment (LCA)
Life cycle costing (LCC)
Social life cycle assessment (S-LCA)
Sustainable conservation and restoration

ABSTRACT

Sustainable restoration process is one of the biggest challenges for public and private decision makers in the Cultural Heritage sector. Currently, sustainability assessment methods are well established tools to quantitatively determine their environmental (LCA), economic (LCC) and social (SLCA) impacts from products/service across the entire value chain. Nevertheless, while these life cycle methods are widely applied in many industries and service sectors, they still are at its infancy in the restoration work of Cultural Heritage. The main goal of this paper is to define and build a general framework including all impact indicators related to the restoration work processes to apply experimentally, and for the first time, all the sustainability assessment dimensions together within the Cultural Heritage sector. The ISO 14040 standard under guidelines published by the UNEP/SETAC Life Cycle Initiative has been used as an assessment tool. Then, a CH-LCM Model framework based on a previous work from the author is applied to the real case concerning the restoration of the fortress of Uncastillo (Spain). The data collected from the real case concerning the restoration of the fortress of Uncastillo (Spain) have allowed us to reach two objectives: firstly, to validate the model empirically and, secondly, to identify successful managerial practices for the decision makers. In this respect, the paper shows that the life cycle approach can be considered an effective method for improving innovative managerial practices towards the sustainability, preservation and restoration of Cultural Heritage by assessing the environmental impact, the financial and economic feasibility and the implementation of an engagement strategy for the stakeholders. Finally, we have pointed out a set of valuable recommendations for future actions.

© 2018 Published by Elsevier Masson SAS.

1. Introduction

The cultural sector is comprised of (and differentiated from) both the point of view of the resources and its protagonists as well. In addition, its examination from an economic perspective faces many problems in the delineation of the limits of culture as an economic activity. As a result, all these complexities have prevented the identification of the cultural sector in a universally accepted way and, thereby made its study a challenging one. In the economic field, the discipline that aims to study the production and consumption of culture is the so-called "culture economy" [1]

Within the discipline of the economy of culture, we can broadly distinguish three major areas of analysis: the performing arts, cultural industries and historical and cultural heritage [2]. This third one, cultural heritage, is the subject of this study. This sector presents many challenges since it is a key component to the identity of nations and, because of its uniqueness, carries with it the moral obligation to make it available to present and future generations [3].

In addition, due to its ethical and moral value of historical memory, Cultural Heritage must endure for future generations. This responsibility stimulates all the participants involved in its management of the adoption of a social responsibility orientation and, of course, a sustainable development over time [4].

The Cultural Heritage sector is a system that, due to its intrinsic nature, needs special attention when it comes to carrying out restoration and conservation of the works of art that compose it.

* Corresponding author.
E-mail address: d.settembre.2016@alumnos.urjc.es (D. Settembre Blundo).

https://doi.org/10.1016/j.culher.2018.01.008
1296-2074/© 2018 Published by Elsevier Masson SAS.

Please cite this article in press as: D. Settembre Blundo, et al., Improving sustainable cultural heritage restoration work through life cycle assessment based model, Journal of Cultural Heritage (2017), https://doi.org/10.1016/j.culher.2018.01.008

Furthermore, these works of art possibly lead to more complex regulatory processes or "rules" in this sector because of the difficulties encountered in assessing the needs of multiple (economic) interest bearers, the safeguarding of their historical memory (social) and the respect for the territorial context (environmental) as a part of the technical problems. Therefore, this sector represents a great opportunity to reconcile social and environmental development with economic growth [5].

In the Cultural Heritage sector, as in other areas, sustainable development is not only a condition to be fulfilled when designing and implementing restoration work, but it also constitutes a process of directional change, through which the system radically improves orientation and makes it persistent over time [6]. The first step in this direction is to agree when this change represents an improvement, which may differ among observers who adopt different meanings of the concept of sustainable development, especially in the cultural heritage sector where there is a plurality of stakeholders.

Settembre Blundo et al. [7] describe Cultural Heritage as a set of multiple processes characterized by many Stakeholders interdependent among them, including individuals, companies and public institutions and, therefore, as paradigm of the so called complex socioeconomic systems [8].

Therefore, there may be several and different expectations related to the perception of sustainability that are manifested not only in its environmental dimension but also in terms of economic growth. This dilemma is solved by understanding sustainable development as a qualitative process of concretizing the potential of the present and future sector while growth is measured in terms of quantitative increase of its wealth [9].

Bennett et al. [10] argue that the Cultural Heritage and Sustainability are concepts intertwined in a perspective in which human activity is the sum of the legacies of the past and the future potentials. In doing so, sustainability represents one of the main challenges in the management of Cultural Heritage today. Therefore, the challenge for decision-makers is, on the one hand. to combine the needs of society with the obligation to protect the environment and natural resources, and on the other hand is to accompany sustainable development with future economic growth [11]. This objective can be achieved through the application of techniques such as the life cycle management (LCM) approach, which encompasses the three dimensions of sustainability that are environmental, economic and social ones [12].

In order to quantitatively analyze these three dimensions of sustainability there are specific methods: the life cycle assessment (LCA) to determine the environmental impact [13] the life cycle costing (LCC) to determine the economic impact [14]; and the social life cycle assessment (S-LCA) to determine the social impact [15].

The LCA analysis is standardized under the ISO 14040-14043 regulations, which provide the specific guidelines for conducting the environmental assessment [16]. According to ISO standards, the methodology is structured in four phases:

- goal, scope definition;
- inventory analysis;
- impact assessment;
- results interpretation.

The tool considers the entire life cycle of the product, process, or activity, for example, "from cradle to grave", starting with the extraction and processing of raw materials to its final disposal.

In the same vein, LCC is shaped according to the structure of LCA following ISO 14040, in four similar phases:

- goal, scope definition;
- inventory costs;
- aggregate costs by cost categories;
- results interpretation.

LCC methodology converts the environmental impacts into monetary units and it can also provide an additional information to decision makers for evaluating the economic and financial sustainability of a product or process [17].

Finally, the social dimension of sustainability takes into consideration the effects on the stakeholders involved along the life cycle processes, and it is evaluated by the S-LCA method [18]. Currently the S-LCA method is not yet formalized by international standards and analogously to the LCC, S-LCA adopts the phases specified by the ISO 14040 standard for the LCA and the same guidelines published by the UNEP/SETAC life cycle initiative [19].

Adding up all dimensions, Klöpffer [20] summarized the three-life cycle-based techniques in a new conceptual formula (LCSA = LCA + LCC + S-LCA) where LCSA is the life cycle sustainability assessment. LCSA extends the scope of current environmental LCA to embrace the other two dimensions of sustainability in order to understand the fundamental interactions between nature and society [21].

It is a stated fact that the current scientific literature does not provide clear evidence related with integrated applications of the three dimensions of life cycle approach to Cultural Heritage. Nevertheless, there have been some interesting attempts such as the one focusing on social impacts of cultural services from Arcese et al. [22] where a theoretical framework was developed for the evaluation of social impact on the Cultural Heritage sector, through the application of SLCA methods by previously classifying the stakeholder subcategories in order to improve consistency analysis.

In another recent study, the LCA approach was combined with LCC and S-LCA methods in order to design a conceptual protocol called "Cultural Heritage Life Cycle Management" (CH-LCM) that defines methodological guidelines to assess the sustainability of restoration processes [7].

Despite all these recent attempts, a more comprehensive approach and empirical evidence is needed to assess sustainability within the Cultural Heritage sector and this study tries to fulfil this gap by building up the results of these two studies and more particularly on the one on CH-LCM.

2. Research aim

The aim of this study is to validate the conceptual protocol of "Cultural Heritage Life Cycle Management" aforementioned, through its application to a practical case of Cultural Heritage restoration, in order to build an adequate operational model for the design and monitoring of restoration work on the Cultural Heritage in accordance with the three pillars of sustainability.

A case study will be adopted as the research application and conceptual assumptions represented in CH-LCM protocol (Fig. 1) have been used as a guide to evaluate and identify the environmental, economic and social impact that derives from restoration of Cultural Heritage.

In this research, the "operational validation" has been applied as the paradigm for obtaining a satisfactory valid model. According to Sargent [23] in the modelling process, the operational validation "is defined as determining that the model's output behavior has sufficient accuracy for the model's intended purpose over the domain of the model's intended applicability".

It will be used as an output for the model validation process, a specific framework composed of impact indicators for the

Please cite this article in press as: D. Settembre Blundo, et al., Improving sustainable cultural heritage restoration work through life cycle assessment based model, Journal of Cultural Heritage (2017), https://doi.org/10.1016/j.culher.2018.01.008

Download English Version:

https://daneshyari.com/en/article/7446214

Download Persian Version:

https://daneshyari.com/article/7446214

Daneshyari.com