Value based building renovation – A tool for decision-making and evaluation
Per Anker Jensen*, Esmir Maslesa
Centre for Facilities Management, DTU Management Engineering, Technical University of Denmark, Produktionstorvet Building 424, 2800, Lyngby, Denmark

1. Introduction
Renovation of buildings is currently achieving increased attention in many European countries. A fundamental reason for this is an aging building stock following the huge increase in new building activities in the years following the Second World War. Throughout their life time, buildings deteriorate and become less attractive, if not maintained properly. The fact that we spend most of our time indoors indicates, why healthy and well-performing buildings are of a such importance, not only for our global society, but also for the health conditions of every single of us that spend most of our lifetime indoors. Other appealing reasons for building renovations are higher energy prices and the increasing focus on sustainability. There is an emerging need to reduce consumption of fossil energy resources and CO₂-emissions in order to avoid serious climate effects in the future [1]. Still higher demands on energy performance of new buildings in EU-regulations and national buildings codes mean that the discrepancy in energy performance between existing buildings and new buildings becomes greater and greater. Even though the need for renovation of existing buildings is increasing, there are still fairly limited actual renovation activities going on in most countries. There are many different reasons for this, which has been shown in a number of research studies on barriers and incentives, see section 2.3.

This article is based on the joint European research project: “A concept for promotion of sustainable retrofitting and renovation in early stages” (ACES), in which the Technical University of Denmark, the Royal Institute of Technology, Sweden, and Frederick University, Cyprus were involved. It was based on the fact that approximately more than 40% of the total energy in Europe is spent within the buildings sector, which significantly contributes to greenhouse effects and air pollution. Moreover, it is estimated that approximately 85% of the 160 million buildings within the European Union are thermally inefficient [2]. Hence, it is crucial for the existing building stock to become refurbished. The ACES project was carried out from September 2011 to November 2013 and was part of the European...
Building renovation is the process of fixing or replacing existing parts of the building to improve its performance, either to its original state or better [4]. At the same time, building renovations also provide the possibility to change building design/lay-out, functions, architectural expression etc. to match users’ current and/or future needs. Combining multiple disciplines introduces complexity to building renovations, and because of that, interdisciplinary expertise is required to deal with most renovation projects.

Building renovations usually address several challenges in a specific property at the same time and therefore contribute with multiple benefits. Today, focus is mostly on energy-efficiency and deterioration, but there are also non-energy benefits of building renovations such as improvement of indoor climate, better daylight conditions, improved working spaces etc. In office buildings for instance, indoor climate is considered very important and can directly be linked to employee performance. Earlier research has shown that productivity can be increased 6–9 % by improving indoor air quality, which means that investments in indoor climate are also business investments [1]. Improving building design through renovations should therefore not only be a financial issue, but also the question of added value and better indoor climate conditions.

2.2. Barriers and incentives

Even though there are many benefits of building renovations, several international research studies have analysed the barriers for initiating renovation projects. The World Business Council for Sustainable Development (WBCSD) has produced a number of reports about energy efficiency in buildings with a global outlook. In Ref. [8] they state that several barriers stand in the way of rapid progress ranging from market and policy failures, through professionals’ inadequate knowledge and understanding, to the behaviour of building users. Their modelling work indicates that measures with a substantial impact are unlikely to meet normal financial investment requirements and are therefore unlikely to be implemented. Furthermore they identify several structural obstacles that significantly inhibit the likely take-up rate even of financially attractive investments.

A European ERABUILD project on building renovation and modernisation conclude in their final report [9] that the barriers in general are the lack of knowledge and information and the lack of cost effectiveness and funding. For owner-occupiers and private landlords the lack of knowledge and information, and funding, are seen as the main problems. An additional barrier for private investors is that they do not profit themselves from the investment made in rented out buildings — often called the landlord/tenant dilemma [4,10]. In relation to opportunities, Itard et al. [9] regard that they are going to be generated by governmental actions and market processes. Demands of owners and occupants (e.g. with regard to comfort) have been changing and are going to change in the near future, which will have a positive effect on sustainable renovation.

In the UK, the Better Buildings Partnership has produced reports about low carbon retrofitting. The partnership identifies barriers in the following five areas [11]:

1. Commercial, including failure to provide a compelling and viable business case for investment in retrofit and the inherent split incentive between owners and occupiers.

2. Roles and Processes, including no defined process to designate individuals within an organisation with the responsibility and authority to identify, plan and deliver energy saving and carbon reduction interventions.
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