Conference
Teaching and Learning for Change: Sustainability in Higher Education

Life Sciences and Facility Management
IFM Institute for Facility Management

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Part 1: Model to integrate sustainability-transformation competences within a MSc programme

- Processual: Fundamental knowledge of *real estate management*, *facility management*, *architecture*, *workplace management*, and *civil engineering*
- Economical: Essential *economic* knowledge to effectively advocate for *costs*, *investment*, and *financing* of sustainability in businesses
- Ecological: The ecological dimension emphasizes principles of *green* and sustainable building, including *energy* and *water* conservation and *waste* and *emissions* reduction.
- Empirical: Management through *data analysis* as a basis for *critical thinking*, *informed* decision-making, and sustainable action. Data may be displayed as *graphics*.
- Social: Sustainability contributes to a *healthy* society. Skills and competencies are, among other things, the ability to think in terms of *systems/life cycles*, *values/ethics*, *collaboration/participation*, and *problem-solving/innovation/creativity*.
- Technical: Understanding of *operational*, *information technology (IT)*, and *building technologies*, including the integration of *digitization* for improved processes and potential sustainability enablement.

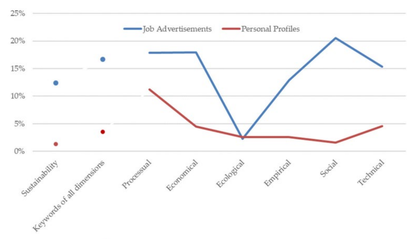


Figure 1. Frequencies of keywords and dimensions in job advertisements and personal profiles.

Organizations in and associated with the real estate sector rely on a competent workforce capable of effectively managing sustainability practices. A comprehensive analysis was conducted on 600 job advertisements and 1520 personal profiles, employing a keyword-based search approach derived from sustainability definitions and contexts. It is suggested that educational institutions incorporate the sustainability dimensions and keywords identified into the descriptions of their education and training programs. Educational institutions can better prepare students with the necessary competencies and skills demanded by the industry, ensuring they are well-equipped to contribute to sustainability practices in the real estate sector.

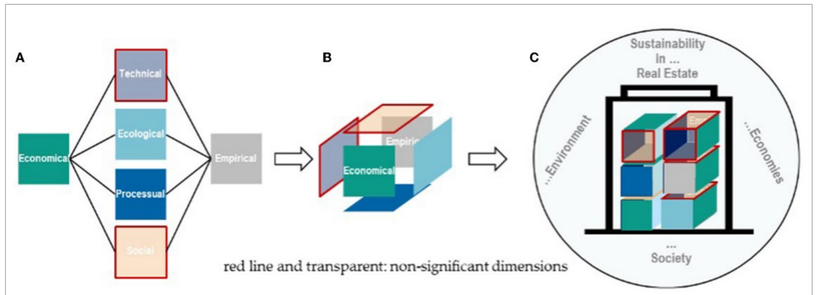


FIGURE 2
Cubic of sustainability in real estate of higher education programs analyzed consists of **(A)** six dimensions; **(B)** cubic of Sustainability; **(C)** enabling sustainability among others in real estate. Red-framed dimensions are not significantly presented in this analysis.

A total of 122 European university degree programs were examined for enabling future real estate managers to drive the sustainability transformation toward a circular built environment. The results show that topics on sustainability are covered significantly. Graduates are empowered in several disciplines that evolve around the real estate life cycle, but not in all the required ones. There seem to be gaps in teaching especially in the subject area of CE. The extent to which students are also socially empowered is hard to trace. The critical discussion shows that the introduction of a holistic approach to the management of real estate to master level students can help them gain a sustainability perspective prepare them to act circularly in the future. A concise proposal for how to embed circular economy management into a master course structure is given. It illustrates how the need for research in education and the essential contribution of the educational system, of formal, informal, and non-formal education, can be solved.

Part 2: Module Circular Economy Management

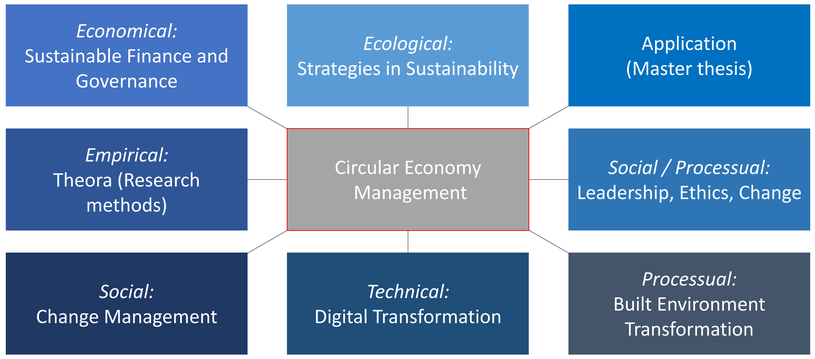


FIGURE 3
Skills for circular economy in real estate of higher education program in line with the six dimensions of Cubic sustainability in real estate.

To deal with the limited resources available in an economical and environmentally friendly manner, the change from linear to circular real estate management and sustainable building design, use and management is essential. How the model used in the module Circular Economy Management is shown in Figure 3.

The real estate industry is responsible for tying up many resources, sometimes for decades. In order to deal with the limited resources available in an economical and environmentally friendly manner, the change from linear to circular real estate management and sustainable building design, use and management is essential. The sustainability and circularity assessment is another element for assessing, (further) developing and applying the impact of the built environment on the climate and nature, also against the background of corporate, owner and user responsibility.

In this module perspectives on converting the existing linear economic systems into circular economy systems are given, circular economy strategies and design options as well as challenges for circular economy systems in the real estate context are discussed.

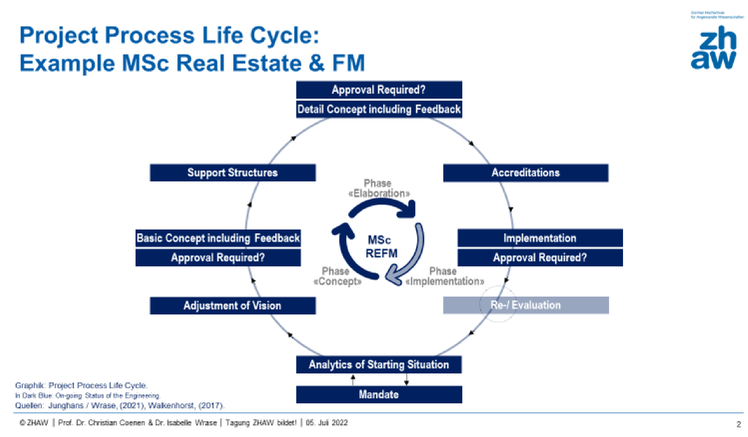
The building as a layered model - system separation in building construction and possible future Closed loop systems of the future (energy and/or material focus) as well as principles of circular planning/ building/ use/ operation are introduced. The module further provides methodological approaches and benefits of environmental assessment (also of buildings). In this context, impact on carbon accounting at portfolio level as well as cost accounting of waste avoidance and sustainably optimized dismantling is discussed.

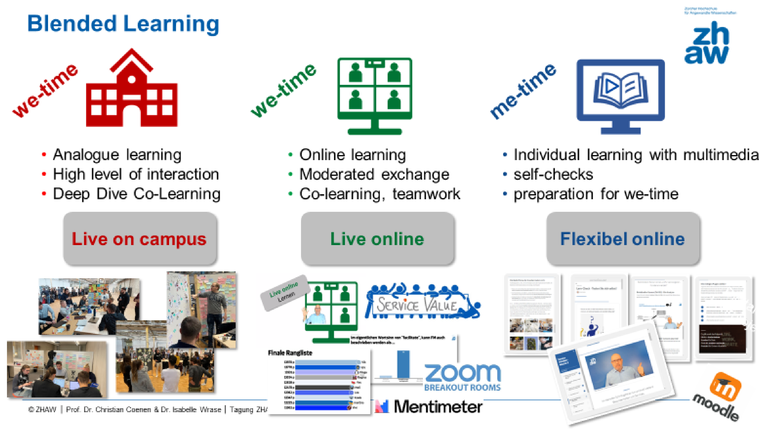
The background of these models, however, touch on ecological, environmental to technical, engineering topics. We believe that the role of the real estate and facility management professional is to incorporate all these issues into the facility since this provides the largest benefits. But the actual professional is not educated to deal with all of these issues. Resource and energy efficiency and pollution prevention are typical fields of engineering application. Harmonization with the environment is multidimensional and most real estate and facility managers deal with this task but is there an integrated and systematic approach to reach a sustainable building?

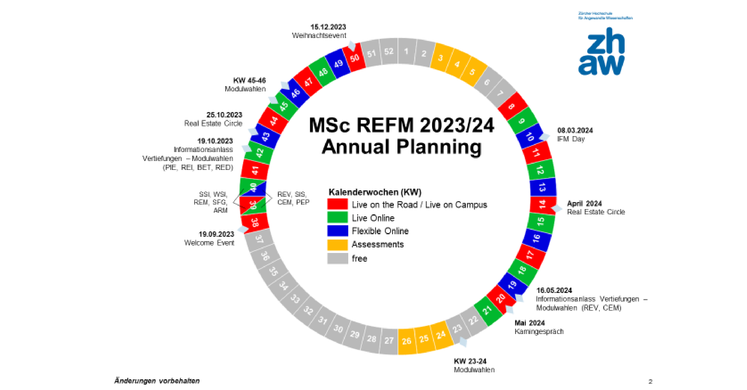
In this respect our MSc curriculum tries to educate real estate and facility managers on the:

- Sustainability consequences of transformation
- Quality of real estate concept with respect to circularity
- Quantity of real estate quality and circularity potential
- Quality of circularity concept
- Management consequences of circularity concepts

Part 3: Blended Learning-Approach of the MSc REFM-programme







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