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An Analysis of Sustainability in Real Estate in Job Advertisements and Personal Profiles in Switzerland

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Abstract: Organizations in and associated with the real estate sector rely on a competent workforce capable of effectively managing sustainability practices. This study examined the alignment of sustainability-related qualifications between employers and individuals in the Swiss real estate-related job market. 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. The findings revealed that companies emphasized the importance of "sustainability" in their job advertisements, whereas employees rarely mentioned it in their profiles. Nevertheless, both employers and workers demonstrate a demand for expertise, competencies, and skills that contribute to fostering sustainability in the real estate domain. Noteworthy keywords encompassed digitalization, green buildings, economic thinking, creativity, and collaboration. To facilitate improved job matching between organizations and applicants and to ensure sustainable practices in the real estate sector, it is recommended that organizations integrate these suggested keywords in their job advertisements and that employees incorporate the corresponding keywords into their profiles. Furthermore, educational institutions can enhance their programs by incorporating these keywords and the proposed dimensions of sustainability into their educational frameworks.

Keywords: sustainability; real estate; job advertisements; workforce; education

Citation: Wrase, I. An Analysis of Sustainability in Real Estate in Job Advertisements and Personal Profiles in Switzerland. *Sustainability* **2023**, *15*, 9789. https://doi.org/10.3390/su15129789

Academic Editor: Jun (Justin) Li

Received: 3 May 2023
Revised: 8 June 2023
Accepted: 17 June 2023
Published: 19 June 2023

1. Introduction

Driven by climate change, sustainability in the real estate sector has emerged as one of the herculean tasks of our time. The real estate and construction sector in developed countries, such as the countries of the European region, account for approximately 30% of energy consumption and 40% of greenhouse gas emissions [1]. In addition, this sector is responsible for 12% of water consumption and 40% of waste worldwide [2]. However, the European Union has set a goal to become the world's first climate-neutral region by 2050, and the Swiss Federal Council also aims for Switzerland to achieve climate neutrality by the same year [3,4]. To accomplish these ambitious objectives within the next three decades, it is highly likely that stakeholders, including organizations, will face (further) laws, regulations, and requirements [5]. Both private and public organizations will rely on a competent workforce capable of effectively managing sustainability in real estate within the given timeframe. Additionally, educational institutions have a responsibility to provide appropriate education and training that empowers workers to actively contribute to sustainability transformation in the real estate sector.

Education for sustainable development is recognized as an integral part of Sustainable Development Goal (SDG) 4, which focuses on quality education and is essential for achieving all other SDGs [6]. Target 4.7 specifically emphasizes the importance of equipping learners with "the knowledge and skills needed to promote sustainable development, including, among other thing, through education for sustainable development". Quality education serves as a key enabler for driving change and effectively managing sustainability in the real estate sector [7]. However, concerns regarding the socioeconomic and environmental

challenges facing societies have been widespread for the past sixty years [8–11]. Despite the efforts made so far, recent research and data on climate change, inequalities, pollution, and species extinction suggest that progress is still insufficient [12–19]. Limiting the rise in global temperature to 1.5 degrees Celsius necessitates rapid capacity building, including the development of a workforce capable of spearheading the sustainability transformation in the real estate industry [14].

This paper undertakes an analysis of the alignment between sustainability-related qualifications sought by employers and the profiles of individuals in the Swiss real estate job market. A comprehensive examination of 600 job advertisements and 1520 personal profiles was conducted, employing keyword-based searches derived from sustainability definitions and contexts. Given the global sustainability challenges, particularly in the real estate industry, the study seeks to answer the following research questions:

- Are organizations actively seeking sustainability expertise in real estate, and if so, what are the cues for sustainability in real estate to successfully manage their role in transforming the built environment?
- Do current professionals working in real estate possess the necessary expertise, skills, and competencies to drive sustainability in the real estate industry?
- Is there a gap between the qualifications and competencies provided by the workforce and the sustainability needs of organizations in the real estate industry?

This article is structured as follows. The first chapter provides an introduction. The second chapter focuses on a comprehensive literature review regarding the expertise, competencies, and skills necessary for sustainability management in the real estate field. Furthermore, insights from an expert workshop and interviews with industry professionals are presented, shedding light on the specific qualities sought by the real estate industry. Keywords were derived from sustainability definitions and contexts. In the third chapter, the data collected from job advertisements and personal profiles of professionals in the Swiss real estate industry are analyzed to determine the significance and presence of the keywords and dimensions identified. In the fourth chapter, the key findings are presented. In the fifth chapter, these findings are discussed and conclusions drawn, addressing the demand for sustainability within organizations, the qualifications offered by professionals, and the shortage of a suitably trained workforce. Furthermore, the limitations and novelty of this contribution are discussed. The concluding sixth chapter provides insights into the content that should be incorporated into Master of Science (MSc) programs in real estate in Switzerland to enable the education and development of a skilled workforce that aligns with market demands.

2. Keywords Derived from Sustainability Definitions and Contexts

During a pre-study from May 2020 to July 2021, over 50 job advertisements were analyzed, focusing on the requirements for a Master of Science or a bachelor's degree and more than 10 years of professional experience in the field of real estate in Switzerland. The analysis of job advertisements involved systematically examining the content to extract relevant information regarding qualifications, skills, and job responsibilities. The following process was employed. (1) Searching for relevant job advertisements, such as those requesting a Master's degree or senior/leadership positions in real estate, using sources like online job portals, company websites, and LinkedIn. (2) Collecting relevant information from the job advertisements, including job titles, company names, job descriptions, required qualifications, and desired skills. These data were compiled into a dataset for further analysis. (3) Analyzing the texts to identify the most common keywords related to skills, competencies, and contextual information. Examples of keywords may include "sustainability", "analytical", "social", and "circular economy". The data were systematically coded on the basis of identified themes or categories. (4) Interpreting the data analyzed to draw conclusions and insights regarding the match between sustainability-related qualifications sought by companies and the presence of these qualifications in the job advertisements for professionals.

Preliminary results indicated that, firstly, (future) professionals and managers in the real estate industry face challenges that necessitate a holistic approach to real estate and infrastructure management encompassing planning and construction, utilization, and deconstruction [20]. Sustainability management in this industry requires knowledge from various disciplines, including architecture, civil engineering, real estate management, and facility management [21,22]. Merely possessing knowledge of buildings or operating real estate is insufficient to effectively manage sustainability in the field [23].

The literature highlights several drivers of sustainability in real estate; in order of increasing importance, these include positive investor relations, marketing benefits, and improved corporate culture and image [24]; reduced liability and risk [24,25]; cost savings, such as lower construction and energy costs [26–28]; and compliance with laws, regulations, and policies [29–31]. These findings are supported by statements from executives of large companies on climate neutrality [32]. Secondly, economic understanding is key to sustainability management in the real estate industry [33,34].

Furthermore, sustainable property management efforts have evolved beyond their initial impetus [33,34]. In recent years, there has been a steady growth in the integration of sustainability principles in the real estate industry. This shift in focus encompasses ecological aspects, going beyond cost reduction and contributing to improved ways of living, working, and enhancing societal and environmental well-being [35,36]. Traditional cost savings goals are now complemented by an increasing interest in the positive impact of sustainability in real estate to address, thirdly, broader environmental challenges, as well as challenges related to well-being, health, and society [36,37].

To validate the findings from the job advertisements analyzed, interviews were conducted with 30 executives from the private and public real estate industry, and an expert workshop was held with 25 executives in January 2021. The executives worked in various sectors in Switzerland, including banks, insurance companies, medium-sized industrial companies, pharmaceuticals, and public institutions. The 25 executives were divided into five groups of five persons each. Each group had a designated moderator responsible for overseeing the discussions. This group size was selected with the intention of facilitating in-depth and comprehensive analysis, allowing for a thorough comparison of the job offer results with the participants' knowledge and experience. The interviews were designed to be open-ended, enabling participants to freely express their opinions and insights. The objective of this approach was to determine whether the keywords derived from the job offers, pertaining to competencies, requirements, and higher-level topics and contexts, would withstand scrutiny within this framework.

The interview and workshop discussion confirmed the importance of holistic competencies in architecture, civil engineering, real estate management, and facility management, as well as an understanding of economics and ecology in the field of real estate. In addition, the participants emphasized, fourthly, the importance of expertise in data management and, fifthly, social skills and leadership abilities, much more than in the job descriptions detected so far [38]. The workshop participants were nearly unanimous in their belief that meeting job requirements with excellence necessitates not only operational or strategic thinking from (future) managers but also a comprehensive understanding among employees of the connection between strategy and operational actions as well as proficiency in management and leadership [34,39]. In addition, the megatrend of digitalization is significantly reshaping expertise across all professional fields, including the ability to enable sustainability transformation in real estate. Sixthly, familiarity with topics in digitization has become a requirement in today's workforce, regardless of the chosen field [34].

Overall, specialization in real estate management alone is insufficient for the (future) workforce [40]. Professionals in the real estate industry face challenges that demand the holistic management of real estate; this entails not only expertise in core real estate disciplines but also additional knowledge in areas such as operational technology, social skills, and scientific work, all integrated within the broader context of the sustainability mega-

trend. Such multidisciplinary competencies appear indispensable in effectively managing sustainability in the real estate industry today.

There is a wide range of terms used for socio-ecological and economic challenges and in the real estate sector [41,42]. A few of the most important definitions are given here:

- Sustainability: Sustainability refers to the ability to meet the needs of the present generation without compromising the ability of future generations to meet their own needs. It involves the responsible use and management of resources, the preservation of ecological balance, and the promotion of social equity and economic development that can be maintained over the long term [43].
- Sustainable Consumption and Production: Sustainable consumption and production refers to the promotion of resource-efficient and environmentally friendly practices throughout the entire lifecycle of goods and services. It involves minimizing resource use, reducing waste generation, and promoting sustainable lifestyles and business practices that contribute to the well-being of individuals and the planet [44].
- Green Building: Green building encompasses the design, construction, and operation of environmentally responsible and resource-efficient buildings throughout their lifecycle. It incorporates elements such as energy efficiency, water conservation, waste reduction, and the use of sustainable materials [45].
- Carbon Footprint: The carbon footprint represents the total amount of greenhouse gas emissions, primarily carbon dioxide (CO_2), generated directly and indirectly by an individual, organization, product, or event. In the context of real estate, it encompasses emissions associated with building construction, operation, and maintenance [46].
- Circular Economies: The circular economy is an economic model that aims to minimize waste, optimize resource utilization, and promote sustainable production and consumption. It is based on the principles of designing out waste and pollution, keeping products and materials in use for as long as possible, and regenerating natural systems [47].

Consequently, numerous definitions and contexts have emerged from the "environmental education" and "sustainable development" movements [48]. However, since all these definitions and contexts aim at education for a sustainable future, it can be assumed that there is no contradiction between these approaches [48,49]. Therefore, Scalabrino et al. developed a theoretical framework for identifying sustainability (in education) to facilitate an earlier transition to an equitable, low-carbon, circular economy [49]. This framework includes many elements, which are also further supported by a further systematic analysis of transversal competencies for employers in a transnational context [50]. The following required competencies, among others, were extracted to potentially identify sustainability in job advertisements and personal profiles [40]: thinking in life cycles; dealing with complexity and uncertainty; coherence between values, ethics, responsibility, etc.; critical thinking; the ability to read data and graphs; empathy and emotional intelligence; collaboration and participation; and creativity, innovation, and problem solving.

In general, to date, there is no comprehensive, generally accepted definition or model for managing sustainability in real estate. In some cases, existing systems can be applied, such as the framework for real estate management as an academic discipline or the preliminary model for sustainable facility management, which contributes to the three overarching focus areas of sustainability: the ecosystem, society, and the economy [40,51–54]. From the author's perspective, there is a need for further development of definitions and approaches in real estate to adopt a more holistic view that enables sustainability transformation. It is not necessary to prioritize one aspect over another, but rather to consider all aspects in a balanced manner. Only when all the necessary aspects are equally taken into account can the highly complex task of sustainability transformation in the built environment be truly achievable. Further research is required to advance this understanding.

3. Materials and Methods

Regardless of the definition and/or model applied, the framework for explaining sustainability in real estate could include the following dimensions and keywords (in *cursive*):

- 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.

Based on these dimensions and the keywords derived, it is possible to assess whether there is an indication of a gap in sustainability management in real estate among workers, whether organizations lack awareness of the competencies required to fulfill sustainability in real estate, or whether there is a gap in both areas. Since this research is about whether sustainability plays a role in job advertisements and personal profiles, the keyword *sustainability* was also searched for.

To collect data, job advertisements and personal profiles were analyzed descriptively. The data were collected from LinkedIn "https://www.linkedin.com (accessed on 13 April 2022)", supported by the software provided by LIX "https://lix-it.com (accessed on 13 April 2022)", and then anonymized. No computer code was used for this analysis. All computations were performed using Excel. The data collection was conducted in April 2022. The job advertisements were found by typing "Real Estate", "Facility", "Civil Engineering", or "Architecture" in Switzerland in the search box. When possible, the search was facilitated by searching for word components, e.g., "architecture" was searched by the word component "architect". Although justified, these approaches could be prone to error. The selection criteria for job advertisements included the publication date at any time, work experience above entry level, and both part-time and full-time positions. All positions considered were advertised since the beginning of 2022. In total, 600 jobs advertisements in "Architecture", "Real Estate", and related fields were collected. The dataset was checked for duplicates, i.e., no jobs with the same title, from the same organization, in the same location, or with the same seniority and job type (full/part-time), and the same description was left in the dataset. In addition to the data on the job advertisements, personal profiles, such as "Real Estate" manager, "Facility" manager, "Civil Engineer" and "Architect", were selected in Switzerland. No duplicates were left in the dataset. A total of 1520 personal profiles were examined.

To this end, the "job title" and "job description" texts were combined into one text per job profile, and the "about", "description", "areas of training", and "experience" texts were combined into one overall text per personal profile. Furthermore, the data were consolidated and harmonized where necessary, including the harmonization of organization names, e.g., "Google Research" and "Google", and geographical information. The data were consolidated at the municipality level where individual resided, as was performed for the place of work, in the 26 cantons of Switzerland and abroad [55]. The biological sex was inferred from the first name [56]. If the first name did not clearly indicate the biological sex, the profile was marked as "unknown". In addition, the information on educational attainment was consolidated on the basis of the degree options in the Swiss education system [57,58]. All keywords were researched in German and, if necessary, in English. By default, members see their profile in the language they use on LinkedIn. For

the researcher, the member's profile was displayed in the language the researcher used when it was installed. But as many English words are also used in the German context, English was also added. For the results, the occurrence of a keyword in job advertisements or personal profiles did not matter, only whether it was mentioned at all (1) or not at all (0).

The research examined whether there was a link between sustainability and the dimensions identified. A Chi-square test of independence was performed to determine whether sustainability was associated with the dimensions. As this test is well known and described in the standard literature, the test is not shown in detail here [59]. The null hypothesis (H_0) and alternative hypothesis (H_1) of the Chi-square test were:

- **H_0:** *Sustainability is not associated with dimension "Processual", "Economical", "Technical", etc.*
- **H_1:** *Sustainability is associated with dimension "Processual", "Economical", "Technical", etc.*

To conclude how strong the effect was, a contingency coefficient was performed. The hypothesis (H_0) and the alternative hypothesis (H_1) of the one-tailed significance test were:

- **H_0:** *$\rho = 0$ ("the sustainability correlation coefficient is 0; there is no association")*
- **H_1:** *$\rho > 0$ ("the sustainability correlation coefficient is greater than 0; a positive correlation could exist")*

where ρ is the sustainability correlation coefficient. Between 0.1 and 0.3, there was a weak effect; between 0.3 and 0.5, there was a moderate correlation; and above 0.5, there was a strong correlation [59].

4. Key Findings

4.1. Results of the Descriptive Data: Job Advertisements and Personal Profiles

In total, 83% of the job advertisements retrieved were published by small and medium-sized organizations (≤50 employees); 4% were published by public institutions, such as cantonal building offices, universities, or the Swiss Confederation (refer to Table 1 "Descriptive data of the analyzed 600 job advertisements"); and 14% of the job advertisements stemmed from larger private organizations, e.g., the consulting companies Accenture and CBRE, the supermarket chain Migros, or the pharmaceutical group Roche. Differentiated by industry, 20% of job advertisements were posted by "Staffing and Recruiting" and "Human Resources Services". A further 17% was composed of jobs advertised in real estate, construction, architecture, civil engineering, and facility services.

Table 1. Descriptive data of the analyzed 600 job advertisements.

Organisations	
Private organizations (>50 employees; selection)	14%
Public organizations	4%
All other private organizations	83%
Industries of organisation	
Staffing and Recruiting, Human Resources Services	22%
Real Estate Industry	17%
Pharma & Biotechnology Research	6%
Work location by canton	
Zurich	42%
Berne	12%
Geneva	7%
Basel-City	6%
all other cantons	33%

Table 1. *Cont.*

Work location on- or/and offsite	
On-site	83%
Hybrid	12%
Remote	1%
not provided	5%
Senority level	
Associate	49%
Mid-Senior level	32%
Vice president/Director	8%
Partner/C-suite	2%
not provided	10%
Job Type	
Full-time	94%
Part-time	4%
not provided	3%

These results show a great diversification of the industries of real estate jobs. Ten percent of the organizations in the advertisements could not be allocated to an industry (not shown in Table 1). Differentiated by location of work, the canton of Zurich appeared to be in first place in terms of the possibility of finding a new job (circa 42%), the canton of Berne was in second place (about 12%), and the cantons of Geneva and Basel-Stadt were in third and fourth place (7% and 6%). The rest of the jobs were spread throughout Switzerland (33%). Most jobs were on-site (83%), but there was already a notable proportion of hybrid jobs (on- and off-site; 12%) and fewer remote jobs (1%). Five percent of the work locations on- and/or offsite could not allocated to the jobs, as the information is not provided. Examined by seniority level, in total, 81% of all job postings examined called for associate (junior) to mid-senior level, while 10% called for director or executive level. A total of 10% of the job advertisements did not provide this information. Moreover, 94% of job postings were full-time positions, and only 4% were part-time. The remainder of the jobs could not be matched by job type (3%).

The data showed that 19% of the personal profiles surveyed were of people employed by large private organizations (refer to Table 2, "Descriptive data of the 1520 examined personal profiles"). However, in line with the data on the organizations advertising the jobs, 78% of the workforce analyzed was employed by small and medium enterprises ($\leq$50 employees). Both seniority and job function data were not meaningful, as most of the people did not provide this information (63% and 96%, respectively). The data showed a similar distribution of residences by canton as the locations of the job offer organization; the cantons of Zurich (34%), Berne (10%), Basel-City (9%), and Vaud (6%) were the preferred places of residence. Regarding higher education, Bachelor of Science and Master of Science degrees were the most common educational degrees, totaling 33%. A total of 3% held a doctoral or professorial title, while 11% indicated continuing education. The distribution of sexes among the profiles was 67% men and 30% women. The detailed analysis showed that real estate managers and architects had a slightly higher representation of women, at about 40% and 35%, respectively, compared with civil engineers and facility managers (not shown in Table 2); 4% of the profiles did not specify a sex.

Table 2. Descriptive data of the 1520 examined personal profiles.

Organisations	
Private organizations (>50 employees; selection)	19%
Public organizations	3%
All other private organizations	78%
Job Functions	
Engineering/Technical	36%
all other functions, e.g., Finance	2%
not provided	63%
Residence by canton, Switzerland or abroad	
Zurich	34%
Berne	10%
Basel-City	9%
Vaud	6%
all other cantons or abroad	41%
Higher education	
Bachelor, Master	33%
Ph.D., Professor	3%
undefined	64%
Continuting education	
Certificate, Master	11%
undefined	89%
Senority level	
Manager	3%
Vice president/Director/Partner/C-suite	1%
not provided	96%
Sex	
Male	67%
Female	30%
Unknown	4%

4.2. Results of the Descriptive Data: Sustainability and Its Dimensions

Searching for "sustainability" in the 600 job advertisements in real estate, facilities, construction, and architecture resulted in 75 occurrences, or 12% of all job listings examined. For example, companies were looking for a "Global Sustainability Expert" and someone to "provide sustainable solutions that (...) help customers effectively manage electrical, hydraulic and mechanical energy".

In only 20 out of 1520 (1%) of all personal profiles, was the word "sustainability" found. The personal profiles rarely used "sustainability" in descriptions, such as "I have a strong passion for (...) environmental issues and focus on the topic of sustainable packaging development"; job titles, such as "Head Group Sustainability"; or the education statement of having completed a "Master's in Sustainable Architecture and Technology Innovation for the Environment".

If one searched for the keywords defined above, all dimensions—except for "Ecological" (2%)—were in the range of 13% to 21%. In particular,

- Processual: knowledge in "civil engineering", "facilities", and "real estate" seemed to be most important, as these keywords were mentioned the most.
- Economical: the keywords "economy", "cost", and "businesses" were the most important ones.
- Ecological: this keyword was rarely found.
- Empirical: the keywords "data" and "analysis" were the forerunners.
- Social: the most mentioned terms "health", "values, ethics", or "creativity innovation and problem solving" were found in more than 1 of 5 cases.
- Technical: "technologies" and "IT" were the most important keywords.

If one searched for the keywords in the personal profiles (refer to chapter 3, "Material and Methods"), all dimensions—except for "Processual"—lay in the range of 2% to 11%. The keywords in the "Processual" dimension could be found in about every 10th personal profile. In particular,

- Processual: Expertise in "facilities", "real estate", and "architecture" was provided.
- Economical: The keywords "economy" and "businesses" were the most important ones.
- Ecological: As in job advertisements, these keywords were rarely found.
- Empirical: As in the job advertisements, the keywords "data" and "analysis" were the forerunners.
- Social: "creativity innovation, problem solving" were the most mentioned keywords.
- Technical: "technologies" and "IT" were also the most important keywords.

The results are shown in Figure 1 "Frequencies of keywords in job advertisements and personal profiles".

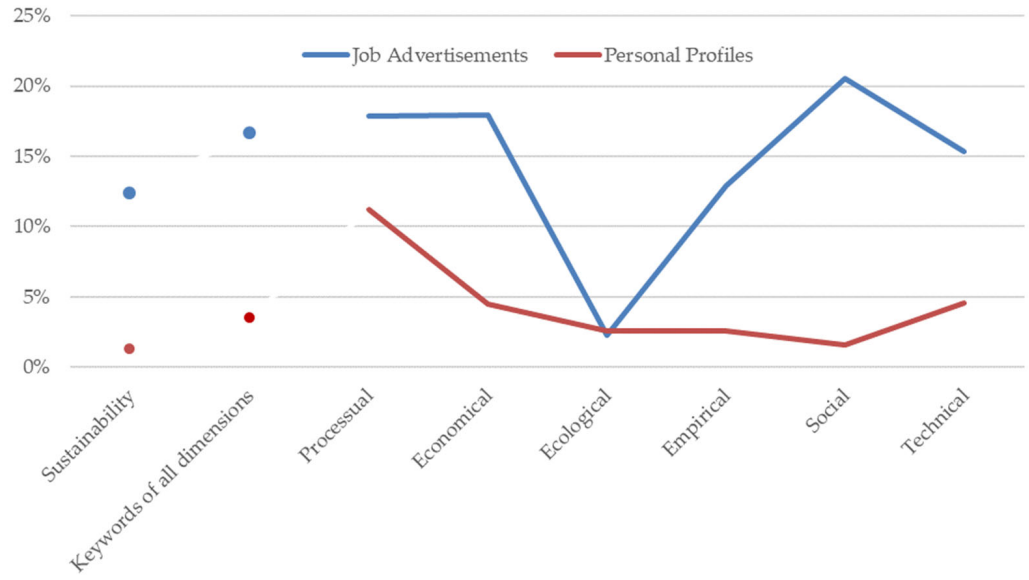

Figure 1. Frequencies of keywords and dimensions in job advertisements and personal profiles.

4.3. Empirical Results: Sustainability and Its Dimensions

The Chi-square test of independence yielded the following results. Almost all dimensions that contained keywords describing sustainability were associated with sustainability in the examined job advertisements. According to this analysis, only the "Empirical" dimension was not significantly associated with sustainability within the job advertisements of the organizations. That said, there was also a variance in how significantly the dimensions seemed to be associated with sustainability, as shown in Table 3, "Relevance of the word "sustainability" and the dimensions of sustainability in real estate in the analyzed job advertisements and personal profiles". The dimensions "Processual", "Economical", "Technical", and "Ecological" were more significantly associated with sustainability than the dimension "Social" in the job advertisements.

Table 3. Relevance of the word "sustainability" and the dimensions of sustainability in real estate in the analyzed job advertisements and personal profiles.

Job Advertisements	*p*-Value	A < 0.05	Personal Profiles	*p*-Value	A < 0.05
Sustainability	3.02×10^{-111}	*	Sustainability	$0.00 \times 10^{+0}$	*
Processual	7.85×10^{-111}	*	Processual	$0.00 \times 10^{+0}$	*
Economical	1.22×10^{-105}	*	Economical	$0.00 \times 10^{+0}$	*
Technical	3.02×10^{-100}	*	Technical	1.44×10^{-90}	*
Ecological	6.66×10^{-100}	*	Ecological	1.64×10^{-89}	*
Social	2.34×10^{-30}	*	Social	2.11×10^{-79}	*
Empirical	$5.15 \times 10^{+1}$		Empirical	1.73×10^{-36}	*

* significant.

In the personal profiles, all six dimensions were significantly associated with "Sustainability". Differentiated by how significantly the dimensions seemed to be associated with sustainability, only the dimension "Empirical" was less significantly associated than the other dimensions in the personal profiles. These results are also shown in Table 3.

In both cases, for job advertisements and personal profiles, the contingency coefficients were 0.26 and 0.29, respectively.

5. Discussion

5.1. Discussion of the Results of the Descriptive Data: Job Advertisements and Personal Profiles

Organizations: The majority of job advertisements were from small and medium organizations, indicating a significant contribution of these sectors in the job market. Public institutions accounted for a small portion of job advertisements, suggesting a potential focus on private sector employment. Larger private organizations, particularly in industries like consulting, grocery retail, and pharmaceuticals, had a significant presence in job advertising. The dominance of IT services and consulting category in job advertisements highlights potential growth and demand in this sector.

Location of Work by Canton: In Switzerland, the Zurich metropolitan region is the economic leader. About 10% of Switzerland's total Gross Domestic Product (GDP) is generated in this region, and one in ten Swiss jobs is located here. The city of Zurich is among the top ten international financial centers [60]. One reason for this could also be the high number of domestic and foreign multinational companies that have their headquarters in Switzerland. These companies make a significant contribution to the Swiss economy; they create 1.3 million jobs, often in highly productive sectors, contribute to more than one-third of Switzerland's GDP, and generate nearly half of Switzerland's corporate tax revenues [61]. According to the analysis of the job listings, the Canton of Zurich was the most favorable location for finding job opportunities. Jobs in the real estate, facilities, architecture, and civil engineering fields were relatively evenly distributed across locations in Switzerland.

Industries of organization: In total, about 570,000 full-time equivalents are employed in the real estate industry, representing 15% of total Swiss employment. Most full-time equivalents in the real estate industry work in construction (about 50%), manufacturing and other related services (20%), facility management and security (circa 10%), architecture and engineering (10%), and housing (circa 5%) [60].

Seniority Levels: Associate (junior) to mid-senior level positions are in high demand, while director- and executive-level roles account for a minority of job advertisements. Facility management stands out as an area where approximately 20% of positions require director- and executive-level experience.

Location of work by on- or offsite and Job Type: The majority of jobs require on-site presence, while a notable portion offer hybrid work options combining on- and off-site and

even remote work. Real estate managers (25%) and facility managers (around 10%) have a higher likelihood of being offered hybrid or remote work opportunities. Originally, one would expect jobs in real estate, in particular in facility management, to be on-site, but as the way of working is changing due to the coronavirus pandemic (COVID-19), and there is and will be a shortage of young talent, the definition of office space and place of work is also changing in real estate [62,63]. It might be that this development leans toward a more digitalized way of working, especially in the field of facility management. Further research might be valuable in the field of remote or hybrid work location for facility managers. Nevertheless, most of the job advertisements request full-time, not part-time.

Although the data retrieved are only a snapshot of the job advertising landscape in Switzerland, the distribution of real estate jobs found here is consistent with other findings [39,64].

Organizations and Residence: Small and medium enterprises employ a significant portion of the workforce analyzed, suggesting their importance in the job market. Facility managers (about 25%) and civil engineers (30%) are prominently represented among employees of large private organizations. The majority of the individuals live in the Canton of Zurich.

Job Functions and Seniority Level: Regarding the personal profiles, it can only be assumed that the question about the job function is not clearly asked, the possible selection is not applicable, or individuals do not want to provide this kind of information. A total of about 35% of people stated that their professional function was technical or engineering, which seems reasonable given the work areas analyzed here. The same reasons could apply to the seniority level. Almost 96% of the personal profiles analyzed did not provide this information. Nonetheless, this could indicate a lack of maturity in real estate jobs. Especially in organizations in which real estate is not part of the core business, such as life sciences, food retail, and banking, there might be little incentive to rank individuals employed in the so-called secondary processes higher in the organizational hierarchies. As a result, the leaders of these secondary processes and their teams may have less exposure to the executives than the leaders of primary processes and their teams. Successes and challenges related to the management of sustainability in real estate may be less discussed and decided upon than issues related to the core businesses.

Sex: The distribution of sexes in the industry is skewed, with approximately 70% men and 30% women. Real estate managers and architects have a slightly better representation of women compared to civil engineers and facility managers. The lack of women in these work areas shows the untapped potential of the female workforce in all disciplines [62,63]. However, as long as the majority of jobs request full-time, not part-time, this potential might not be exploited [65].

Educational Qualifications: The data provided on higher education, e.g., Bachelor or Master of Science, and continuing education, e.g., Master of Advanced Studies, showed that about 35% graduated from a university. Consecutive Master's degrees were the most common (around 20%), followed by approximately 10% opting for continuing education. In Switzerland, the grammar school rate is about 20%, and the vocational baccalaureate rate about 15% [66]. Nevertheless, the education of facility and real estate managers seems to be outdated, with the mean graduation date in 2000. This could also indicate a lack of suitable junior staff among the real estate and facility managers. However, since the birth dates of these individuals are unknown, this is only a guess. Differences in educational qualifications exist within the real estate industry, with civil engineers (around 75%) and architects (approximately 60%) having higher rates of academic degrees. Facility and real estate managers have a lower rate of academic degrees but show a preference for continuing education. Further research is required, especially in the light of demand for facility managers in senior positions.

These findings provide insights on the distribution of job advertisements, workforce composition, location preferences, job types, and educational qualifications in the real estate

industry. This can be used to inform recruitment strategies, workforce planning, and talent development initiatives in the relevant sectors.

5.2. Discussion of the Results of the Descriptive Data: Sustainability and Its Dimensions

The keyword "sustainability" appeared in 12% of the job advertisements examined, indicating a moderate level of demand for sustainability-related skills and expertise in the industry. Companies are actively seeking professionals with a focus on sustainability, as evident from job titles such as "Global Sustainability Expert" and the need for individuals who can provide sustainable solutions. Nevertheless, it is known that job advertisements list a wide array of qualifications. Given the efforts to sustainably transform the built environment, it may be thought-provoking that the word "sustainability" did not appear more frequently in job advertisements. The discourse analyzed shows that sustainability is not the most important issue for organizations when looking for potential employees. Additionally, not all dimensions of sustainability may be "enforced" or actively pursued by companies. Companies exist to generate a return on investment, regardless of marketing claims that their services and products might improve health or even society.

In the personal profiles, the term "sustainability" was rarely used in the descriptive parts. There were few instances in which individuals expressed a passion for environmental issues or had relevant educational backgrounds in sustainable architecture and technology innovation. However, it could be that the issues related to "sustainability" are already well managed in the organizations or that it is so self-evident to the workforce that there is no need to mention this topic at all. Another reason could be that most people do not to want to repeat these competencies, skills, or knowledge in the descriptive parts of their profile when they have already mentioned their degree.

Whatever the reasons, the research suggests that companies are demanding competencies, skills, and knowledge in the area that are relevant to the implementation of sustainability in the real estate industry. Sustainability and the dimensions defined here, which enables the management of sustainability in real estate, also seem to play a role in the job advertisements and in the personal profiles. Only a few individuals appeared to be qualified in all required dimensions. Interestingly, among these individuals were a CEO, a director, and an entrepreneur. This could confirm that a so-called link between those working in the real estate and the executives and/or the principal stakeholder is weak or even non-existing. Future research could follow up on those that scored highly in one of the dimensions described. To create an even better fit between the competencies sought and described in the job advertisements and the (future) workers in real estate, the keywords listed in chapter 3, "Materials and Methods", could be useful to enable the sustainability transformation of the built environment. However, further research is also required to follow up on this matter.

5.3. Discussion of the Empirical Results: Sustainability and Its Dimensions

Public and private organizations are looking for competencies, skills and knowledge in their workforce that fit within the scope of sustainability in real estate. According to the job advertisements analyzed, e.g., one should have the qualifications ("Processual" dimension), know-how to work economically and be familiar with digitalization and technologies ("Economical" and "Technical" dimensions), and be and become innovative ("Social" dimension). In addition, the workforce appears to be competent. However, unlike in the job advertisement of the organizations, employees seem to recognize the importance of working with data, analysis, and reading graphs ("Empirical" dimension). While certain dimensions, such as "Processual", "Economical", "Technical", and "Ecological" were more strongly associated with sustainability in job advertisements, personal profiles tended to emphasize the "Technical", "Social", and "Empirical" dimensions. These findings indicate that different dimensions play varying roles in the association with sustainability in job advertisements and personal profiles. Understanding these associations can help organiza-

tions and individuals better align their sustainability-related messaging and qualifications to meet industry demands and expectations.

According to this analysis, most of dimensions represented by the keywords derived from definitions and contexts were significantly associated with sustainability, even if the effect between what organizations were asking for in their job advertisements and what the workforce as a whole described as their competencies, skills, and knowledge, as well as what was defined as being part of sustainability in real estate, was rather moderate [59]. The contingency coefficients for both job advertisements and personal profiles were relatively similar, with values of 0.26 and 0.29, respectively. This coefficient represents the strength of association between dimensions and sustainability. The similar values suggest a moderate association between the dimensions and sustainability in both cases.

Few studies have addressed the transdisciplinary context of sustainability in real estate, which requires expertise, competencies, and skills from numerous disciplines. In addition to knowledge in disciplines primarily based in the areas of real estate, e.g., architecture, civil engineering, real estate management, and facility management, other disciplines such as business administration, social sciences, and information and operational technologies are needed to manage sustainability in real estate, including through digitalization. Critical thinking, empathy, and emotional intelligence are just some of the competencies to be mentioned on the basis of the literature review in the context of education for sustainable development. One consequence of this could be that the relevant professional organizations take all these dimensions into account when drafting job advertisements. Nevertheless, follow-up studies could consider larger data sets that include different countries.

5.4. Discussion of the Overall Results: Proposed Framework for Sustainability in Educational Contexts

Importance of Education, Research, and Innovation: Education is the most important foundation for independent and responsible thinking and acting, research is the source of new knowledge, and innovation is the basis for market success. Education, research, and innovation are thus among the basic requirements for ensuring individual well-being, social cohesion, economic growth, and global sustainable development [53].

Broad and In-Depth Knowledge for Sustainability in Real Estate: Dealing with the highly complex topic of sustainability in real estate and the built environment requires broad and in-depth knowledge in different disciplines and comprehensive competencies.

Early Introduction of Education for Sustainability: Introducing education for sustainability at the earliest stages of learning should be a given. Nevertheless, the above discussion shows how broad but also in-depth knowledge in different disciplines and comprehensive competencies are required to cope with the highly complex topic of sustainability in real estate and the built environment. In addition to practitioner-focused continuing education, such studies could fit perfectly into master's programs at universities. Firstly, in a bachelor's program, students learn to deal with issues and challenges in one discipline; in a consecutive master's program, students can learn to deal with contexts set in various disciplines. Secondly, MSc programs always include research-based studies; the content distinction from existing continuing education programs should be noted.

Evolution of Real Estate and Facility Management Education in Switzerland: In Switzerland, until the introduction of the BSc and MSc Facility Management in 2006 and 2008, education and academic qualification in the context of real estate and facility management had been provided by various certified academic programs leading to a wide range of Master of Advanced Study programs offered by the Universities of Applied Sciences and the University of Zurich in Switzerland [67–69]. However, it was not until ten years later that the first MSc in Real Estate was established at the School of Business and Finance at the Lucerne University of Applied Sciences and Arts. An analysis showed that the focus is on real estate economics and finance, as is the case with most MAS programs in real estate and facility management in Switzerland [70]. For example, the MSc in Real Estate at the Lucerne University of Applied Sciences and Arts focuses on financing and investment topics in real estate [71,72]. Since the economic and financial focus is an important aspect

when it comes to promoting sustainability in real estate, environmental, and social aspects of sustainability, as also required in the job advertisements analyzed, may not be sufficiently addressed. This seems to be the case with the MSc Real Estate and Facility Management, which has been offered at the Zurich University of Applied Sciences, which integrates all six dimensions of sustainability in its educational framework.

Integrating Sustainability Dimensions in Real Estate Education: Real estate education programs should take up the challenge of educating students who are able to perform in all sustainability dimensions and thus be part of enabling sustainability in real estate. Further research should analyze whether MSc education programs in Europe are preparing the workforce in the required way.

Education as a Key Enabler for Sustainability in Real Estate: By doing so, research could assessed whether education, as described in the Sustainable Development Goal (SDG), especially number 4.7, may be key and enable support for change and managing sustainability in real estate [7].

These findings underscore the importance of comprehensive sustainability education, the evolution of real estate education programs, and the need to address all dimensions of sustainability in the curriculum to meet the demands of the industry and contribute to sustainable development.

5.5. Novelty Score

The novelty score of this contribution might be moderate. The paper presents an interesting observation and provides practical recommendations, but it does not introduce radically new concepts or significantly challenge existing knowledge. The study focused on analyzing the sustainability-related qualifications match between employers and personal profiles in the Swiss real estate job market. It examined job advertisements and personal profiles to identify the presence of sustainability-related keywords. The findings suggest that while companies mention sustainability in their job advertisements, employees rarely emphasize this aspect in their profiles. It is proposed that organizations should use sustainability keywords in job advertisements and employees should include the respective keywords in their profiles to improve job matching and enable sustainability in real estate. It is also suggested that educational organizations should incorporate sustainability dimensions into their education and trainings. In terms of novelty, this paper highlights the discrepancy between job advertisements and personal profiles regarding the mention of sustainability in real estate. Additionally, this paper offers practical suggestions for organizations, employees, and educational institutions to address this mismatch and enhance job matching in the context of sustainability. While the ideas proposed are not entirely groundbreaking, they provide specific recommendations based on the study's findings.

5.6. Limitations

In general, to date, there is not one holistically and generally accepted definition or model for managing sustainability in real estate. The dimensions and keywords proposed here could be considered when further developing a holistic definition or approach to managing sustainability in real estate.

Another limitation might be that the potential bias introduced by the searcher's profile in the search results. It may not be possible to duplicate the same results from another researcher, as the results were also provided on the basis of the researcher's profile and the search algorithm used by LinkedIn.

The results of the job advertisements and personal profiles in the real estate sector are analogous to the results of regular job surveys of the Swiss labor market, but the number is nevertheless small. If the sample is small or not representative of the entire population, the findings may not be generalizable to the broader context.

The data lack comprehensive information on seniority levels, job functions, and educational qualifications for a sizable portion of individuals, making it challenging to draw conclusive implications. The data collected from personal profiles rely on self-

reported information. There could be limitations associated with individuals' accuracy or willingness to disclose certain details, potentially affecting the reliability of the findings.

Although derived from definitions, the selection of keywords was based on a literature review and the authors' and executives' experiences of how frequently they are used rather than on an empirical basis. The list of keywords is not final.

Furthermore, the question arises as to what content, teaching, and learning objectives should be taught to both current and future employees to ensure and accelerate sustainability in real estate.

However, given that Switzerland is home to many small and medium enterprises as well as multinational corporations, and that Switzerland's government places a high value on education, research, and innovation, this analysis could have some merit regarding whether companies are demanding sustainability transformation in real estate and whether the workforce is ready to provide and enable this [73].

6. Conclusions

The findings of the study suggest that there is a potential discrepancy between the use of sustainability-related keywords in job advertisements and personal profiles within the real estate industry. To address this issue, several recommendations and implications can be considered.

According to the results, it is recommended that companies actively incorporate the suggested sustainability-related keywords in their job advertisements. Companies can enhance the clarity and accuracy of their sustainability-related requirements, attracting applicants with relevant qualifications and skills. Similarly, employees are encouraged to include these keywords in their personal profiles to better highlight their sustainability competencies and increase their chances of matching with appropriate job opportunities. By improving the alignment between companies' expectations and individuals' qualifications, the overall job-matching process can be strengthened, leading to the promotion and sustenance of sustainability within the real estate industry.

Furthermore, the study has important implications for educational institutions. It is suggested that these 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.

The sample size of 600 job advertisements and 1520 personal profiles obtained from LinkedIn may be considered small, and the generalizability of the findings might be limited. Further research is needed, as the area of understanding what companies request and what individuals offer in terms of sustainability qualifications is not well-developed.

To address the limitations and expand the knowledge base in this area, several opportunities for further research can be pursued. Firstly, a larger-scale study with a more diverse sample across different regions and sectors can be conducted. Secondly, exploring the underlying reasons for the discrepancy between job advertisements and personal profiles regarding sustainability qualifications would provide valuable insights into the dynamics and challenges of sustainability workforce management in the real estate industry. Lastly, future research could focus on assessing the effectiveness and impact of incorporating the suggested sustainability-related keywords in job advertisements, personal profiles, and educational institutions, thus contributing to a better understanding of how such approaches facilitate sustainability transformation in the built environment.

Funding: ZHAW Zurich University of Applied Sciences.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Publicly available datasets were analyzed in this study. These data were retrieved from LinkedIn (https://www.linkedin.com accessed on 13 April 2022) with technical support.

Acknowledgments: For technical support from Alfie Lambert from LIX (https://lix-it.com accessed on 13 April 2022).

Conflicts of Interest: The author declares no conflict of interest.

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