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Facebook Data as Part of Cultural Heritage Investments Toolbox: Pilot Analysis of Users Interests and Preferences Concerning Adaptive Reuse

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Abstract: The growing popularity of social media data brings questions about its accuracy and usefulness for a wide array of cultural heritage projects, often lacking data sources crucial for better planning and implementation. In this paper, we are studying the opportunities offered by the freely available Facebook Ads Manager data on target group sizes in different locations. We conducted a small experiment and a pilot survey to verify if Facebook data concerning its users' interests is accurate and could be used to facilitate the implementation of projects in the field of adaptive reuse. Despite all discovered limitations of this approach, we point out how Facebook data, along with other social media outlets, can be used to extract some strategic information and add to the socio-cultural assessment toolbox. As such, this type of data could be of use to local leaders planning activities and investments around cultural heritage sites. We also posit that such data can facilitate benefit transfer from cities through better understanding of local preferences and values-orientations.

Keywords: cultural heritage; adaptive reuse; social media analysis; benefit transfer method; transfer of knowledge



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1. Introduction

The development and implementation of sustainable planning [1–3] and revitalization programs became one of the biggest challenges for urban decision-makers. With varying degree of success, leaders and innovators worldwide have been struggling to introduce sustainable solutions and policies in various areas of city functioning: from transportation to cultural heritage. Transforming cities into more sustainable and less wasteful organisms is not an easy task—it requires joint effort of many stakeholders and a deep understanding of complex relations between goals of sustainable development and human preferences.

The aim of this paper is to test the usefulness of freely available data derived from social media in gaining such insights. Much has been said about social media as communication platforms and public relation tools [4–13]. Here, we study their not-so-obvious functionalities, allowing for relatively simple numerical assessment of interests' propagation in a given population. Our main research questions were: (I) Can Facebook Ads Manager data help assess the preferences and interests of a given community? and (II) Can Facebook Ads Manager data be used to compare cities in terms of citizens interests and preferences to facilitate the transfer of good practices?

We posit that our method may help local leaders and changemakers to better understand interests and preferences of local communities and, as a result, to support citizen-centered sustainable solutions. Our study aims to fill the research gap by providing a more comprehensive picture of the social media as data source for planners and community leaders. Especially the latter could benefit from this cost-free approach to gaining more insight into the local milieu.

This is particularly important in the context of global knowledge transfer. Cities around the globe have been testing and monitoring the implementation of sustainable policy and are willing to share their insights as well as promoting what turned out to be successful. With a pressing need for action, many policymakers might be tempted to copy solutions that were proved to be working, but the simple replanting of ideas from one place to other is rarely sufficient. The inadequate understanding of citizens' preferences, motivations or interests has led to a failure of many policies, no matter how sophisticated or potentially beneficial the solutions [14]. Those failures teach us that every policy transfer has to be preceded by the diagnosis of socio-economic, cultural, and political context as well as preferences of the target community. The greater the similarities between an original implementation site and a new location, the bigger are the chances that the solution will be successfully adopted/replanted. If the context varies too much, new solutions may underperform, or, in the worst-case scenario, lead to new conflicts and other negative side effects.

Therefore, the process of rehabilitation, restoration of cultural heritage and landscape should be accompanied by gathering of data that can be used to compare locations. Moreover, the same data should inform policy makers how to best communicate a new solution to the citizens, in order to entice a better response from the target community. Adopting a well-tailored narrative can help trigger public engagement, which in turn enables dialogue and can facilitate more successful and socially sustainable implementation [15,16].

1.1. The Field of Cultural Heritage Adaptive Reuse

In this paper, we present the results of the pilot research testing if social media data (Facebook advertising data) can inform city-level policies and changemakers operating in the specific field of cultural heritage adaptive reuse. Cultural heritage, such as historical sites and landscapes, museums, temples, and urban parks, can be defined as resources that provide over time a range of cultural, social, economic, and environmental output [17].

Cultural heritage is an extremely interesting policy field to analyze, as it plays the role of a multifaceted platform, where diverse actors, following different values and interests, can find their niches and collaborate to produce a successful outcome [18]. However, as we could observe in several case studies [19], there is often a visible clash of values around cultural heritage investments. On the one hand, keeping the original character of a historical site or landscape seems vital for tradition-oriented local community members and the so-called heritage community—made of art historians, architects, and similar experts, guarding the site historical value. This is one of the important manifestations of collective processes of meaning-making around built heritage—especially important for those local communities, which link their identity to nearby historic places or landmarks [20]. On the other hand, redesigning old buildings or whole parts of the city to become more sustainable, is crucial from both climate and economy perspective. It allows for buildings to become less wasteful and resource absorbing (through energy and materials conservation, closed cycles of water and heat, local value chains, etc.), but also to maintain or even upscale their social and cultural functions.

Therefore, the changemakers have to tread carefully between keeping the original character of these places and allowing for its use and reuse in an environmentally friendly and economically sustainable way. Doing that requires deeper knowledge about communities' preferences and needs, to avoid the mismatch between the vision of project managers and local residents. In this, the social media data can become an asset and a tool for the proper calibrating of investment projects, especially those imported from different countries or communities. We hypothesized that the social media analysis will allow for cost efficient, practical tool for negotiating changes within the local communities as well as providing solutions and spaces for local businesses.

In particular, we verify if tools like Facebook Ads Manager can help local project leaders assess the number of people who might become enablers of change in the area, and who can participate in the process of adapting good practices to fit into particular

communities. This step, requiring the exploration of local values orientation as well as interests and preferences, is especially important when a certain project or innovation brings new norms into the community, requires behavior change or acquiring new skills [21].

Our paper describes the results of the pilot application of this approach to diagnosing local orientations and preferences. Although we are conscious that social media data is often used in ethically doubtful way [22–24], we hope that with implementation of proper ethical protocols it can also create opportunities for civil society leaders and other non-profit or non-governmental actors interested in cost-efficient data collection methods. During this exercise, we tested what kind of data about users' interests and preferences can be derived from Facebook advertising service, to see if it can be useful to guide the implementation of adaptive reuse projects in the field of cultural heritage.

Although at this moment in time, Facebook algorithms remain highly obscure and difficult to use in planning, our data illustrates how this type of analysis can easily reveal differences between communities in terms of interest profiles, but also help finding similar trends between cities and countries. The validation of data is also presented, based on an online survey disseminated through the same Facebook ads system. Given the fast development of social media analytics, we postulate systemic reflection on its benefits and shortcomings to make sure they strengthen knowledge-based planning instead of blind top-down application of certain ideas and investments.

1.2. The Studies of Social Media in the Context of Cultural Heritage

New media and ICT technologies are extensively analyzed within the context of built and natural heritage. Various studies [25,26] have assessed the efficacy of new media as adaptive reuse technologies and tools, enabling the cultural heritage to become more interactive, dynamic, and innovative. Some researchers illustrated how smartphone or tablet apps can be used as catalysts of place attachment [27]. Others focused primarily on how social media changes the perception of cultural heritage and behavior of users in the heritage sites. The latter was based on qualitative and observational studies, during which behaviors such as taking photos and sharing them on Facebook were studied [28].

The use of online data in cultural heritage research is often associated with visual media, such as Instagram [29] or older Flickr [30]. The visual and geolocation analysis was focused on user experience and social practices within the cultural heritage sites, as well as outside. As it was expressed by Vardopoulos et al. [29], visual social media “are used (. . .) as a means of mobilizing communities, by defining specific city locations (. . .) as places that provide an encouraging socially unifying channel for community involvement”.

Some of the researchers proposed qualitative methodologies of organizational studies in the context of cultural heritage. For example, van der Hoeven [26] studied “crowd-sourced heritage”, using the qualitative content analysis of the social media activities and policy documents of 19 Dutch heritage projects and organizations. It has conclusively been shown that online urban heritage practices seem to have more impact when they are rooted in the wider media environment or combine different media types (not only new media). The crowdsourced heritage was therefore defined as the combination of individual practices, social media presence and the organizational network of NGOs, local traditional media, and public archives.

None of the contributions to research on cultural heritage listed above include quantitative analyses or the use of quantitative data from social media, such as Facebook, to shape and guide leadership of cultural heritage projects or wider public-benefit policies. We would like to fill this particular research gap by introducing the use of Facebook Ads in systematic gathering and analyzing the quantitative data on cultural heritage sites and its potential users.

Introduction of innovation in the area of adaptive reuse projects can pose a challenge for local governments and leaders because its success depends on understanding the citizens' interests and abilities to change their habits. For many, change implies danger or unwanted effort, others are motivated by the status quo bias [31]. Roger [32] argued

that the conflicting values might be the reason why people avoid engaging in innovative actions and Argyris [33] shows that lack of proper knowledge about the innovation has to be overcome in order for the change to happen.

Studies based on digital data sources can help leaders recognize existing resources and most promising mobilization frames [34] to apply within local communities. This approach can be especially useful in testing the compatibility of values promoted by the planned intervention (e.g., innovation and sustainability) with those supported by the local community (e.g., tradition and local identity).

1.3. Social Media as Tools for Benefit Transfer Analysis

Many innovative solutions are based on the cross-fertilization and experience exchange between local leaders, changemakers, and expert communities. For example, as mentioned above, good practices concerning adaptive reuse can be exchanged between countries or cities, but to do that, project leaders have to adapt certain elements of these practices to the specificity of their local conditions. To transfer innovative solutions (e.g., circular economy models) between locations it is important to know how general the results of specific implementations are and to what extent we can expect a similar positive outcome. Those questions relate to the benefit transfer (or value transfer) issue and seek to investigate which (general and specific) conditions from various case studies are more or less valid for a new given case at a distinct site [35].

The benefit transfer method [36,37] was so far extensively used in cross-disciplinary environmental studies [38,39]. The core idea behind the benefit transfer method boils down to the benefit estimation for one context by measuring benefits from another context. In practical terms, the benefit transfer method is realized in several methodological steps. Firstly, the researcher has to identify and study specific values in one context that could be transferred to other contexts. Secondly, the researcher decides whether the identified and studied values are transferable when it comes to other populations and their characteristics. Thirdly, the researcher is adapting existing values to the new context, e.g., by using additional and supplemental data, as well as by investigation of social understanding of the specific value in the new context.

We hypothesize that social media data provide comparative opportunities for benefit transfer analysis and implementation within the field of cultural heritage policy in similar urban contexts. To date, several studies have specifically investigated the role of Facebook Ads for data-driven solutions for local communities, policymakers, and other stakeholders. Many of those applications concern public health issues, e.g., Araujo et al. [40] used Facebook data for tracking non-communicable diseases around the world. The data was based on demographics such as age and gender, and also other information provided by the users on their Facebook pages (such as interests, hobbies, favorite pages etc.). A broader methodological perspective has been adopted by Gittelman et al. [41] who used Facebook likes data in the studies of public health surveillance. In this particular case, Facebook data was triangulated with traditional public records. Authors introduced an analytical model that was more precise in predicting specific diseases than the traditional models based on data generated by public institutions.

The use of social media data was also applied to other specific segments of public policy, such as migrant assimilation policies [42], predictive potential of crime rate [43] and social consultations around energy technologies in the local community [44]. For example, Dubois et al. [42] studied the levels of assimilation of Arabic-speaking migrants in Germany, using the intra-Facebook analysis for testing the propagation of “distinctly German interests” (comparing to more generic or worldwide interests) within the specific groups of Facebook users.

Researchers emphasized the exploratory relevance of geolocation and segmentation data, which enables analysis at the level of local communities. For example, Fatekhia et al. [43] proposed the predictive model of a local crime rate, based on the triangulation of Facebook demographical data and zip codes. Two sources of data increased the accuracy

of predicting the crime rate in local communities by several percent compared to models based on public data.

Some analysts e.g., [44] have attempted to introduce Facebook's analytical and marketing tools to the process of social consultation, as demonstrated in case of the emerging energy technologies, such as hydraulic fracturing for oil and gas in the United States. This research was based on an online survey that was distributed by the Facebook Ads marketing tool. Although this particular tool has helped map positive and negative opinions about shale gas extraction, researchers suggest that the pool of respondents should be expanded for better data saturation. The lack of transparency in the construction of Facebook Ads "interest categories" was also defined as problematic. Given the recommendations from previous studies, we attempted data triangulation to verify Facebook data, and to test their usefulness to build accurate solutions for local communities.

1.4. Social Media as Public Engagement Tools

Implementing sustainability solutions without proper data could prove difficult for both local leaders, as well as national and municipal governments. Kinzer [3] argues that transformations required in the process of adapting sustainable lifestyles could be achieved more easily when local communities are engaged in the process and points out that gathering knowledge as well as adaptive management skills are required for successful implementation. One way of achieving that goal could be adopting the tools that already exist, such as social media analysis.

As various studies show, local governments around the globe increasingly use social media as tools of participation [45–48]. However, the governments' use of social media varies, ranging from announcing and informing, consulting and involving, to collaboration and empowerment [45]. It is indeed tempting to limit consultation processes to the Facebook audience and forget that participation requires long-term engagement in the cycle of information gathering, discussing, and communal decision-making.

As Arnstein [49] famously pointed out, each level of participation means stronger voice for stakeholders and citizens. However, when it comes to social media engagement, most of the researched government pages and online accounts used it primarily as a tool for announcing and informing, with the exception of police offices in The Netherlands and USA that were using social media as a means of collaboration, building virtual networks that contributed to strengthening the coproduction of safety by e.g., enabling the police to reach more citizens faster [48]. However, the dominant one-way style of communicating with citizens remains an important obstacle in using social media as an effective tool for building social support for sustainability policies and goals. Yet, other local actors, like associations, informal initiatives, or protest movements, tend to use social media in a much more comprehensive and open way. As Sowada [50] points out, grassroots urban movements are extremely strategic and effective in using Facebook to inform, mobilize and include wider audience in local activities or protests. However, this e-resourcefulness [51] is often limited to using standard predefined functionalities and could benefit from strategic use of interest analysis (see e.g., audience scan tools proposed by Sotrender company).

Many of the studied activists perceive Facebook as an important (although by no means sufficient) tool for networking and coordinating civic actions nationwide, as well as monitoring public discourse around crucial issues. We were interested in testing if simply using tools provided by Facebook can help similar changemakers gain some knowledge about the interests and goals of citizens without having to engage them in the time-consuming face-to-face process or investing in proper surveys and diagnostic analysis.

2. Materials and Methods

Our research consisted of three stages: (1) verification of the accuracy of targeting data offered by Facebook Ads Manager, (2) study of preferences concerning changes in built heritage induced by adaptive reuse, and (3) exploration of similarities between cities based on their residents' interests derived from Facebook Ads Manager. The aim of the

third stage was to illustrate how “soft” data on residents’ interests can be used to identify similarities and differences between cities in context of adaptive reuse and to offer practical implications for leaders, policy makers and managers of adaptive reuse projects. We selected two interests that are relevant in the context of adaptive reuse projects balancing the cultural and environmental aspects: cultural heritage and sustainable development; plus two control interests: new technologies and innovation.

2.1. Ethical Issues

Extraction of data from Facebook raises concerns of many scholars and experts, especially in the light of the growing number of cases showing how the data provided by users of social media is mishandled and abused. Therefore, we thoroughly considered the ethical aspects of the study and its implications. The design and procedures of both studies were also approved by the Research Ethics Committee at the Robert Zajonc Institute for Social Studies, University of Warsaw.

In our studies we collected two kinds of data via Facebook. In the first study, we asked Facebook users to fill in a short questionnaire. Facebook Ads Manager enables to promote a link with a study among Facebook users who have a specific set of interests, like sustainable development or cultural heritage. Facebook algorithms extract users’ interests from their online behavior. To make sure we do not exploit our respondents, prior to the study the participants were informed about the aim of the study and its character and had to give their explicit consent to participate. The participation in the study was voluntary and the respondents could withdraw from the study at any moment, without the need of providing us with any explanation. All data was gathered anonymously.

In the second study we gathered Facebook data on the interests of its users. Each person who promotes a post on Facebook by its Ads Manager is informed about the number of Facebook users who share a specific set of interests, but no personal information about the users is revealed. Based on that information one can decide on the optimal target group of users, by indicating a specific set of interests and location and checking how many of potential recipients of the post are on Facebook. It is only possible to obtain approximate quantities, rounded to one hundred. If there are less than one hundred users interested in a given subject, no further data can be obtained. This type of browsing through Facebook users’ interests is free of charge and available to anybody with a Facebook account. Facebook collects the data on its users’ various online activities based on its consent agreement. Users are informed that their online activity is analyzed by Facebook algorithms and, if they agree, they can receive ads compatible with their interests (or rather Facebook’s interpretation of their interests). Every Facebook user has an opportunity to define the extent of data that is shared with potential advertisers or to disable such a function.

2.2. Study 1a—Verification of Facebook Users’ Interests

The assignment of interests is done by Facebook and the algorithms used in this procedure are not open and cannot be verified by anyone outside Facebook. Therefore, we decided to verify the accuracy of Facebook algorithms by comparing the assignment of interests with interests self-reported in the questionnaire. We hypothesized that users, who according to Facebook are interested in cultural heritage, will indicate an interest in cultural heritage more strongly than those who are defined as interested in sustainable development, innovation, or new technologies.

The online questionnaire was created on SurveyMonkey platform and then promoted via Facebook. Altogether, we targeted four groups of Polish Facebook users: users interested in cultural heritage, users interested in sustainable development, users interested in innovation, and those interested in new technologies. The users assigned to more than one group were excluded from the research.

Our short questionnaire asked users about the strength of their interest in four mentioned areas (0 indicating no interest, and 7 indicating very high interest in a topic). We

advertised the questionnaire as a study concerning the local community. The questionnaire was promoted for ten days from 25 June to 5 July 2020 on Facebook at the total price of \$171. Altogether, 194 users completed the questionnaire, selected based on their interest in a given category. We had to exclude 14 respondents who learned about the questionnaire not from a sponsored link, e.g., from other users who shared the link to the questionnaire with their friends via mail and not via the pre-defined Facebook ads. The questionnaire was anonymous. We only controlled which questionnaire was completed by the representative of which targeted group. In the end we gathered 50 responses from Facebook users who were targeted as interested in sustainable development, 46 interested in cultural heritage, 45 interested in innovation, and 39 interested in new technologies.

2.3. Study 1b—Preferences toward Changes in Built Heritage

In the second step we asked users about their preferences toward specific aspects of adaptive reuse of built cultural heritage. Firstly, we wanted to investigate how the readiness to accept changes in built cultural heritage can be influenced by specific interests. We hypothesized that the interest in sustainable development will increase people's readiness for change in built heritage as long as the investment leads to the implementation of more environmentally friendly solutions, even at the cost of authenticity of the place, while interest in cultural heritage will decrease the acceptance for change.

Moreover, respondents were instructed to evaluate four aspects of adaptive reuse projects: preservation of authenticity of the building, implementation of environmentally friendly solutions, creation of new jobs and satisfaction of diverse needs of the local community. The four aspects represent four pillars of sustainable development: economic, social, cultural, and environmental [52].

2.4. Study 2—Data Collection of Facebook Users' Interests

The aim of this stage of our research was to show how Facebook data regarding interests can be used to better understand the specificity of the local community, including their interests' profile. The sizes of the interested population were also derived from the Facebook Ads Manager, which offers targeting a specific group of users based on their age, gender, place of residence, education, and/or interests. After specifying the characteristics of a target group, Facebook returns information about the size of such a group in a given location. For example, if you want to promote a post among adult women, who are interested in games in Poland, Facebook will show how many of its users fit such description.

We used the same tool in order to gather information about the interests of residents of 22 cities located in 11 different European countries. We selected two cities per country (Table 1) to allow for inter-country diversity and to test if the interests in cultural heritage and sustainable development are specific to a given country. We have chosen 22 cities from the database of best practices in built heritage adaptive reuse, that were collected under the CLIC project [53].

Table 1. Cities used in the cluster analysis.

Country	Cities	Country	Cities
Slovenia	Maribor, Ljubljana	Italy	Salerno, Naples
Netherlands	Amsterdam, Rotterdam	Germany	Essen, Berlin
Spain	Barcelona, Valencia	Belgium	Genk, Louvain
Poland	Warsaw, Poznań	Sweden	Goteborg, Boras
Czech Republic	Praga, Zlin	Croatia	Rijeka, Rovinj
Great Britain	Portsmouth, Manchester		

We have gathered information about the number of users (from the tested cities) interested in (1) cultural heritage, and in (2) sustainable development. Because we investigated cities of different sizes, we transformed the absolute values extracted from Facebook into

percentages of local users. We therefore divided the number of users with a specific set of interests by the number of all Facebook users in a given city (as reported by the same Ads Manager). In this way we tried to eliminate the effect of city size from the analysis. The data was collected from 19 to 26 May 2020.

We run cluster analysis on the standardized dataset. The aim of the cluster analysis is to find groups of entities with similar characteristics [54]. In other words, we assumed that cluster analysis will reveal which cities are similar to each other in terms of their residents' interests, as defined by Facebook users living in a given location.

3. Results

3.1. The Accuracy of Facebook Algorithms

Four Kruskal-Wallis tests were conducted to determine if four groups targeted via Facebook Ads Manager (by interest in cultural heritage, sustainable development, innovation, new technologies) indeed differed in their interests. Data was not normally distributed, as assessed by Shapiro-Wilk's test ($p < 0.05$), distributions of all declared interests in division to subgroups were negatively skewed. Therefore, we decided to use non parametric test, Kruskal- Wallis test, to compare medians. Declared interest in cultural heritage was significantly different between groups, $\chi^2(3) = 16.936$, $p = 0.001$. Subsequently, pairwise comparisons were performed using Dunn's [55] procedure with a Bonferroni correction for multiple comparisons. Adjusted p -values are presented below. The post hoc analysis showed statistically significant differences in the strength of declared interests between Facebook users. Those who belonged to the target group interested in cultural heritage ($Mdn = 7$) indeed declared to be more interested in cultural heritage than members of a target group interested in sustainable development ($Mdn = 5$) ($p = 0.001$), innovations ($Mdn = 6$) ($p = 0.032$), and new technologies ($Mdn = 5$) ($p = 0.024$). There were no statistically significant differences between any other groups.

The analysis of the data on declared interests in sustainable development did not show any statistically significant difference between any of the Facebook target groups, $\chi^2(3) = 2.866$, $p = 0.413$. Similarly, no statistically significant differences were found in case of interest in innovation between Facebook target groups, $\chi^2(3) = 2.774$, $p = 0.428$, nor in a strength of declared interests in new technologies, $\chi^2(3) = 3.379$, $p = 0.337$. To sum up, the four target groups differed only on the dimension of self-reported interest in cultural heritage.

3.2. The Importance of Interests in Adaptive Reuse Projects

In order to explore how divergent interests in cultural heritage and sustainable development influence the acceptance or resistance to modification in the original built heritage during the adaptive reuse process (dependent variable) we run a multiple regression on the questionnaire data.

The multiple regression model (in a statistically significant way) predicted the resistance to changes in built heritage, $F(2, 177) = 11.884$, $p < 0.001$, adj. $R^2 = 108$. Both variables added (in a statistically significant way) to the prediction, $p < 0.05$. Regression coefficients and standard errors can be found in Table 2. Importantly, the reported interest in cultural heritage increased the reluctance to any changes in built heritage that could compromise the authenticity of the building. On the other hand, interest in sustainable development reduced the reluctance to these changes.

Table 2. Multiple regression results for readiness to accept changes in built heritage (* $p < 0.05$, ** $p < 0.01$).

	B	95%CI for B		SE B	Beta β
		LL	UL		
Constant	2.208 **	1.227	3.19	0.498	
Interest in CH [^]	0.423 **	0.251	0.595	0.087	0.361 **
Interest in SD ^{^^}	−0.151 *	−0.298	−0.005	0.074	−0.152 *

[^]CH-cultural heritage, ^{^^}SD-sustainable development.

We also explored which aspects of adaptive reuse are most important for the respondents. Four dimensions were taken under consideration: preservation of authenticity of the building, implementation of environmentally friendly solutions, creation of new jobs and satisfaction of diverse needs of the local community.

A Friedman test was run to determine if there were differences in evaluation of different aspects of adaptive reuse. Pairwise comparisons were performed with a Bonferroni correction for multiple comparisons. There was a statistically significant difference in evaluation of importance of different aspects of cultural heritage, $\chi^2(3) = 63.011$, $p < 0.001$. Post hoc analysis revealed statistically significant differences in importance of implementation of environmentally friendly solutions ($Mdn = 7$) to creation of jobs ($Mdn = 6$) ($p < 0.001$) and to satisfaction of diverse needs of local community ($Mdn = 6$) ($p < 0.001$). Similarly, the protection of authenticity of the built heritage ($Mdn = 7$) was judged as more important than creation of jobs ($Mdn = 6$) ($p = 0.001$) and satisfaction of diverse needs of local community ($Mdn = 6$) ($p < 0.001$). There were no statistically significant differences in evaluation of the importance of protection of authenticity of the built heritage and implementation of environmentally friendly solutions in built heritage under adaptive reuse process, nor were there any differences between evaluation of importance of creation of jobs and satisfaction of diverse needs of the local community.

3.3. Cluster Analysis of Interests

We ran two cluster analyses to reveal similarities and differences among studied 22 cities. In the first analysis, we used only one predictor—interest in cultural heritage—because only this interest passed the verification test run on Facebook data. In the second, having in mind the limitations of the conducted verification (see section on Limitations) we decided to explore data further and run the second analysis in which we added the interest in sustainable development. Two-step cluster analysis with just interest in cultural heritage as a predictor produced a sample ($n = 22$) with a silhouette measure of cohesion and separation above 0.5. Two clusters were revealed within the data set. The first cluster was very small, and it was composed of three cities: Barcelona, Naples, and Salerno. The second cluster was composed of the remaining 19 cities. The residents of cities that were gathered in the first cluster are much more interested in cultural heritage ($Mdn = 4\%$) than residents that populate the second cluster ($Mdn = 1\%$).

The division of cities into clusters changes when we add interest in sustainable development as a predictor. The second analysis revealed three clusters, with a silhouette measure of cohesion and separation above 0.5 (Figure 1). The first cluster was formed by the three cities in which residents are much more interested in cultural heritage ($Mdn = 4\%$) than residents of other cities. The cities in the first cluster were (again): Barcelona, Naples and Salerno. The second cluster was composed of the cities in which residents are much more interested in sustainable development ($Mdn = 34\%$) in comparison to residents of other cities. The cluster comprised of four cities: Amsterdam, Berlin, Boras, and Goteborg. The rest of the cities grouped into the third cluster in which the interest in cultural heritage and sustainable development did not differ in any statistically significant way from the overall median calculated for the whole sample.

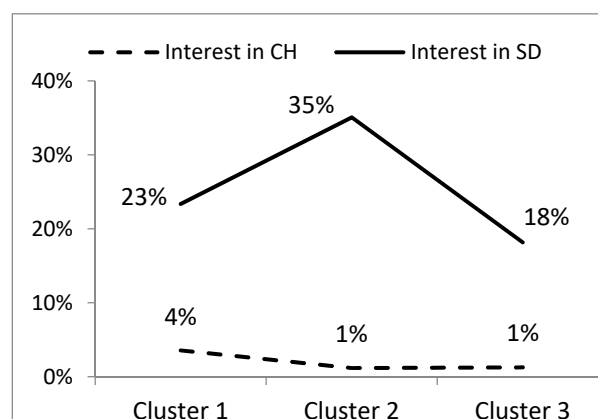


Figure 1. Mean centers of clusters.

4. Discussion

Our cities and local communities are changing faster than ever, putting pressure on every leader or manager striving to build a right investment strategy [56]. While places remain more or less stable reference points, community needs and preferences constantly ebb and flow. With the future of work, mobility and housing becoming more complex and less predictable, it is important to think differently about how we approach adaptive reuse projects in order to derive better outcomes for people.

Meanwhile, the adaptive reuse of built heritage is slowly gaining its momentum. Experts from many fields, like social sciences, architecture, economics, or environmental studies see great value in transformation of built heritage for the benefit of the local communities as well as general wellbeing [56–59]. There is an increasing number of cases in which adaptive reuse appears to be successful and policy makers and/or managers responsible for it are willing to share their knowledge and experience with others. However, success can be difficult to transfer due to many factors like beliefs, norms, values, and socioeconomic conditions of the local community. Here, we show how the data regarding interests of residents can help to understand the similarities and differences between diverse locations of adaptive reuse projects.

Facebook data shows that citizens of different cities have a unique profile of interests. For example, citizens of Barcelona are more interested in cultural heritage than citizens of Amsterdam, while citizens of Amsterdam are more interested in sustainable development than citizens of Barcelona. This divergence in interests might transfer into perception of adaptive reuse of culture heritage and landscape. Citizens of Amsterdam might be more ready to compromise the authenticity of the cultural heritage in order to achieve a higher sustainability than citizens of Barcelona. Therefore, in case when solutions developed and adopted in Amsterdam were to be transferred to Barcelona, or vice versa, it should be done with a great prudence. Otherwise, implementation of new solution might be rejected by the local community, which has other priorities and preferences.

Despite their limitations and ethical concerns [60,61], social media are here to stay and continue to both reflect as well as co-create our social realities [21,26]. It is in those realities that all revitalization or adaptive reuse projects are taking place. Some of them face strong opposition from the local communities, where most vocal members are often averse to change, especially any interference in sites perceived as shared heritage [62]. In other localizations, only a narrow heritage group remains dedicated to rescuing and investing in cultural heritage sites, while the wider community (including entrepreneurs and potential sponsors) remains uninterested [63]. With proper data it is possible to diagnose how big different groups of citizens are, what are their preferences, and even make a prediction as to how they will react to intervention.

Socio-cultural context is a crucial factor in successful implementation of adaptive reuse investments, especially in case of cultural heritage projects that are strongly linked to shared history, local identity and place attachment [29,64]. To enable effective and sustainable

projects in this area, everyday interests and overall mindset of the local stakeholders have to be taken into account at all stages. In our study we addressed only four interests among many more identified by the Facebook algorithms. Only in case of cultural heritage interests we could positively verify the accuracy of the algorithm, while in case of sustainable development, innovation, or new technologies, we were not able to find similar patterns. This result should be verified in other national contexts (as it can be culture specific) and on bigger samples with additional measures of interests, going beyond self-reported ones.

Our second analysis allowed for linking the reported interest in cultural heritage with predicted resistance to changes. We found that the interest in cultural heritage increased the reluctance to any changes in built heritage that could compromise the authenticity of the building or site. However, interest in sustainable development had a reverse effect and reduced the reluctance to this type of change.

Importantly, the protection of authenticity of the built heritage was judged as more vital than creation of jobs or satisfying diverse needs of a local community. This suggests that in the Polish context the potential of cultural heritage adaptive reuse to address the needs of local community members as well as labor market challenges is still unrecognized. Studies in other countries would allow for better understanding of those patterns and differences in the perception of cultural heritage in other cultural contexts.

This type of study could be based on the results from our third analytical exercise, which focused on clustering cities based on the percentage of population interested in cultural heritage and sustainable development. Interestingly, the cluster consisting of Southern European cities (Barcelona, Naples, and Salerno) was characterized by highest interest in cultural heritage, while another cluster consisting of Northern and Central European cities (Amsterdam, Berlin, Borås, and Göteborg) was characterized by higher interest in sustainable development among Facebook users. The similarities between cities identified based on the Facebook data could be useful for creating knowledge transfer clusters as well as coalitions for specific issues aiming at gathering wider social support.

While societal and cultural factors can be enabling in bringing innovative solutions into revitalization projects, they can just as well become main barriers in successful implementation [65]. Some of the examples of cultural heritage adaptive re-use studied within the CLIC project framework, highlight existing social barriers that cause projects to grow in an isolation from the local community and hinder their potential positive impacts.

While socio-cultural factors remain crucial for an overall success of adaptive reuse projects, they are also the most elusive and understudied. There is little ready-to-use data available to potential leaders or stakeholders interested in the initiative. While population surveys, combined with qualitative exploratory methods, would be an ideal source of information, it is very rare that leaders have the time and resources to invest in this type of professional research. This creates an interesting challenge for us, searching for alternative sources of knowledge to support revitalization processes. We hope that for those who are striving to lead adaptive reuse processes in line with local needs and values, social media data can be another source of inspiration and understanding how to better conduct investments and inspire change.

5. Conclusions

In this paper, we tested a novel and potentially useful approach to better framing investments in cultural heritage adaptive reuse. A quick analysis of freely accessible data could allow both public, private, and non-profit organizations to assess the interest profiles of local residents. As a result, local investment strategies could be based not only on the qualitative data concerning existing initiatives or political priorities, nor on costly quantitative population surveys. Instead, project leaders or managers could assess the dominant interests among local Facebook users to decide on the most effective implementation strategy.

For example, in communities characterized by high interest in cultural heritage and low interest in sustainable development, local leaders could start their information and

consultation activities with linking the importance of securing the future of cultural heritage sites with opportunities presented by green energy solutions. By addressing potential hesitancy towards change at the early stage of the projects, managers could avoid conflicts at the later stage of the implementation. Knowledge about residents' interests' profile would allow them to properly address the priorities that the local community is giving to the intrinsic value of the heritage, without resigning from modern solutions.

Similarly, in communities where interest in new technologies or innovation is dominant, local leaders interested in saving cultural heritage could invest in presenting their plans as an important link between the past and the future. By speaking the language of interests and values recognized in the local community, the managers will have a greater capability to build support coalitions around adaptive reuse projects. An understanding of the local communities and their interests should also help mobilize different, sometimes unobvious, resources and allies.

Despite discovering some shortcomings of interest profiling, we concluded that in case of cultural heritage interests, Facebook predictions were in line with self-reported interests of its users. While comparing to other types of interests, cultural heritage also remained more concrete and narrower to others, suggesting that it has potential to precisely evaluate the size of the target group.

However, the lack of transparency concerning Facebook algorithms as well as their constant modifications means that all potential users of Facebook data have to remain cautious and make sure to verify results before using them for project implementation or policy formulation.

6. Limitations

Presented research is an answer to the growing need for testing accuracy of information produced by algorithms, especially when the algorithms themselves are not publicly available for scrutiny. There are two kinds of limitations to the performed study that need to be discussed here. One is connected to the validation of Facebook data on users' interests and one is related to the cluster analysis.

In a validation stage of research, we have managed to show that the Facebook algorithms accurately identified users' interests in only one out of four tested cases. However, this result cannot be treated as a proof of low accuracy of Facebook profiling. There are few reasons for that. First of all, our survey we collected declarations not behaviors, while Facebook algorithms analyze users' online behavior. The mismatch between these two is analogical to the attitude-behavior gap that Ajzen [66] wrote about. There are many reasons why attitudes do not always embody behavior. They can stem from personality, risk aversion, external circumstances like social pressure or time. Secondly, it is possible that people who are not really interested in new technologies, innovation, or sustainable development might feel that it is socially desirable to indicate that they are interested in these matters (see social desirability bias).

We think that a more systematic study in this area is needed, especially now, when scientists are frequently reaching for social media data. Moreover, it is important to notice that the validation was conducted on a small group of Facebook users. Therefore, it would be important to run validation simultaneously in different countries and preferably on a bigger set of interests.

Because of the presented limitation, we decided to run a cluster analysis with interest in sustainable development as a predictor, although we have not managed to validate the accuracy of all data. The second limitation refers to the cluster analysis itself, or rather to the composition of predictors that influence the formation of clusters. It is important to identify a wider list of variables that influence the context of the policy implementation and use them all in the analysis. Otherwise, we can end with inaccurate clusters.

The serious limitation for implementing similar studies on the local level stem from the small size of the local population—in cases when the targeted group is smaller than 100, Facebook will not produce relevant data. This means that Facebook Ads Manager

can provide only limited data for studying local community and is useful on a city rather than neighborhood level. It is also worth mentioning that Facebook's population is rather young, so we risk ignoring the needs or interests of the older cohorts if we focus solely on the social media data. Other sources of data should be used to address this problem.

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