

A Game-Based Collaborative Decision-Making Approach for Cultural Heritage Reuse

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Abstract. Preserving cultural heritage plays a crucial role in sustaining the identities of communities and individuals while also nurturing belonging, civic participation, and collective memory. This paper explores the application of gamification as a tool for enhancing community engagement in the valorisation of cultural heritage. It addresses the need for innovative strategies to promote active participation and foster a sense of belonging, contributing to sustainable and inclusive development models. The research investigates the potential of gamification to bridge the gap between local communities, cultural heritage sites, and relevant stakeholders on a local level. A methodology for assessing the impact of gamification projects is presented, drawing upon a pilot study focused on the *Colommunity* project in Bacoli, Italy. A *game-based* collaborative decision-making approach has been implemented to encourage the co-exploration and co-management of the Colombario del Fusaro, an ancient Roman funerary site, which is currently completely inaccessible due to the absence of a suitable management plan. The study integrates the gamification approach with the Theory of Change to analyse the relationship between project activities, outputs, outcomes, and resulting social and cultural impacts. The findings highlight the effectiveness of gamification in creating engaging experiences that motivate community involvement in cultural heritage. The research emphasises the importance of co-creation processes that involve local communities, experts, and institutions to ensure the development of valuable and sustainable initiatives. Furthermore, the paper contributes to the ongoing discussion about the long-term impact of gamification in the cultural heritage sector.

Keywords: Archaeology · Faro Convention · Heritage Community · Gamification · Collaborative Decision-making process

1 Introduction

Cultural heritage preservation underpins the recognition of shared values, strengthening ties between people and places and encouraging more inclusive forms of civic engagement. The symbolic and historical value that these cultural resources often manifest represents a heritage of vital importance not only in terms of culture but also in terms of education and strengthening territorial economies, providing a fundamental context for many everyday activities. At the European level, already in 2015, the report *Cultural*

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Heritage Counts for Europe (CHCfE) [1] recommended in principle 5 of the 5 strategic recommendations to maximise the cross-sectoral impact of cultural heritage by integrating it into all sectoral policies, through participatory governance and by recognising the strategic value of culture for sustainable, inclusive and smart development at the local and regional level.

This approach is also confirmed by the European Agendas for Culture [2], which calls for the identification of guidelines for the management and enhancement of cultural heritage, because it constitutes a shared resource, a common asset and responsibility, and its preservation is a priority for national, regional and local self-governments [3]. Furthermore, the structured involvement of local actors, including civil society, in the management strategies, valorisation and creative and innovative reuse of heritage plays a crucial role in the regeneration processes of urban spaces and socio-cultural processes [3].

The Faro Convention, adopted in 2005 by the Council of Europe, emphasises the importance of cultural heritage as a fundamental resource for the well-being of communities. It introduced a significant change in the way cultural heritage is conceived. The Convention has redefined the role of cultural heritage by emphasising its relational dimension with its community, which means understanding how people interact with and derive meaning from heritage [4]. In this way, culture becomes a strategic investment sector to achieve a sustainable and regenerative heritage development model, to contribute to the building of a peaceful and democratic society. By introducing the concept of the Heritage Community, the Convention brings about a real revolution and redefines the paradigms of heritage conservation. The latter is no longer considered a mere object of contemplation, but an integral part of our collective identity [5], recognising the right of people to enjoy and contribute to its protection.

The continuous threats brought about by the processes of abandonment, deterioration, deconstruction or alteration that attack material cultural heritage, especially when minor and unrecognised, make it a more vulnerable resource due to natural factors as much as human actions [6] among which the lack of appropriate management and valorisation certainly stands out.

These phenomena risk the disappearance of the memory of these sites and the loss of their historical value and cultural identity. As pointed out by Garcia-Fernandez and Medeiros, the fragility of these assets requires new tools for awareness-raising and valorisation, including through innovative languages and technologies. To make this happen, Sacco and Teti [7] stress the importance of investment in Europe as well as in Italy for the promotion of new business models, so that cultural and creative production becomes the dynamic incubator of heritage valorisation [8, 9].

According to the Culture 3.0 framework, integrating emerging sectors like digital media and gaming into cultural production is key to unlocking culture's developmental potential. This also allows the integration of 'new human and artistic skills within the new value creation processes' [7] to overcome a passive protection model and foster a dialogue between past and present.

Artistic and cultural promotion depends first and foremost on the citizenship, which plays a fundamental role as the primary user of cultural resources, thus making it necessary for these resources to become part of citizens' daily lives [10]. Out of a static

and detached logic of heritage, innovative approaches such as gamification can be a key tool to make cultural heritage alive and dynamic, stimulating the involvement of local communities and trying to keep up with the socio-cultural changes of the context in which they are inserted, generating new forms of collective value [11]. In this logic, game-based approaches that offer place-based experiments, to attract not only the "educated tourist", but also the non-specialist visitor and primarily residents [10] must be favoured and enabled instead of standardised strategies divorced from contexts.

Several programmes at the European level - such as Horizon 2020 and Creative Europe - have adopted strategies for cultural valorisation through innovation and digitisation. Italy, too, has developed an extended partnership called Cultural Heritage Active Innovation for Sustainable Society (PE5 - CHANGES), which promotes a regenerative approach aimed at responding to contemporary heritage challenges by fostering collaboration between research, enterprises, institutions and citizens.

This contribution is part of one of these research projects, the extended partnership PE5 CHANGES - Cultural Heritage Active Innovation for Sustainable Society - promoted by the PNRR (National Recovery and Resilience Plan), conducted by the Department of Architecture (DiARC) of University of Naples Federico II in the Campi Flegrei area of the Campania region, near Naples.

This region is rich in archaeological, historical, cultural, and natural heritage, attracting significant attention due to frequent archaeological discoveries and ongoing excavations by various international research institutions. The research project focuses on exploring a unique aspect of this "distributed" heritage, emphasising its collective value over individual monuments. This objective moves beyond the traditional concept of "minor heritage"- a term that once referred to less significant or overlooked elements of cultural heritage - by recognising the value of the landscape and its layers of historical sedimentation. It advocates for a broader understanding of heritage that includes not only individual artefacts but also the collective and systemic value of entire territories. This shift challenges the notion of "monuments" as isolated objects of preservation, highlighting instead the importance of the broader cultural and natural context in which they exist [12].

Starting from this context, the research proposes to explore the role of gamification as a tool to stimulate the active involvement of the community in the valorisation of its heritage. Furthermore, the most effective strategies to stimulate a sense of belonging and activate participatory dynamics are investigated to understand how culture and heritage affect collective wellbeing, strengthen social cohesion and promote sustainable and inclusive development models.

The article is structured in different sections exploring the involvement of communities in heritage enhancement through gamification. In Sect. 2, the research methodology will be analysed, focusing on the specific case of a pilot project that the contributors carried out within the PE5 CHANGES project, using gamification as a participation tool; the evaluation approach to measure the project impacts used in the case study will also be analysed. In Sect. 3, the *Colommunity* platform will be analysed in detail, exploring why it came into being, its structure and how it works. The results of the project will be discussed, presenting the design of *Colommunity* and the digital system developed

to monitor social impacts, as well as the theoretical framework on the impacts of gamification. Finally, in Sect. 4, the conclusions will discuss the operative implications and future directions for research.

2 Materials and Methods

2.1 Gamification

Since antiquity, games have been regarded as fundamental activities, although traditionally been seen as mere leisure activities. However, the influence of play goes far beyond its specific context, thanks to what sociologist Roger Caillois has described as the "social vocation" of games [13]. By taking on a collective dimension and not just a connotation of personal distraction, games become a moment of sharing, meeting and interaction between people, even outside the dynamics of the game itself. The term "gamification", which was popularised after 2010 within the digital media industry, has increasingly gained attention across various domains, including education, marketing, and cultural heritage [11, 14].

The success of gamification is closely linked to the growing integration between the digital world and everyday life, where the influence of video games on society has helped to profoundly transform both individual habits and modes of communication [15]. On the other hand, games, which are designed for entertainment, manage to create engaging experiences and motivate people to participate in an activity for long periods. Consequently, gameful-design has been widely adopted as an effective strategy to make even non-game products and services more engaging and motivating [16]. As an illustration of this, gamification is an approach already widely used within the education system, helping students to develop their skills and immerse themselves more deeply in their studies, benefiting their cognitive functions considerably and making learning a more engaging activity [17].

The effectiveness of gamification is based on some principles of game psychology, a discipline that studies the motivations and psychological mechanisms that drive people to play and feel involved in the activity. To understand its potential, it is essential to distinguish between the concepts of play and game: the former refers to a free form of activity, the latter to a structured activity with defined rules and objectives [16]. Within these concepts, there are different practices: toys, understood as simple objects to play with, belong to play without imposing a fixed purpose or structure; on the contrary, games involve regulated and purposeful systems, as in serious games, real video games developed for educational, training or social purposes, going beyond the mere function of entertainment [18] and gamification, which consists of game-design techniques - like scoring systems, challenges, and rewards - in non-game settings to increase user engagement and motivation [16].

An interesting theoretical model is the MOAR! - Motivation, Occasion, Action, Response - developed by Viola and Cassone to understand user involvement in training processes and video games (Fig. 1). The MOAR! model is a cycle consisting of four phases, Motivation, Occasion, Action and Response, which, through a constant and calibrated repetition of actions, can transform them into stable and lasting behaviour.

This scheme highlights how involvement is not only linked to the moment of play but arises from a continuous interaction between desires, context, activity performed, and feedback received, thus generating a motivating and potentially transformative experience. It starts with motivation, which may be internal (i.e. dictated by curiosity or passion) or external (understood as the promise of a reward or recognition), followed by the presence of a concrete opportunity to act, i.e. a favourable context suited to the person's capabilities.

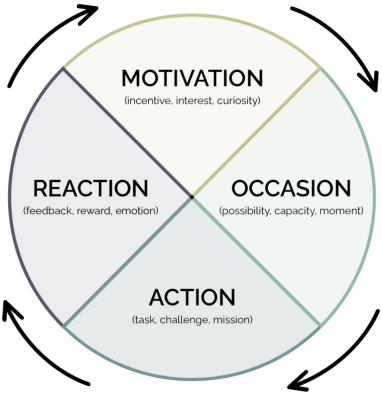


Fig. 1. The MOAR! scheme (source: Viola and Cassone, 2017)

The individual then performs an action, which must be well-structured, rewarding and possibly repeatable, so that it can turn into a habit. Finally, the response (feedback) represents the perceived return of the action: it can be immediate or emotional but must always close the loop by generating new motivation. If the loop is well designed following this model, the scheme fosters sustainable engagement, turning the interaction into an engaging and potentially transformative experience.

This circular process makes actions motivating and attractive, especially when considered boring or unpleasant [15], as a management or learning process might be. The establishment of a physical and emotional bond - engagement - between the object of the game-design process and the individual, making it long-lasting, makes gamification an important tool for engagement and the promotion of virtuous behaviour in different and numerous fields. If we analyse the scientific literature regarding the application of gamification in the field of cultural heritage, some studies [14] have pointed out that this is indicated as an effective means both for the interpretation of cultural heritage in its historical contexts, but also as an understanding device for learning. Applications of this methodology usually occur more within cultural institutions such as museums, which host archives, exhibitions and permanent collections that tend to be more readily available to gamification experts.

Another notable finding to emerge from the analysed literature is the experimentation of this game-based approach within tourism experiences for the enhancement and valorisation of the visit to the heritage site [14].

Drawing on the methodology currently being applied within PE5 CHANGES project – developed by the research group to which the authors belong – the methodology presented in Fig. 2 represents an adaptation of the MOAR! framework (Fig. 1), endowing it with a more dynamic and fluid progression between phases, rather than a strictly cyclical structure.

This revised framework is grounded in the methodology proposed by Mazzarella et al. [9], which aims to foster interaction between Urban Living Labs (ULLs) and cultural landscapes to support the formation of Heritage Communities. It is articulated in three iterative phases and embeds the Social Multicriteria Evaluation within the ULL process to guide activities, strengthen stakeholder collaboration, and enhance sustainability assessment. By doing so, it outlines the principal phases of a collaborative decision-making process oriented towards implementing circular economy principles in the development of Heritage Communities. Following the MOAR framework, the phases are simplified and adapted to support the application of the methodology to the construction and development of the case study, ensuring contextual responsiveness and operational clarity throughout the process.



Fig. 2. Authors' elaboration of the MOAR! scheme, based on the methodological framework of the Phases and Steps of the Heritage Community Urban Living Lab (HeCo-ULL) by Mazzarella et al., 2024.

Despite the already widespread application and growing maturity of gamification in the field of cultural heritage, there is still much to experiment with regarding the use of game-based approaches in this field. In addition to the technological challenges, studies on serious games and gamification of cultural heritage have shown the importance of a collaborative approach, so that content creation is accessible to a wide public without losing historical accuracy and cultural sensitivity [19].

In this perspective, the inclusion of different stakeholders within the creative process is of relevant importance, which makes it clear that a co-creation process allows cultural institutions - promoters of the game-based approach - to generate a relationship between

community and technology developers, making the results more effective and enabling the generation of shared values [19].

2.2 Impact Assessment

Impact evaluation is an essential tool for understanding and measuring whether and how interventions and projects generate significant changes in the contexts in which they operate. In particular, social impact evaluation has become increasingly widespread in recent years, not only among scholars but also in response to the demands of the European Commission [20], new funding bodies, and, in Italy, as a result of legislative developments such as Law 106/2016 and the guidelines on the evaluation of social impact (d.lgs. 24 July 2019) [21]. While most definitions describe social impact as a positive social change [22], some authors define it as a reduction in negative effects [23], confirming the variety of perspectives that contribute to the complexity of defining social impact.

Generally, social impact refers to any change that "affects the way people live, work, relate to one another, organise to meet their needs and generally cope as members of society. The term also includes cultural, political, environmental, health, and psychological dimensions" [24]. According to Italian Law No. 106 of 6 June 2016, the evaluation of social impact is understood as the "qualitative and quantitative evaluation, in the short, medium and long term, of the effects of the activities carried out on the reference community with respect to the identified objective".

It is therefore especially important to design projects with impact in mind when engaging in processes of reuse and valorisation of heritage that aim to activate local communities around the recognition of shared values.

In this perspective, the Theory of Change (ToC) [25] is a valuable tool for its ability to stimulate the development of solutions to complex social problems [26], while also helping organizations understand how their work and relationships contribute to complex, long-term social change and how their actions relate to the broader ecosystem of activities [27]. Technically, ToC can be considered both a theory and a practice, a process and a product [28], and it serves both as a tool for planning and framing problems as well as for monitoring and evaluation. A key feature of ToC is its ability to represent the entirety of the process needed to produce the desired change, breaking down complexity into small, manageable steps, while focusing on short-, medium- and long-term changes and linking program activities to results at each stage of the process [29].

Through the impact value chain, the ToC breaks down the process of generating social impact into five main stages, enforcing an approach that begins with a forward-looking vision and then works backwards to construct the steps needed to achieve the expected impact. This includes identifying the long-term changes (impacts) and medium-term outcomes, then constructing and measuring the project's performance through immediate results (outputs), activities and processes capable of triggering change, and the resources needed to implement them.

The construction of the impact value chain thus reflects a paradigm shift in how we approach heritage valorisation, no longer solely through a conservation lens, but through a dynamic process capable of activating social capital, generating participation, and producing tangible benefits for local communities [30, 31].

Among the key impact dimensions relevant to the ongoing research, two are particularly significant for investigating the formation of heritage communities through gamification-based activation processes: the **social** and **cultural** dimensions.

On the social level, particular attention is given to the increase in social cohesion resulting from civic engagement processes, which can lead to greater individual and collective empowerment. Equally relevant is the enhancement of the sense of belonging to the cultural asset residents feel, as this emotional connection strongly influences their attitudes of care and respect for the territory in which they live. Furthermore, the collaboration among residents to overcome individual and collective challenges in pursuit of a common goal can strengthen cooperation networks between citizens and institutions, leading to increased mutual trust.

On the cultural level, the reappropriation of the historical and symbolic meanings of places supports intergenerational transmission and, at the same time, contributes to the growth of competences among individuals within the heritage community [32, 33].

Within this framework, it becomes evident that ex-post impact assessment, and even more importantly, the ex-ante design of an impact-driven process, is fundamental in heritage enhancement pathways, which require new tools to guide political decision-makers and attract funding.

In this regard, the active involvement of citizens in heritage communities plays a central role in improving the quality of life through actions aimed at achieving the shared goal of enhancing their heritage. This research explores technology as a tool for engagement, involvement, and co-evaluation of experiences that are designed and implemented with and by local communities to promote the value of heritage.

3 The Case Study

3.1 A Heritage Community Project for the Valorisation of the Colombario del Fusaro: Colommunity

The work presented was developed within the framework of a master's thesis and curricular internship carried out by Federica Guglielmi at the Faculty of Architecture of the Federico II University of Naples. The thesis project is part of the extended partnership PE5 CHANGES - Cultural Heritage Active Innovation for Sustainable Society - promoted by the PNRR (National Recovery and Resilience Plan), aimed at stimulating the valorisation of cultural heritage, promoting a national network involving universities, research organisations, companies, institutions and citizens, and fostering multidisciplinary synergies and collaborations. The CHANGES project aims to amplify the impact of culture not only in the academic but also in the social context, promoting a dialogue between knowledge, territory and community. Cultural heritage is conceived as a dynamic element that can achieve innovation, inclusion and sustainable development. In particular, Spoke 1, which is where the research fits in, is titled 'Historical landscapes, traditions and cultural identities' and, in line with the principles of the Faro Convention, has among its objectives the development of strategies, methods and tools for the preservation of cultural sites through Heritage Communities, the realisation of historical and archaeological research involving the local population and the development of a digital platform for the management and enhancement of cultural heritage.

An initial mapping of the archaeological heritage of the Campi Flegrei area in Campania, undertaken during an internship, served as the starting point for a more in-depth investigation into a poorly valorised yet historically and culturally significant asset of the territory: the Colombario del Fusaro in Bacoli (Figs. 3 and 4).



Fig. 3. Colombario del Fusaro, Bacoli (Naples, Italy). Photograph by Federica Guglielmi, depicting the archaeological site in its urban context.

This site represents an extraordinary example of Roman funerary architecture and is distinguished by its circular plan, a highly unusual configuration for buildings of this type, which typically exhibited rectangular or quadrangular forms. Notwithstanding its importance, however, it exists in a condition of limited accessibility and restricted collective knowledge. The analysis of this site thus offered an opportunity to reflect upon the necessity for novel valorisation and engagement strategies.

Through a preliminary phase of on-site exploration and analysis, structured through diverse instruments such as site visits, bibliographic research, press mapping, stakeholder mapping, surveys, and structured interviews, it was possible to identify the principal issues contributing to the site's inadequate valorisation.

The integration of hard and soft analysis tools facilitated the collection of pertinent data and enabled an understanding of, simultaneously, the perceptions, expectations, problems, and values that the various stakeholders involved attribute to the Colombario del Fusaro. A key finding that emerged is that the values most attributed to the asset are of a historical and archaeological nature. However, values related to the recreational, emotional, and identity dimensions are significantly less associated, despite being essential for strengthening the bond between the community and the cultural heritage.



Fig. 4. Colombario del Fusaro, Bacoli (Naples, Italy). Photograph by Federica Guglielmi, depicting the underground section of the archaeological site.

The overall evaluation of the data collected led to the identification of two main issues that compromise the relationship between the archaeological asset and the community: the limited knowledge of the site by both residents and visitors, which prevents its recognition from a cultural and identity perspective, and the inaccessibility of the park and archaeological site, which hinders active management by interested third-sector organisations.

Starting from the needs that emerged, a Value Chain was designed (Fig. 5) by listening to the main stakeholders involved in the territorial exploration phase. Among the long-term impact objectives identified is, above all, the increase in the sense of belonging felt by the inhabitants of Bacoli towards the cultural heritage of the Colombario, along with the activation of reuse and management experiments for the site.

A set of criteria and indicators has begun to take shape, to guide impact-oriented design by incorporating integrated qualitative and quantitative data collection mechanisms within the application's digital system, such as short questionnaires or quizzes, to monitor levels of acquired skills, heritage knowledge, and perceived satisfaction and well-being while experiencing the Colombario's spaces.

In the short term, there was a shared recognition of the need to experiment with small-scale actions, both inside and outside the Colombario, intending to engage an initial group of residents in the re-recognition of the abandoned site, starting with the most relevant clusters, such as local associations, committees, and schools.

To engage these stakeholders, the Colommunity platform, based on gamification dynamics, was designed as a digital infrastructure capable of converting users from online to offline participation. It enables groups of citizens to propose initiatives for

the enhancement of the site, ranging from storytelling and historical dissemination to collaborative clean-up actions and shared memory mapping, among others.

To achieve this, the main necessary resources were identified, from financial ones for building the digital platform, to human resources, namely professionals and volunteers to be involved in the development of the app and the implementation of activities to be promoted through it.

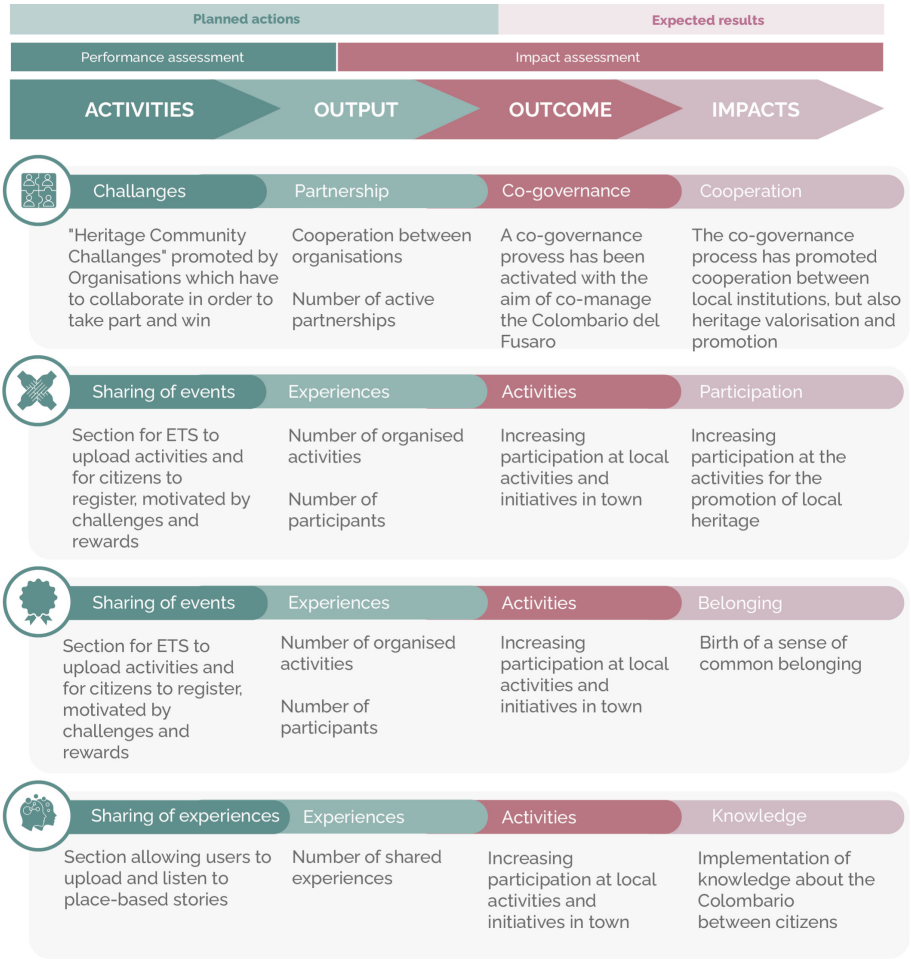


Fig. 5. The Value Chain process

Drawing upon these premises emerges Colommunity (Fig. 6), a mutual-learning interactive platform that hybridises a game-based approach to territorial exploration, akin to geocaching, to actively engage the community of Bacoli in the valorisation of the Colombario del Fusaro. The platform leverages gamification, incorporating scores,

leaderboards, and quizzes, to offer cultural experiences that valorise the tangible and intangible heritage of Bacoli.

The principal aim is to establish a nexus between the local community, third sector organisations, and the Colombario del Fusaro, allowing citizens not only to rediscover their history but also to cultivate a genuine sense of belonging to it. In this manner, each individual can actively contribute to the creation of value for the territory and foster the development of a Heritage Community.

Colommunity is designed to instigate tangible actions within the territory through "challenges" conceived for the co-exploration of cultural heritage. These challenges are structured to co-create an itinerary centred on the Colombario del Fusaro and to enhance knowledge of the local area. Furthermore, the platform offers "rewards" intended to augment player agency: complimentary tickets to heritage sites, priority access to local cultural events, and discounts on typical local products. This is made feasible through the realisation of rewards in collaboration with local partners and associations, which not only incentivises active participation but also establishes a virtuous cycle of value, concurrently stimulating a circular economy.

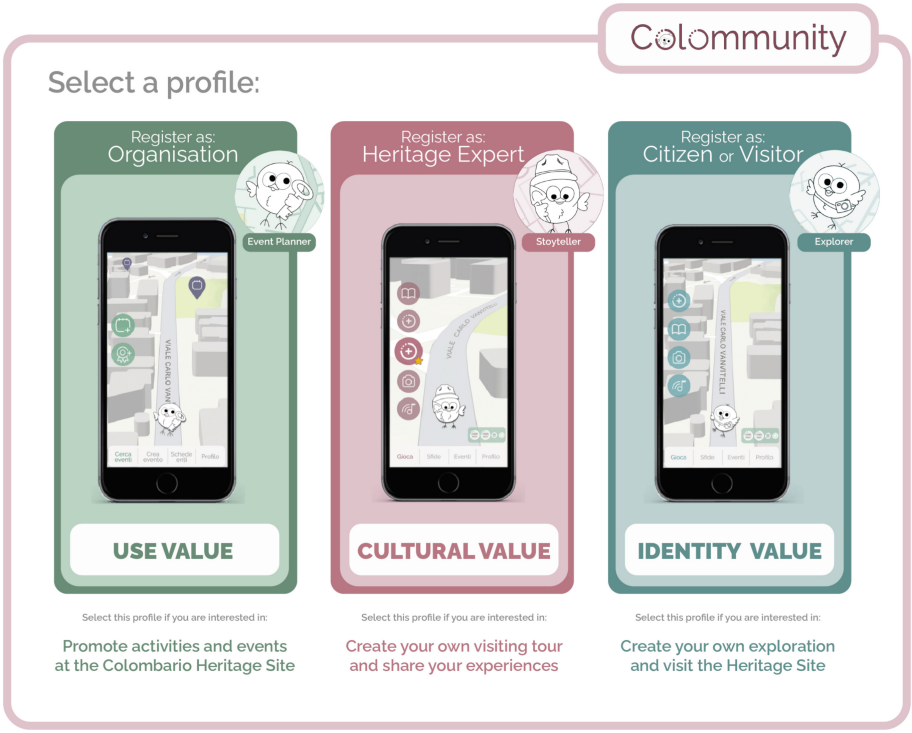


Fig. 6. Colommunity digital platform itinerary

This approach facilitates the construction of a collaborative network amongst local entities, generating novel value for the community and fostering the growth of a sense of belonging and collective identity. In an initial phase, users have the option to register under three distinct profiles (Fig. 6), each conceived to address the diverse needs and contributions that each category of participant can bring to the project.

The first profile is dedicated to the local community, which plays a fundamental role in transmitting the identity-related and affective values associated with their territory. Members of this profile, through the creation of "story experiences", help to bring to life narratives, experiences, and connections that reinforce their sense of belonging.

The second profile is intended for experts in history and archaeology, whose historical and cultural knowledge is fundamental for narrating and interpreting the local heritage. These users can input "story gems" and serve as creators of cultural content (narratives and audio guides) that enrich the player's experience, deepening the understanding of its roots and development through the centuries.

Finally, the third profile is aimed at third sector entities, which have the objective of generating use values for the territory. These players are essential for the creation of initiatives, events, and projects that involve the community, contributing to the promotion of a shared and sustainable management of cultural heritage. Consequently, the platform becomes a point of reference for cooperation between local authorities, citizens, and institutions, generating social and economic value for the territory.

The initial challenge guides the player, through the method of geocaching and the use of GPS, to the primary point of interest: the Colombario del Fusaro. This introduces the player to the historical and cultural significance of the site and promotes a form of experiential learning. Upon reaching the site, the user has the opportunity to deepen their knowledge of the local heritage and, concurrently, to unlock new opportunities for interaction with the platform, accessing new functions and increasing their score.

Players within Colommunity can continuously enrich the pathway, contributing content and experiences. Simultaneously, they are informed about cultural events and activities promoted within their territory, constructing a dynamic and interconnected network that facilitates the realisation of joint initiatives and the building of a more informed, active, and aware community.

4 Conclusions

The Colommunity platform exemplifies the potential of gamification to engage local communities in the preservation and valorisation of cultural heritage. By combining a game-based approach with territorial exploration, the platform successfully encourages active participation in discovering and promoting the rich history of Bacoli, specifically through the Colombario del Fusaro.

By integrating gamified elements such as scores, leaderboards and quizzes, Colommunity not only enhances cultural experience, but also strengthens the connection between local citizens, third sector organisations and the heritage site.

The proposed approach fosters a deeper sense of belonging and empowers individuals to actively contribute to creating value for the community. Ultimately, Colommunity exemplifies a sustainable and inclusive model for developing a heritage community and

highlights the transformative potential of interactive, community-driven initiatives in heritage conservation.

The research shows that gamification can serve as a powerful tool to enhance community engagement in the preservation, valorisation and reuse of cultural heritage. By fostering collaboration and encouraging active participation, gamification can bridge the gap between local communities, heritage sites and stakeholders, creating opportunities for sustainable and inclusive development.

Results from the pilot study of the Colommunity project in Bacoli highlight the potential of game-based approaches to engage diverse audiences in the co-exploration and co-management of cultural assets, highlighting the positive social and cultural impacts of such initiatives and reinforcing the importance of co-creation between local communities, experts and institutions.

This research contributes to the wider discourse on the long-term potential of gamification in shaping the future of citizen activation in cultural heritage enhancement, highlighting the need for innovative strategies that align with community-driven approaches to heritage management.

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References

1. CHCFE Consortium: Cultural Heritage Counts for Europe: Full Report, Krakow (2015)
2. Council of the European Union: Council Resolution of 16 November 2007 on a European Agenda for Culture (2007)
3. Cerreta, M., Daldanise, G., Giovene di Girasole, E., Torre, C.M.: A cultural heritage low entropy enhancement approach: an ex post evaluation of creative practices. Sustain. For. **13**, 2765 (2021). https://doi.org/10.3390/su13052765
4. Bonacini, E.: Partecipazione e co-creazione di valore culturale. #iziTRAVELSicilia e i principi della Convenzione di Faro / Participation and co-creation of cultural value. #iziTRAVELSicilia and the principles of the Faro Convention. Il Capitale Culturale. **17**, 227–273 (2018)
5. Cerreta, M., Giovene di Girasole, E.: Towards heritage community assessment: indicators proposal for the self-evaluation in Faro convention network process. Sustain. For. **12**, 9862 (2020). https://doi.org/10.3390/su12239862
6. Garcia-Fernandez, J., Medeiros, L.: Cultural heritage and communication through simulation videogames - a validation of Minecraft. Heritage. **2**, 2262–2274 (2019). https://doi.org/10.3390/heritage2030138
7. Sacco, P.L., Teti, E.: Cultura 3.0: un nuovo paradigma di creazione del valore. Econ. Manag. **1**, 79–95 (2017)

8. Ventre, S., Cerreta, M.: Participatory art and co-creation methodology in the "Viale delle Metamorfosi" project. In: Computational Science and Its Applications – ICCSA 2023 Workshops. ICCSA 2023 Lecture Notes in Computer Science, vol. 14108. Springer, Cham (2023). https://doi.org/10.1007/978-3-031-37117-2_20
9. Mazzarella, C., La Rocca, L., Ventre, S., Cerreta, M.: Heritage communities urban living lab (HeCo ULL): a circular methodological approach for co-design through social multi-criteria evaluation. In: Networks, Markets & People. NMP 2024 Lecture Notes in Networks and Systems, vol. 1186. Springer, Cham (2024). https://doi.org/10.1007/978-3-031-74679-6_4
10. Lerario, A., Maiellaro, N.: Mappe interattive per la promozione turistico-culturale. SCIRES-IT Sci. Res. Inform. Technol. **4**, 85–96 (2014)
11. Cerreta, M., Daldanise, G., La Rocca, L., Panaro, S.: Triggering active communities for cultural creative cities: the "Hack the City" play ReCH Mission in the Salerno Historic Centre (Italy). Sustain. For. **13**, 11877 (2021). https://doi.org/10.3390/su132111877
12. Devoti, C., Scientifiche, E.: Dai 'Beni Minori' Al Patrimonio Diffuso: Conoscere e Salvaguardare Il 'Non Monumentale'. In: Patrimonio e Tutela in Italia A Cinquant'Anni Dall'Istituzione Della Commissione Franceschini (1964–2014), pp. 143–154 (2017)
13. Caillois, R.: Man, Play and Games. University of Illinois Press (2001)
14. Marques, C.G., Pedro, J.P., Araújo, I.A.: Systematic literature review of gamification in/for cultural heritage: leveling up, going beyond. Heritage. **6**, 5935–5951 (2023)
15. Viola, F., Cassone, V.I.: L'arte del coinvolgimento, emozioni e stimoli per cambiare il mondo. Ulrico Hoepli Editore S.p.A (2017)
16. Deterding, S., Dixon, D., Khaled, R., Nacke, L.: Gamification: toward a definition. In: CHI 2011 Gamification Workshop Proceedings, pp. 1–12 (2011)
17. Padaya, A., Chbaklo, H.: Innovation & integration of video games in education. In: Innovation & Integration of Video Games in Education, Bournemouth, UK (2022)
18. McGonigal, J.: Reality Is Broken: Why Games Make us Better and How They Can Change the World. Penguin, New York (2011)
19. Kosti, M.V., Diplaris, S., Georgakopoulou, N., Runnel, P., Marini, C., Rovatsos, N., Barakli, A., de Lera, E., Vrochidis, S., Kompatsiaris, I.: i-game: redefining cultural heritage through inclusive game design and advanced technologies. Electronics (Basel). **14**, 1141 (2025). https://doi.org/10.3390/electronics14061141
20. European Commission, G: Approcci proposti per la misurazione dell'impatto sociale, Luxembourg (2015). https://doi.org/10.2767/29077
21. Impronta Etica e SCS Consulting: Le linee guida per la misurazione dell'impatto sociale. In: Una guida pratica per le organizzazioni, Bologna (2016)
22. Santos, F.M.: A positive theory of social entrepreneurship. J. Busi. Ethics. **111**(3), 335–351 (2012). https://doi.org/10.1007/S10551-012-1413-4
23. Bartling, B., Weber, R., Yao, L.: Do markets erode social responsibility? Q. J. Econ. (2015). https://doi.org/10.5167/uzh-85623
24. Vanclay, F.: International principles for social impact assessment: their evolution. Impact Assess. Proj. Apprais. **21**, 3–4 (2003). https://doi.org/10.3152/147154603781766464
25. Reeler, D.: A Three-Fold Theory of Social Change with Implications for Planning, Monitoring and Evaluation. (2007)
26. Anderson, A.A.: The community builder's approach to theory of change. A practical guide to theory development. In: The Aspen Institute Roundtable on Community Change, New York (2006)
27. Keystone: Developing a theory of change. A guide to developing a theory of change as a framework for inclusive dialogue, learning and accountability for social impact. www.KeystoneAccountability.org (2009)
28. Vogel, I.: Review of the use of "theory of change" in international development. Rev. Report. (2012)

29. Weiss, C.H.: Theory-based evaluation: past, present, and future. New Dir Eval., 41–55 (1997)
30. Sacco, P.L., Ferilli, G., Tavano Blessi, G.: Cultural participation, relational goods and individual subjective well-being: some empirical evidence. Rev. Econ. Finan. **4**, 33–46 (2014)
31. Merli, P.: Evaluating the social impact of participation in arts activities. Int. J. Cult. Policy. **8**, 107–118 (2002). https://doi.org/10.1080/10286630290032477
32. Cerreta, M., Panaro, S., Cannatella, D.: Multidimensional spatial decision-making process: Local shared values in action. In: Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), 7334 LNCS (PART 2), pp. 54–70 (2012). https://doi.org/10.1007/978-3-642-31075-1_5
33. Cerreta, M., Panaro, S., Poli, G.: A spatial decision support system for multifunctional landscape assessment: a transformative resilience perspective for vulnerable inland areas. Sustainability. **13**(5), 1–23. https://doi.org/10.3390/su13052748