

Digitalization as a tool for Redevelopment – The Finiq case

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Abstract- *Finiq, a rural town in the south of Albania, is experiencing a major demographic crisis. The lack of economic opportunities and difficult access to services discourage people from settling there. The various problems that characterise Finiq are mainly isolation as it's difficult to reach it; the lack of identity due to depopulation and the lack of economic activities; the poor development and preservation of historical heritage as well as the deterioration of the landscape due to climate change and unsustainable human activities. Intervention in the landscape and cultural heritage can play a crucial role in mitigating these problems. Creating connecting paths, parks, rest areas, restoring historical buildings and monuments, together with the development of cultural programmes, could on the one hand provide Finiq residents with a sense of Identity and belonging to the area thus contributing to the promotion and preservation of the cultural heritage; on the other hand, stimulate tourism and investments which would be beneficial to the local economy. Digitalisation, in particular the use of blockchain technology, Building Information Modeling (BIM) and the Internet of Things (IoT) could further mitigate these issues. Blockchain can be used for the provision of a secure and transparent register of historical and cultural heritage, thus facilitating access to information and knowledge about this heritage by citizens and tourists. At the same time, BIM can digitally represent the various areas of the city for easier and more timely planning of interventions in the landscape, built environment and cultural heritage.*

Creating a Digital Twin of the city of Finiq allows the different stakeholders to collaborate and exchange detailed and up-to-date information on the city's infrastructure and heritage, thus ensuring the quality of interventions and better management of the heritage itself. IoT, through sensor technology, would enable the collection of real-time data on the state of preservation of cultural heritage and the use of resources. The data collected and exchanged with and certified by a blockchain platform would increase transparency and citizen participation in cultural heritage management. Furthermore, IoT can provide information on weather conditions and the impact of human activities on cultural heritage, serving as a useful tool for informed, data-driven decisions towards heritage conservation and enhancement. In summary, digitisation, in particular the proposed technologies, could prevent the deterioration of cultural heritage, promote its knowledge and optimise the management of resources while promoting sustainable development. The creation of digital management systems for heritage and tourism activities is envisaged. However, the use of such technologies presents some barriers including the lack of adequate technological infrastructure and the need to train people involved in the use of such tools. The redevelopment of Finiq requires a balance between using the technology and understanding its limitations while analysing the needs and concerns of the community.

Keywords: *Blockchain; Cultural Heritage; BIM (Building Information Modeling); IoT (Internet of Things).*

Introduction - The city of Finiq (Finiq - Wikipedia, s.d.) is characterised by a strong demographic crisis caused by multiple shortcomings including economic opportunity and access to various services. Problems such as isolation, lack of identity, lack of economic activity, and poor utilisation of cultural heritage are the consequence of this scenario. Cultural heritage (On Defining the Cultural Heritage | International & Comparative Law Quarterly | Cambridge Core, s.d.) offers a crucial role in a win-win situation regarding cultural knowledge and local economic development. Digitisation, particularly with the help of emerging technologies such as blockchain, Building Information Modeling (BIM) and Internet of Things (IoT) (Siountri et al., 2020) could improve this scenario by mitigating the identified problems. The objective of the research is to explore the potential of digitisation and in particular the emerging technologies proposed for the redevelopment of Finiq.

The transition of Finiq over the years

The city of Finiq, located in southern Albania, is experiencing a serious demographic crisis caused by several historical, economic and social factors. In order to understand the origin of this situation, it is necessary to examine the historical events that led to this present condition. Finiq has a long history dating back to ancient times, when it was known as Phoenice, a city of strategic importance for trade between the Eastern Mediterranean and Western Europe. Over the centuries, however, the city has undergone numerous transformations

and cultural influences, falling under the control of various kingdoms and empires, including the Roman, Byzantine and Ottoman Empires.

This continuous political change resulted in a lack of sense of belonging in the citizens, amplified by a significant depopulation of the city during the communist regime of Enver Hoxha (L'Albania di Enver Hoxha, la dittatura comunista tra le più feroci del mondo, s.d.), when many residents were forced to move to the city to work in factories, thus losing their sense of cultural identity and connection to their homeland. The fall of the communist regime in 1991 led to the opening of Albania to the outside world, but also to a high degree of corruption and lawlessness that caused a significant decline in Finiq's economic and social conditions, prompting many people to seek better opportunities elsewhere. This situation has led to a lack of essential services such as education, health and transport, as well as difficult access to services, thus, isolating the city.

Moreover, in the 20th century, the city suffered a significant economic and demographic decline, mainly caused by the agrarian policy of the Albanian communist regime that led to the state ownership of land and the reduction of economic opportunities in the area.

The cultural and historical heritage of the city (Lista dei patrimoni dell'umanità in Albania - Siti Unesco, s.d.) was neglected for decades, leading to the loss of many important buildings and monuments. The natural landscape of the area has also suffered degradation accelerated by climate change and unsustainable

human activities. The situation of political and social instability that characterised Albania during the 1990s made it difficult to implement development policies and improve the economic and social conditions of the population. In this context, many Finiq families found themselves forced to emigrate in search of better opportunities abroad, mainly to Italy and Greece.

This phenomenon has further contributed to the reduction of the city's population.

Today, Finiq is a rural town with a declining population and a lack of economic opportunities and services, but it possesses a valuable cultural and historical heritage that could be valued and exploited to promote local development by playing a crucial role in mitigating the problems of urban decay and emigration from the Finiq area.

Through the creation of connecting footpaths, parks, rest areas and the restoration of historic buildings and monuments, together with the development of cultural programmes, Finiq residents could be given a sense of identity and belonging to their area, thus contributing to the promotion and preservation of the local cultural heritage. Moreover, these initiatives could stimulate tourism and investment in the area, benefiting the local economy. Cultural tourism is indeed a growing sector, and the beauty and uniqueness of Finiq's cultural heritage could attract visitors from all over the world. Furthermore, investment in the conservation and enhancement of cultural heritage can contribute to the creation of jobs in the tourism and cultural sector.

Intervening on the landscape and cultural heritage of Finiq could be an important opportunity to improve the quality of life of residents, preserve the history and culture of the area, boost tourism and the local economy, and promote the sustainable development of the area. Today's technological process and digitalisation make it easier and more efficient to carry out any redevelopment. Tools such as Blockchain, BIM (Building Information Modeling) and the Internet of Things (IoT) are able to create an effective and efficient synergy to monitor and evaluate the entire process of managing an urban redevelopment (Siountri et al., 2020).

The proposed Technologies

The proposed Technologies: Blockchain

Blockchain technology is seen as a bursting infrastructure to support the exchange of information between people who do not trust each other (Di Pierro,

2017) (Min et al., s.d.). By registering different types of information within this technology, the registered information will be associated with characteristics of irrevocability and uniqueness in an archive or database distributed to all network participants. Blockchain, a sub-category of Distributed Ledger Technology (DLT), is a shared, immutable ledger that facilitates the process of recording transactions and tracking digital assets. A physical asset can be represented by the blockchain (a house, a car, cash, land or an intangible asset (intellectual property, patents, copyrights, brand name) (Lee, 2023). It is defined as a digital ledger whose entries are grouped in 'blocks', linked together in chronological order, and whose integrity is guaranteed by the use of cryptography.

Main features of blockchain

The main features of blockchain technology are (Aldweesh, 2023):

- Decentralisation: the main feature of blockchain is that it is a decentralised system. Information and rules are managed by several nodes, each of which has an up-to-date and encrypted copy of the registers. In this way, all network participants can verify any tampering or sequential additions to the ledger;
- Disintermediation: no intermediary is needed for the transfer of value;
- Immutability: information that is written in the register cannot be changed or deleted;
- Cryptography: one of the fundamental pillars of the Blockchain is cryptography, operating on the Blockchain is safe because there is a cryptographic process that makes it secure. A pair of asymmetric keys (How does public key cryptography work? | Public key encryption and SSL | Cloudflare, s.d.), one public and one private, is needed to encrypt information. This combination of keys makes it impossible for malicious parties to tamper with the information;
- Traceability: knowing the address, economic relations and transfers can be traced, but it is also possible to trace funds that are allocated to non-profit organisations. Blockchain makes it easy to trace all transactions, thus also the flow of value, from a point of departure to a point of arrival;
- Programmability of transfers: starting with Ethereum (the second generation Blockchain) (Ethereum - Wikipedia, s.d.), it has been possible to programme transfers of value through smart contracts. In essence, it is possible to programme and thus make certain transactions on the Blockchain automatic;

Transparency: the registry (hence the Blockchain, the public one of course) is visible to everyone and verifiable by anyone.

The Smart Contracts

Smart contracts (Kölvart et al., 2016) are programmes, with inputs, outputs and functions, which are used to create automatism on the second generation blockchain compatible with Ethereum. These automatism can be simple transactions with a sender and a receiver or predefined automated commands. With smart contracts, it is also possible to notarise, i.e. to carry out transactions with regard to data records and information on the blockchain. In other words, smart contracts are protocols in which the system is able to perform automatic actions (or performances) when a predetermined condition occurs.

The proposed Technologies: Building Information Modeling (BIM)

Building Information Modeling (BIM) («Building Information Modeling», 2023) represents a universal method concerning the collaborative design, realization and operation of buildings and infrastructures. By putting project information at the center, the set of technologies and methodologies that characterize this method are able to improve collaboration and digitization. Building Information Modeling involves the use of advanced software to create detailed three-dimensional models of building information.

This information concerns every aspect of the building in the architectural, structural and plant engineering fields. Building Information Modeling prepared using this method will allow the visualization and management of information throughout the entire life cycle of the building. The main advantage of using this method is the reduction of errors and inefficiencies in the design and construction of buildings. Another advantageous aspect is the collaboration of all parties involved (architects, engineers, builders, etc.) for better management of the building. This approach or methodology allows us to simulate the behavior of buildings under different conditions and carry out detailed analyses on various topical aspects such as environmental sustainability and energy efficiency (Angjeliu et al., 2020).

Main features of Building Information Modeling (BIM)

The main features of Building Information Modeling (BIM) are:

- Three-dimensional modelling: the use

of specific advanced software for the realisation of detailed three-dimensional models of architectural, structural and plant information allows greater accuracy in the design, construction and maintenance phases of the building;

- Collaboration and sharing: this method promotes collaboration between all the actors involved in a project by sharing data and information in real time. This enables faster problem-solving and more informed decision-making;
- Cost reduction: BIM enables management of the entire building lifecycle, from design to use and maintenance. This optimises the management of the building and reduces maintenance costs over time.

The proposed Technologies: Internet of Things (IoT)

Internet of Things (IoT) («Internet of Things», 2023) technology encompasses all physical objects connected to the Internet. Generally, these objects are equipped with sensors that enable the transmission and reception of data in order to make certain information available to users and automate the actions. The real challenge of the Internet of Things lies in the management and quality of the data obtained. Artificial intelligence and machine learning are very often used to support this technology for higher accuracy of the data obtained (Merenda et al., 2020).

The four phases of the Internet of Things (IoT)

Once the data has been collected, it is then analyzed. We can point to four main phases in this process:

- Data acquisition: IoT devices through sensor systems detect data from the surrounding environment;
- Data sharing: data collected by IoT devices are sent via an internet connection to cloud sharing systems or are stored on a local system;
- Data processing: at this stage, software programming takes over in carrying out predefined actions such as an alert;
- Actions to be carried out on the basis of the data obtained: various actions and/or informed decisions are planned on the basis of the data obtained.

Research Question

- What are the main issues of Finiq in relation to cultural heritage conservation?
- How can emerging technologies such

- as blockchain, BIM and IoT be used to address these issues?
- What are the main barriers to enter the adoption of these technologies?
- How can these barriers be addressed?
- How could the redevelopment of Finiq and the preservation of cultural heritage increase the sense of identity and belonging of Finiq residents?
- How is the involvement of citizens (in the understanding and 'partial' adoption of the proposed technologies) in the management of cultural heritage and the promotion of tourism in Finiq be possible?

Digitalization to support Finiq issues

In the face of Finiq issues, the phenomenon of digitalization in this context, through the help of proposed technologies such as blockchain, BIM and IoT could be an effective solution to mitigate these issues. In the face of Finiq's identity problem, the use of blockchain in this context offers several fields of application such as provenance and authenticity. Specifically, immutable and secure digital records could be created that allow us to trace the origin and history of present heritage and the official records pertaining to that heritage (Vacchio & Bifulco, 2022). By registering Finiq's historical and cultural heritage information in a blockchain platform, the registered information will be associated with irrevocable and unique characteristics in a repository available to anyone who wants to access it. Authentic digital identities will then be provided to each asset. Depopulation through BIM can be mitigated by representing all the areas and buildings in the city that are subject to intervention and through these informed three-dimensional models planning redevelopment (Gigliarelli et al., 2016), managing issues and assessing environmental impacts. In this way, Finiq will be more attractive to its inhabitants and tourists, and investors will also be encouraged to consider Finiq as an attractive investment destination, thus increasing local economic development and creating new jobs in the area. The IoT through the use of sensors enables the monitoring of the state of preservation of historical and cultural heritage in real time (Maksimovic & Cosovic, 2019). The various sensors and devices connected to the network are able to detect parameters such as humidity and temperature but also the presence of atmospheric pollutants in order to intervene promptly to prevent the deterioration of the heritage and increase its preservation. Furthermore, the combination of BIM

and blockchain is supported by the ability of both technologies to serve as a single source of truth (Hijazi et al., 2019). By combining the recording of real time data on the blockchain, a database can be built that integrates BIM models in order to acquire information on the design and management phases of the works in Finiq. If the built, cultural and historical heritage is equipped with sensors, a BIM-blockchain system can provide a complete picture of the condition of the works being worked on and plan maintenance interventions automatically through the use of smart contracts.

Barriers to entry for the implementation of these technologies

Barriers to entry for implementing technologies such as blockchain, BIM and IoT are varied and require a holistic strategy to be successfully addressed. Some of the common barriers and possible measures to overcome them are discussed below: Implementation Costs: Adoption of these technologies often involves significant investment in infrastructure, software and staff training. To overcome this barrier, it may be useful to consider phased implementation approaches, starting with low-cost pilot projects to demonstrate value before expanding use on a large scale.

Technical Complexity: Emerging technologies such as blockchain and BIM can be complex to implement and require specialized skills. Staff training is crucial to overcome this barrier. Collaborating with industry experts and providing specific training programs can increase the expertise of the team involved.

- Security and Privacy: Managing sensitive data, especially in contexts such as cultural heritage preservation, raises security and privacy concerns.
- Interoperability: Technologies must often integrate with existing systems. Ensuring interoperability between different platforms and systems requires careful planning and requires the development of common standards for communication between technologies.
- Cultural Acceptance: Resistance to change can be a significant barrier. Actively involving end users from the outset, explaining the benefits of new technologies, and encouraging participation can help overcome this resistance. Meetings and informational/training webinars could engage citizens in understanding the benefits of technologies and the various opportunities they offer the city of Finiq.

- Regulations and Regulations: Lack of clear regulations or the presence of regulations that do not fully support the adoption of these technologies can be barriers. Addressing these barriers requires a strategic approach and collaboration among stakeholders, regulators, industry experts, and the local community. Awareness of these challenges and implementation of targeted measures are critical to the successful adoption of emerging technologies in Finiq.

Conclusions

In conclusion, the detailed analysis of the potential of digitization in Finiq, supported by advanced technologies such as blockchain, BIM, and IoT, highlights a promising path to address current challenges and build a more efficient and future-oriented city that can boost tourism. During this exploration, we recognized that although emerging technologies offer innovative solutions, their implementation is accompanied by significant barriers to entry. Effectively managing these challenges will require efforts focused on cost reduction and skill acquisition by those involved. It is crucial to take a proactive perspective to overcome financial barriers by promoting phased implementation models and targeted pilot projects. In addition, investing in specific training programs for the community and staff involved will foster a smoother transition to the efficient use of these cutting-edge technologies. Looking to the future, interesting research insights arise. The continuing evolution of blockchain, BIM and IoT leads the way for further innovation. Future research could focus on creating new sustainable business models based on these technologies, exploring opportunities for deeper integration and considering the social impacts of digitization. In addition, it is crucial to actively involve institutional regulatory bodies in Finiq's digital transformation process. Collaboration with these entities will ensure regulatory compliance and foster an environment conducive to the growth of digital initiatives. The advent of digitization offers Finiq an opportunity to dynamically shape its future. By overcoming challenges with determination and adopting a collaborative approach, the city can achieve not only greater operational efficiency, but also deeper citizen engagement and maximization of overall benefits. The road to a digitized Finiq is open, and upcoming research and initiatives will be key to consolidating and expanding this progress.

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