Digital territorial assets: vocational drivers' representation for Finiq Municipality's challenge of change

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Abstract- *This research paper provides a base for the development of an integrated strategy to identify and represent the existing territorial systems and ongoing trends in the municipality of Finiq, located in southern Albania. The study explores the features of the territorial ecosystem, to propose an integrated innovative development process through the digitization of the assets.*
The analysis moves from three main driver topics - "Landscape", "Tradition" and "Tourism", showing that the Municipality of Finiq has an underestimated intrinsic value of attractiveness, characterized by its inland natural areas and rich cultural heritage. Starting from these conditions, the innovation of the territorial system through the involvement of the communities of the Municipality of Finiq is one of the main development and enhancement drivers. Based on a holistic approach to setting up and representing land, cultural, environmental, artistic, agro-alimentary, and local gastronomic assets, this research paper aims to propose the improvement of the attractiveness of the Finiq Municipality's, according to advanced international methodological standards, and the resulting territorial and social impact (Rossi, 2022).
It is proposed to implement innovation in the gainful process in the Finiq Municipality by the digitalization of assets through the international BIM standard (Bianchini et al., 2021), creating three-dimensional information models at different levels: individual assets, infrastructures, historical sites (Maietti et al., 2021), and relevant buildings. The three-dimensional model can be implemented in a unified data-sharing environment, allowing for the creation of a digital ecosystem (Banfi et al., 2022) through which different stakeholders and communities can cooperate in processes and exchange information. The ecosystem will create a Digital Twin of the assets (Wu et al., 2021) integrated into a territorial map. A digital model through which, the actors involved, with the support of enabling technologies, will be able to add information to the BIM model in real time, creating a cognitive three-dimensional decision-support model (EcoAlbania, 2021) to re-orient the current shrinking, isolation, and identity trends.

Keywords:
BIM, Digital Twin, digitization, innovation, layers.

Introduction - Finiq, together with Livadhja, Dhivri, Mesopotamia, and Aliko are the five administrative units resulting in the Municipal of Finiq, which is part of the District of Vlora. 58 villages that are spread out around the municipality. They differ into three communities, depending on the anthropogeographical context: Vurgu, which consists of plain villages; Rëza, which consists of mountain villages; and the intermediate hilly area, which includes villages like Sirakat, Livinë, Llazat, Gravë, Karroq (Finiq Municipality, 2021). This area presents a lack of connections, with only 1% of the area covered by water and infrastructure. The result is a varied territorial context characterized by polycentric communities with different needs in terms of services offered.
"Landscape", "Traditions" and "Tourism" are the three key drivers-topics that conducted the reading of Finiq Municipality. The land's morphology is heterogeneous, characterized by 44% plain, 34% mountains, and 22% hills. It has mainly an agricultural vocation, covering 24% of the western part of the Municipality, while the eastern side is characterized by the natural landscape, despite it being affected by significant deforestation: only 25% of the original forest (EcoAlbania, 2021) remains today. The coastal landscape of the Vlora district, to which the Municipality of Finiq belongs, has a natural attraction for tourists and reveals an increasingly unstable balance between natural and anthropogenic processes, being the 'sensitive point of the physical and human landscape'. However, the Municipality of Finiq has an underestimated intrinsic value, thanks to its inland natural areas and rich cultural heritage. According to the growing interest in a European Level of cultural heritage, due to its social, economic, cultural, and environmental impact, it opens up opportunities to increase economic and social cohesion making an even more vital contribution to a sustainable Albania.
The innovation of the territorial system through the involvement of the communities is one of the main development and enhancement drivers and an urgent need for the Municipality of Finiq today. Based on a holistic approach to the development of an integrated strategy to identify and represent the existing territorial systems and ongoing trends in the Municipality of Finiq, this study explores the features of the territorial ecosystem, to propose an integrated innovative development process through the digital representation of the strategic assets.

State of Art

Three-dimensional modeling of the territory is very useful to visualize characteristics, and features and collect information (Del Giudice et al., 2017) about the existing territory. Therefore, the innovation with enabling technologies proposed in this paper proposes the digitization of assets through the international standard BIM (Building Information Modeling), at different levels: individual assets, infrastructures, historical sites (Maietti et al., 2021), and relevant buildings. The BIM process represents a system that shows the ability to manage the information needed in an "all-in-one" environment. The BIM model is a database where any geometric object can be enriched with informative quantities. BIM systems provide therefore a digital environment capable of hosting, organizing, and interacting with all this information through the 3D model, which could become the key access to Finiq Municipality's informative database (Bianchini et al., 2021). To allow the renovated interaction between the real world and its virtual extension to create a digital ecosystem (Banfi et al., 2022) through which different stakeholders and communities can cooperate in processes and exchange information, is essential the integration in the process of a shared cloud environment, called Common Data Environment (CDE) according to ISO standards. A CDE is an internet-based platform used to manage processes to provide and share information. The CDE

represents the source of information for the given assets, often provided and managed by the designated actors. In the context of the Municipality of Finiq, a CDE solution must be implemented to provide citizens with shared access to update, modify, view, and verify data and information related to strategic assets.
The stakeholders interested in the improvement of the attractiveness of the Municipality of Finiq may be either direct or indirect. Direct stakeholders are the national and local governments, local companies, and end-users. Indirect stakeholders are those who are not directly involved, like citizens and communities. It's clear how the proper management of the township requires the optimization of information management, knowledge sharing, and interaction, in fact, the effective utilization of the CDE environment requires a well-designed information management strategy to support the handling of large amounts of BIM-related data, available to so many people with different professional background expertise.
In the process of re-orienting the current shrinking, isolation, and identity trends through the digitization of the territorial ecosystem, the measurement of performances and the monitoring of economic and social environmental sustainability is fundamental. People, including their behavior, and process are important sources of information, and the representation by integrating physical and digital aspects, improving simulations and communication of information and data throughout the model, has become a requirement for real-time monitoring and planning nowadays. The rise of Internet of Things (IoT) applications has offered several new digital solutions by enabling real-time monitoring and asset management, providing integrated tools aided to improve the attractiveness of the territory and its assets, also in terms of services manageable.
The IoT is a concept of gathering, used to describe the interconnection between the network and physical object "things" that are equipped with sensors for the purpose of connecting and exchanging data with other devices and systems over the Internet. It doesn't give information about the existence of things, but enhances the state of "things" (Godager et al., 2021).
It is highly recognized by the literature that increasingly, organizations in a variety of industries are using IoT to operate more efficiently (Godager et al., 2021). In order to utilize IoT sensors, these must be linked to and synchronized with the BIM model the integration of IoT and BIM is essential to take advantage of the digital representation because IoT improves the efficiency of information management and planning that can be carried out more holistically and efficiently. By the integration of the BIM model, the tridimensional virtual representation of the municipality of Finiq, with ICT and IoT sensors updated in real-time, is, therefore, possible to establish a real-world connected virtual model, improving continuous data sharing. The merging of these digital technologies and the 3D model can give spatial context to digital information facilitating also the multi-dimensional representation in real-time.
This innovative way of integrating and managing strategic municipality's assets in an interactive manner in a multi-representation system, through a mutual connection between the physical entities and the digital model, opens the concept of Digital Twin (DT). As expressed by

Fig 1 / Finiq Municipality, concept of the innovation proposed for the territorial system
source / the author

Fig2 / The digital representation of the Finiq Municipality's strategic assets and related entities source / the author

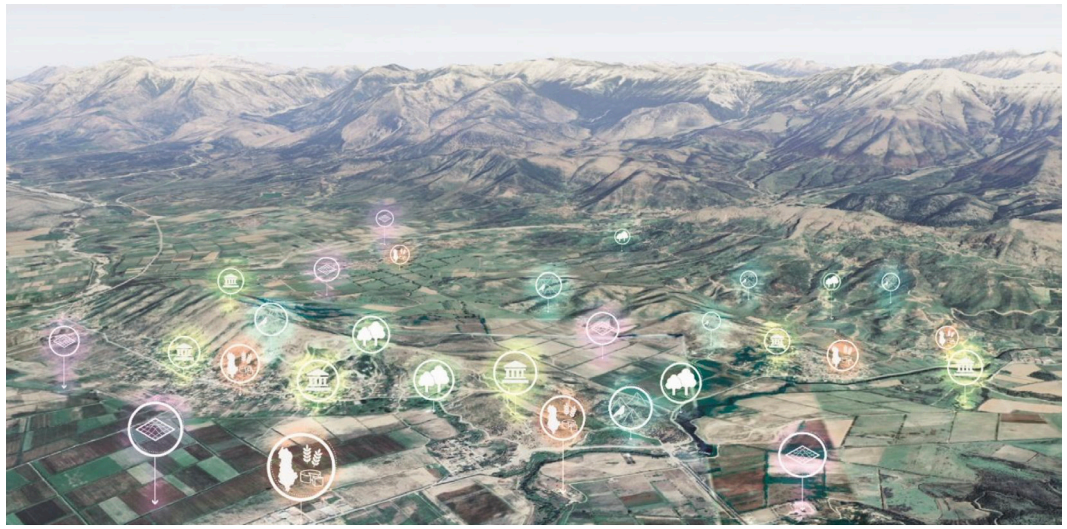

Fig3 / Finiq Municipality, territorial 3D model with meta-objects of the digitized assets source / the author

Osello et. Al. (Osello et al., 2021), DT isn't an infographic representation of the real world incorporating alphanumeric information derived from the IoT but instead is a meaningful graphical and alphanumerical abstraction of real physical assets and data.
Although the DT has the capacity to be applied in almost every field of study, it has received more attention in manufacturing, healthcare, aerospace, and transport (Adele et al., 2023). The findings of influential design studies on the use of the DT demonstrate how it has the potential to transform the methodology with which we approach the design and management of the built environment. In geospatial applications, the digital representation of physical entities into the DT could include a virtual representation of the land, buildings, roads, utilities, etc. In fact, geospatial industries, claim that the DT technology could potentially enhance the influence of stakeholders in order to increase the attractiveness of the territory. It provides an information platform, without interfering with the physical entity, for reviewing the current and historical asset conditions, interactions, and consequences of various real-time registrations (Godager et al., 2021).
It is therefore clear that the digital transformation strategy proposed in this paper, by the development of the DT, needs integration at its core. Its development requires the adaptation of different technologies to make it possible thus triggering the benefits of digitization. BIM, IoT, Artificial Intelligence, and digital monitoring solutions, together with knowledge and data analytics, are the enabling technologies to represent the territorial ecosystem with a holistic approach, through a three-dimensional model that works as an innovative decision-making support tool for the stakeholders involved.
The interoperable management of data (between people and between tools) is placed at the center of the knowledge and planning activities of a territory nowadays. Eisenfuhr (Eisenfuhr, 2011) defined "decision-making" as "a process of choosing from a number of alternatives to achieve the desired results". In the case of Finiq, the goal is the increase of its attractiveness through the Landscape, Tradition, and Tourism assets. The stakeholder might not know all the information related to the different assets that could also be linked. The digital twin could respond in a centralized model both with real-time monitoring of asset performance and by providing alternative options that will lead to maximizing and optimizing decisions.

Objectives

The Municipality of Finiq consists of polycentric communities dispersed throughout the territory. Isolated communities with a lack of infrastructure and with different territorial contexts that imply different needs for the services provided. Shrinking, isolation, and lack of identity are the current trends in the municipality of Finiq. The reading begins therefore from the environmental system, to start the research of assets capable of re-orienting the current dynamics, in order to launch a revitalization of the sustainable development of the communities in this area. In this sense, the Municipality of Finiq has some outstanding vocational factors, like the beauty of the landscapes, suitable for a variety of outdoor activities, and the heterogeneous territory, full of traditional and cultural significances. Especially, the Municipality of Finiq has a rich cultural and historical heritage "written in the stones" of the old settlements of Phoeniciae, Butrint, and in the religious buildings of Dhrovjan.
Based on these conditions, the innovation of the territorial system of the Municipality of Finiq, with the participation of the communities, is one of the main drivers for the development and renewal of the area to increase its attractiveness. The innovation of the territorial systems is an ambitious challenge. Therefore, analyzing the qualities and vocations that the Finiq area expresses, it is necessary to identify development opportunities on a territorial scale. The purpose of this research paper is therefore the digital representation and the setting up of territorial assets that contribute to the improvement of the quality of the services that together, with the innovation of a multi-seasonal experiential tourism that makes better use of cultural, environmental, artistic, agro-food and gastronomic assets, could improve the attractiveness of the Municipality of Finiq.
The collection of data and the design of a digital infrastructure into which they can be collected becomes strategic in this context. A digital ecosystem through which different stakeholders and communities can cooperate in processes and exchange information. In this way, data from different devices and sources can be converted into economic value and information, enabling communities and services to interoperate with the network. The interoperable management between people and tools is placed at the center of the knowledge and planning activities of the territory to improve the technological innovation of the tools and the multidisciplinary enrichment of the context. In this scenario, the Digital Twin (DT), defines a perfect graphic and alphanumeric synthesis of static and dynamic contents, in order to guarantee a correct use of information within a decision-making process based on data and their reliability (Osello et al., 2021).
It is a matter of making a digital infrastructure aimed at supporting the creation of the conditions for a sustainable development relaunch of the communities in the area, through the better organization and representation of the production factors and the strategic assets as elements of the whole territorial ecosystem.
This research paper provides a base for the development of an integrated strategy to represent the existing territorial system of the Municipality of Finiq and the ongoing trends. The study aims to explore the characteristics of the territorial ecosystem in order to propose an integrated innovative development process through the digitization of the strategic assets, which are intended as

any tangible or intangible entity that has an economic value. Based on a holistic approach, this paper's purpose is to represent the land, integrated with cultural, environmental, artistic, agro-alimentary, and local gastronomic assets, with the aim to improve the attractiveness of Finiq Municipality through the consequent territorial and social impact. A virtual holistic representation was adopted for optimized management, knowledge-sharing, and collaboration in Finiq (Godager et al., 2021).

Methodology Used

The DT for the municipality of Finiq proposed in this paper is aimed at representing the potential benefits of networking distributed information resources and their integration, for the promotion of community development. A multiscalar model is capable of comparing heterogeneous information at different scales, with respect to the disciplines and knowledge involved in the decision-making process. According to the analyses, one of Finiq's distinguishing characteristics is its high level of naturalness. It describes its characteristics as a multifunctional landscape in which naturalistic and cultural components interact with each other to drive broader urban and social regeneration. Cultural activities are in fact strictly connected and synergic with environmental, social, and economic ones. In an "Inner Territory" context such as Finiq, similar to what is suggested by the new "Smart Specialisation" principles of the 2021-2027 EU Cohesion Programme, it becomes strategic to develop ICT technologies that support: participatory governance and digital tools capable of informing long term integrated development strategies at the territorial scale.

The digitization of spatial assets through the creation of a model to identify, represent, and visualize critical issues and spatial potential is what is proposed in this paper for the municipality of Finiq. A three-dimensional model with dispersed data and information that generates helpful models to visualize potential future scenarios and facilitate "what if" exploration. Predictive analysis for decision support is provided by real-time multi-source aggregation.

The 3D territory model made by a three-dimensional mesh, created by the acquisition and processing of Lidar data and drone technologies, could be implemented with GIS data (geographic information system), which provides data management and modeling for advanced cartography purposes, and with BIM models. BIM models contain much of the information that a DT requires, providing compressive information about the physical entity, and making it a perfect basis for the innovative 3D model (Godager et al., 2021). At the center, there is the aim of interacting with BIM models (according to the IFC standards) by bi-directionally correlation with the territorial map. Through this integration, all the objects in the DT won't be modeled as physical objects, but just those that are strategic for the representation of the assets identified: landscape, tradition, and tourism. The DT, in fact, is a fit-for-purpose concept (Adele et al., 2023). Its representation is symbolic and placed in a strategic position concerning the different sources of the data investigated and shared (Osello et al., 2021). Cultural, environmental, artistic, agro-alimentary, and local gastronomic entities could be therefore represented by BIM objects with all the information necessary, guaranteeing the creation of a relational database with international standards. For each category, a BIM meta object could be created to be associated with each physical asset, complete with all specific information updated in real-time thanks to IoT synchronization. These models, bi-directionally correlated with the territory model, giving back information, would enable users to interact with them to query and perform tasks proactively.

Over time, it will be possible to replace the initial meta-models with detailed models coming from ex-novo projects, restoration projects, or digitization of existing built environments for management purposes, made by BIM software. Because of its built-in scalability, the proposed methodology allows for progressively increasing levels of geometric and informational detail. In this way, the need for a monolithic and constricted approach to modeling for a progressive and agile approach to the simulation of models, data, interaction, and services.

The platform through which the DT could be used can be designed according to different levels of accessibility and maturity depending on the detail of representation, technology, and collaboration maturity, related to the level of interaction between people, technology, and process involved. Stakeholders could then be able to connect through the digitization of their assets, represented by the BIM object within the ACDat platform, which, equipped with IoT monitoring technology integration, can provide a centralized performance tool for the territory and individual assets.

The structure of the methodological process related to identifying and representing territorial criticalities and potentials, expressed in terms of ecosystem services, is characterized by the collection of data, which are fundamental to be visualized through the Digital Twin. For the construction of the large-scale cognitive framework - environmental, social, economic, cultural, and governance indicators can be used, such as INSTAT (Republika Shqipërisë Instituti i Statistikave) indicators, or Eurostat, aligning the system with Albania's forthcoming entry into the European Union. In regards to soft data, those directly related to the community, through the Digital Twin web platform, with different levels of accessibility depending on the group they belong to: promoters, operators or users, citizens, thanks to the availability of smartphones, can access through a Web Platform or customized APP to the digital model and attribute to the various places and services the perceptions/feelings they arouse. The attributable value varies in a range from 1 to 5, where the minimum indicates "very low" and the maximum is "very high". This operation is fundamental in order to have a measurable output on a qualitative-quantitative scale, which is also useful for subsequent operations.

Based on the Semantic Web, which increases the value of BIM by enabling data integration and complex searches across multiple data sources (Godager et al., 2021), DT represents the constant interchange of data between the physical and spatial network. It enables proper digitization and integration of data and services through the visualization of 3D models of strategic physical entities and strategic maps so that all stakeholders have a single source of modeled spatial data. The use of this approach aims to enhance the interoperability of analysis

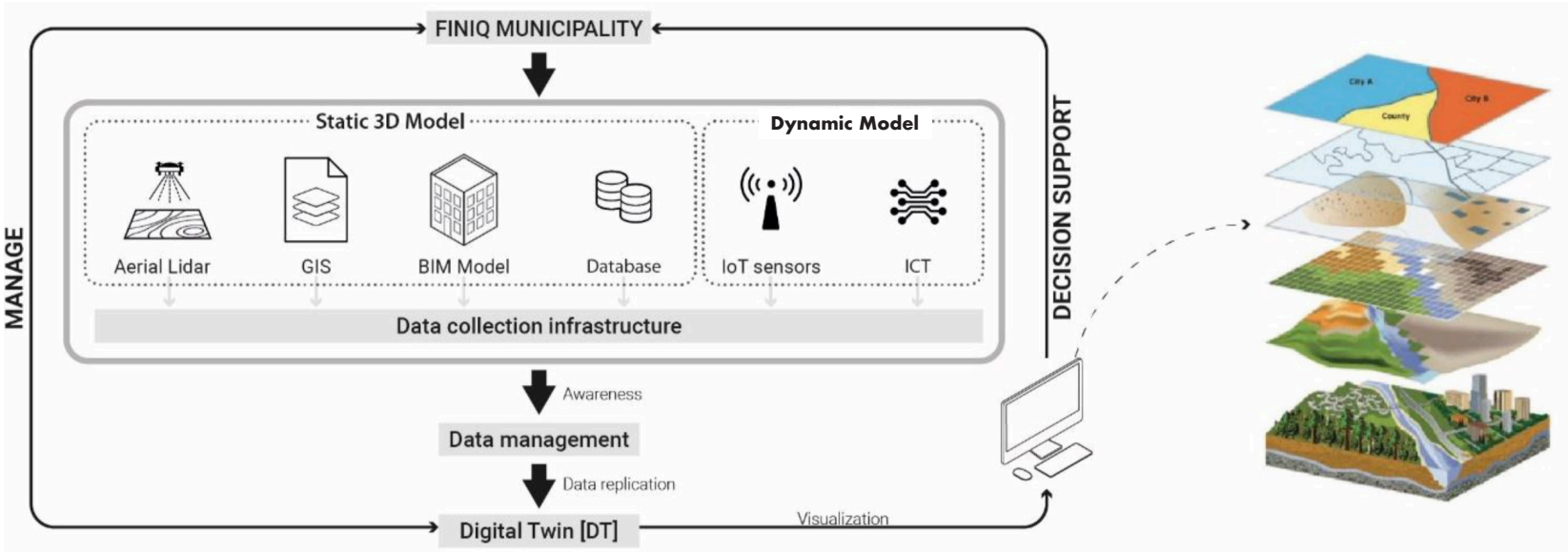

Fig4 / Methodology diagram
source / the author and right diagram: Harder, C., Brown, C., (2017). The ArcGIS Book. 10 Big Ideas about Applying The Science of Where. California: Esri Press. p. 73
source / the author

results with different levels of granularity, share the challenges, and ambitions, and improve the management of the territory in order to improve understanding and lead to responsible proactive decisions.

Results

The aim of this paper is to propose an integrated innovative development, through the digitation of the assets, in order to create a digital twin aimed to increase the attractiveness of Finiq Municipality to re-orient the current shrinking, insolation, and identity trends through a proactive decision-making process. It is therefore proposed the transition for the Municipality of Finiq to a digital ecosystem: a BIM-based model that through its three-dimensional capabilities is more comprehensive, and more interactive, ensuring the correct fruition of the information within a decision-making process based on data and its reliability.

According to Ridley (ARUP, 2019), once a BIM model is generated, it makes sense to convert it into a DT by enriching the model with both static and live data, working throughout the management of the Municipality of Finiq to deliver on this strategy creating value. Beyond the virtuous characteristics given by the development of a DT, such as the 3D representation of the entities of the strategic assets with a mutual connection between the physical entity and the digital model, performing in real-time and in an interactive manner.

Thanks to queries is possible to generate models useful to visualize alternative future scenarios and support "what if" explorations and assessments at different scales, including via statistical learning. The purpose of the Finiq Municipality's Digital Twin is therefore to turn data into insight and insight into action (ARUP, 2019).

Identifying synergetic strategies for the municipality of Finiq can be a catalyst for economic, social, and cultural regeneration, with the goal of involving the community in the planning processes to ensure the proposed model's long-term impact. In this regard, the representation of the territorial ecosystem using the Digital Twin presented in this paper provides an effective foundation for leveraging the potential of spatial analysis, data processing and aggregation, and their mutual interdependence. It also allows for constant confrontation between communities and decision-makers, as well as the identification of various conditions and scenarios required to design and plan intervention priorities from a regeneration perspective, using the three-dimensional model and maps. The DT enables the representation of the territorial ecosystem in a digital environment, including social aspects, allowing even the municipality's most isolated communities to express their opinions and feel represented. This allows direct stakeholders like local administrations and local enterprises to be able to deliver a better life quality through making better and more informed decisions, hence improving the attractiveness of the Municipality of Finiq and the indirect stakeholders such as citizens and communities to live better in Finiq.

Digitization of assets and their setting up in a system, may in this way create a value-chain, as a driver for the economic system of the Municipality. By enhancing territorial vocation factors beginning by their digitalization, this innovation has the potential to increase the added value related to a renewed management system of the municipality's services, while also diversifying the tourism economy aimed at its multi-seasonal management and enhancement. By taking away the tourist pressure on the Saranda coast, one intrinsic value of the DT proposed in this paper, is related to the holistic monitoring of performance and better management and enhancement of tourist flows in the municipality's inland, so that they are better spread both over the territory and during the course of the year. The intrinsic value consists in the increase in incomes to which all commercial activities and services are potentially involved. It would also reduce job insecurity, providing more continuous employment periods.

The digitization of the territorial ecosystem, although highlights a more complex management of Finiq Municipality and its related services, but with higher added value, it causes the need to develop distinctive skills of high educational background concerning professional fields such as digital innovation and social innovation. In this way, the stay of those young people with digital know-how who want to remain in their home territory - Finiq, have the opportunity to work in a highly qualified job.

The making of the digital twin of the Municipality of Finiq, thus fosters the development of a digital ecosystem that allows to begin the raising of the communities of the area, increasing its attractiveness by the strategic asset's organization as a unique territorial ecosystem.

Conclusions and Discussion

Driven by Finiq Municipality's need to increase its attractiveness by re-orienting the current shrinking, isolation, and identity trends, this paper has investigated the role of the digitization of the strategic assets, landscape, tradition, tourism, and the management of the territory through its DT. This research analyzed the role of the development of a digital ecosystem by emphasizing the importance of representation aimed to increase the integration and interactions between people, processes, and technologies.

The conventional geospatial tools, such as BIM, LiDAR, GIS, remote sensing, etc., can capture, create 3D models, measure, and analyze; however, developed without the goal of improving the collaboration of the stakeholders, they are normally static, have limited spatial analytical functionalities, and are not user-friendly. The Digital Twin represents one of the main challenges, solicited by the European Community to create a high-precision digital model of the Earth to monitor and simulate natural phenomena and related human activities (Osello et al., 2021). Despite its potential, one of the main challenges, as noted by

Fig5 / St. Nicholas Monastery Church, Mesopotam, Finiq Municipality, digital ecosystem (left) and (right) DT mockup with highlighted the St. Nicholas Monastery Church complete with the information set source / the author

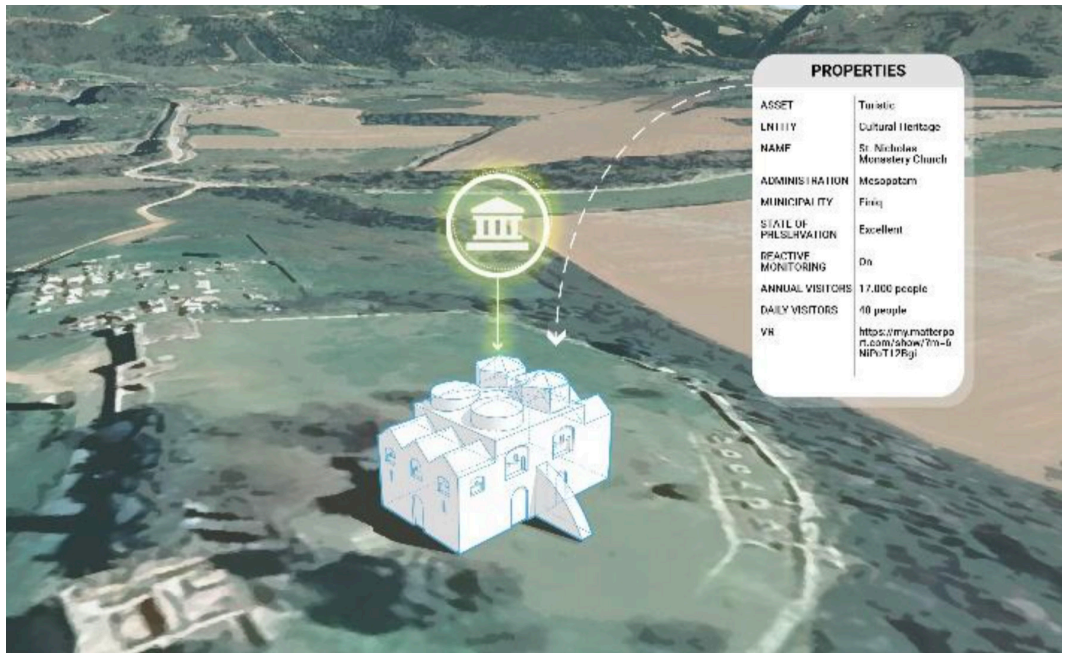

Fig6 / St. Nicholas Monastery Church, Mesopotam, Finiq Municipality, digital ecosystem (left) and (right) DT mockup with highlighted the St. Nicholas Monastery Church complete with the information set source / the author

Shahat et. Al. (Shahat et al., 2021), is the mutual integration between the digital and physical counterparts. (Godager et al., 2021). The communication of data from the physical entity to its virtual replica is possible, however, the opposite flow of the information from the digital model to the physical entity is still challenging (Adele et al., 2023).

Being involved in IoT systems, that offer significant potential in the territory providing significantly enhanced spatial context, in EU countries, technical and organizational measures must be established to ensure compliance with the General Protection Regulation (GDPR) (Godager et al., 2021), related to the fair, lawful and correct use of recorded data rights. In view of Albania's future entry into the European Union, the DT have to handle also this complexity. The trust between citizens and the public administration in terms of data use is being discussed here. DT, for example, relies on citizen-provided data. Awareness-raising campaigns aimed at encouraging citizens to use the infrastructure will therefore be necessary. At the same time, in order to build trust in the system, they will require concrete responses from the public administration to the citizens' issues reports.

To succeed with a strategy that involves the development of a DT for Finiq Municipality, a culture of integrated management of the territory has to be developed. At the same time, the information management perspective must include not only the administration's perspective but also the perspectives of the local companies and communities. The path to continuous and successful digital transformation implies the coordination and communication between all stakeholders, that, while utilizing the available technologies (Godager et al., 2021) can have a tool that integrates data from various users, both administrative and technical, opening up to true digitization and integration of data and services. Digital twin requires interoperability between different competencies and tools, in fact, the approach can only be interdisciplinary. Its development offers the opportunity to allow all stakeholders to have a single centralized modeled territory data, on which to build and evolve maps of services and land management strategies which could carry out interdisciplinary collaborative actions coordinated by actors in different roles. Attention has to be taken to the design of the architecture of the DT because, if it isn't able to achieve the intended purposes, it might be costly.

In this scenario is implied that many data are required for the proper construction of the DT of the Municipality of Finiq. A large data-storage capacity is needed and is therefore recognized that data assembling, the extraction of duplicates, and the integration of big data into a digital twin, are currently challenging tasks and could be costly and time-consuming. To ensure the use of the DT, Finiq's ICT infrastructure should also be enabled with fast Internet connectivity. This challenge to a mature digitalization means that ICT should be transformed from being a support tool to being an integrated part of a territorial core process, where data analysis is important to success.

The proposed DT of Finiq in this paper, fosters the creation of a digital ecosystem through which to optimize tasks, involving many perspectives, technologies, and stakeholders, to begin a revitalization of the communities in the area, increasing its attractiveness by organizing strategic assets as a single territorial ecosystem. The proposed methodological pathway represents one possible approach to developing alternative intervention strategies in the context of Finiq. This innovative approach to representing the territorial ecosystem has the added value of promoting a process of collective awareness and initiating a systematic and active form of change preparation as a foundation for shared regenerative actions in the public interest.

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