

DIGITAL MULTIPLIER IN THE SUSTAINABLE DEVELOPMENT OF TOURISM

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For cultural heritage destinations, the key risk of tourism growth is associated not only with limited resources but also with the limited capacity to manage flows in near real time. The article proposes an approach in which digitalization is treated as a sustainability-enhancing factor rather than as a parallel “technological” vector. On this basis, an integral SDT index (Sustainable–Digital Tourism index) with a digital multiplier is developed. The multiplier reflects how digital maturity increases the return on infrastructure and institutional measures by reducing transaction costs, improving transparency, and enhancing demand management.

Keywords

sustainable tourism; digital transformation; smart destination; composite index; digital multiplier; flow management.

Introduction: Sustainable tourism development in heritage destinations depends on how rapidly demand growth aligns with carrying capacity constraints, the quality of the urban environment, and the preservation of cultural assets. With a high concentration of attractions in historic city centers, even moderate tourist growth may lead to congestion, increasing pressure on transport systems, utilities, public spaces, and monuments.

In this context, digital transformation is important not merely as marketing or online sales, but as a management tool — through data systems, platform coordination, digital navigation, and visitor flow monitoring.

However, digitalization practices often develop unevenly: enterprises implement online sales channels, while public authorities and infrastructure operators fail to establish a unified data and decision-making system. As a result, digital services may accelerate visitor growth without improving the destination’s capacity to prevent congestion.

The purpose of this article is to present a measurable approach to describing this asymmetry and to demonstrate how digital maturity can enhance sustainability through a digital multiplier. The research question is formulated as follows: how can digital transformation be embedded into an integral sustainability assessment in order to reflect its amplifying effect on infrastructure and institutional components?

Table 1. Indicators of the Digital Block of the SDT Index and Their Link to the Digital Multiplier (Example for Regional Diagnostics)

Layer	Indicators	Unit / Status	Interpretation in SDT and Multiplier
Transactional Layer (DIG ₁ –DIG ₂)	Share of online bookings; share of electronic tickets	% of total services	Reduces transaction costs and increases accessibility; strengthens the economic block, but without flow data does not prevent congestion.



Infrastructure Layer (DIG ₃)	QR information, digital routes, e-guides	Availability / coverage of sites (%)	Improves awareness and spatial connectivity; supports redistribution of visitors across routes.
Managerial Layer (DIG ₄)	Unified platform, data integration, monitoring and analytics of flows	Availability; maturity level	Key driver of the multiplier; provides feedback between demand and capacity, enables early response and adaptive management.
Institutional Interface	Data-sharing regulations, standards, stakeholder responsibility	Availability / quality	Increases governance effectiveness and reduces coordination costs; strengthens the institutional block of the SDT.

Materials and Methods: The scientific novelty of the article lies in the development of an integral SDT index with a digital multiplier. The index aggregates key sustainability blocks (economic, socio-cultural, environmental, and institutional) and includes a digital block that influences sustainability not only through summation but also through a multiplier that enhances the effect of basic development measures.

Conceptually, this means that with equal infrastructure resources and institutional rules, a destination with higher digital maturity achieves greater sustainability because it reduces interaction costs, increases demand transparency, and adapts management more rapidly.

The methodology is designed for regions with incomplete digital statistics. Therefore, a compact list of observable indicators is used, grouped into three layers:

1. Transactional digitalization (how tourists purchase and plan);
2. On-site digital infrastructure (navigation and access to information);
3. Management digitalization (platform, data integration, monitoring and analytics of flows).

Each indicator is normalized (on a 0–1 scale or through threshold ranking), after which sub-indices are calculated and integrated into a composite assessment. The digital multiplier is defined as an increasing function of the digital sub-index and is applied to blocks most sensitive to governance (institutional and infrastructure), reflecting the enhancement of their effectiveness as digital maturity grows.

Results: Comparison of digitalization layers reveals a structure typical of heritage destinations: the transactional layer develops faster than managerial digitalization.

Online sales channels and electronic tickets increase convenience and accessibility, while smart navigation tools (QR information, digital routes) improve orientation and visitor experience. These components increase the digital sub-index and positively affect economic dynamics.

However, the absence of unified platform integration and mature flow monitoring systems leads to only partial realization of the digital multiplier. With fragmented data structures, authorities lack real-time information on spatial and temporal demand distribution, predictive measures during peak periods are limited, and decisions remain reactive.

In SDT terms, this implies high values of DIG₁–DIG₃ with weak DIG₄, limiting digitalization's capacity to prevent congestion and improve institutional governance quality.

Discussion: The results have three practical implications. First, digitalization should not be evaluated solely by online sales indicators. For sustainability, management tools are critical: unified data standards, platform coordination, visitor flow monitoring, and attendance analytics. These elements generate the multiplicative effect — increasing returns on infrastructure and regulatory measures by redistributing flows and reducing congestion risks.

Second, the digital multiplier explains a paradox: growth of digital services may coincide with



increased congestion risks. If a destination simplifies booking and promotion but does not build demand-control and capacity-management mechanisms, digitalization amplifies inflow without enhancing manageability.

Third, for heritage cities, priority should not be the addition of fragmented applications but the construction of a platform-data layer:

- (i) a unified integration platform with interfaces for private operators;
- (ii) regular data collection and reconciliation across accommodation, attractions, and transport;
- (iii) a monitoring dashboard with response protocols;
- (iv) integration of navigation with congestion signals and recommended routes.

Such an architecture enables the digital multiplier to function as a true sustainability enhancer.

Conclusion: The proposed SDT index methodology with a digital multiplier formalizes the role of digitalization as a factor that increases the effectiveness of infrastructure and institutional measures in sustainable tourism development.

The key conclusion is that when transactional digitalization dominates and managerial digitalization remains weak, the multiplier is only partially realized, limiting the ability to prevent congestion in heritage destinations.

The practical value of the approach lies in the compact set of indicators, applicability in conditions of incomplete regional statistics, and the possibility of comparing digital development scenarios without resorting to forecasting.

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