SYSTEM DESIGN FOR TERRITORIAL CYCLE TOURISM

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ABSTRACT

Many territories suffer from the lack of strategies and tools for the promotion, fruition and enhancement of their heritage. They require new forms of organisation, ICT interaction platforms, stakeholder participation, infrastructures and services to avoid inadequate fruition and loss of the potential value of their resources. This could generate significant negative effects on the environmental, social and economic aspects of the territory. Nonetheless, the growing interest in ecotourism and the global proliferation of bike sharing systems foreshadow an increasing demand of cycle tourism related services and products. Furthermore, the improved performance features achieved by the technological E-bikes development, could help traveling safely through longer distance and tourist itineraries with steep slopes, especially for users with different abilities and of diverse ages. The paper describes the intermediate results of the current PhD research, based on the definition of an advanced system model applied to cycling tourism for the enhancement and sustainable fruition of territorial resources.
Key Words: Ecotourism, Cycle tourism, E.bike sharing, System Design, Design for Sustainability

1. INTRODUCTION

The most strategically issue in sociological and economic terms of sustainable tourism is represented by the phenomenon of ecotourism bike sharing as a tool for accessing the numerous natural, cultural and historic-artistic resources offered by a territory. This specific form of bicycle tourism makes it possible to observe, learn about and appreciate particular natural areas and landscapes, natural attractions, local craftsmanship, food and wine. In this scenario, the responses offered by standard urban bike sharing models are inadequate to the complexity of issues raised by ecotourism and sustainable tourism. They require new focused design scenarios, stakeholder participation, the promotion of new forms of organization and the definition of actions and ICT system interaction. Furthermore, long-distance and tourist itineraries with steep slopes require bikes with improved performance features (comfort and efficiency), above all for users with different abilities and of diverse ages.

This paper presents the intermediate results of the ongoing PhD research called "System Design for territorial cycle tourism", aimed to demonstrate the possibility to obtain the enhancement of fruition and valorization of a territory heritage, through the definition of an advanced system model (service / product / communication) applied to cycling tourism. Specifically, the paper describes the progressive steps that will result in the definition of new possible solutions offered by extra-urban e.bike sharing system, starting from the description of ecotourism and bicycle tourism phenomenon and the analysis of the problematics within the territorial areas (2. Ecotourism by territorial E.bike Sharing). This is followed by the presentation of the criteria, tools and methods of System Design and System Innovation employed by the research (3. Methodology). Consequently the text describes the definition of the state of the art of cycling tourism through its main characteristics, dynamics and potentialities, but also its problems and necessities (4. State of the art of Cycle Tourism), then the definition of the cycle tourist's main characteristics, starting from the identification of the types and subsequently to the definition of the cyclist's needs (5. Definition of cycle tourism needs). Finally, the text foreshadows what could be a possible scenario for the ongoing development of an integrated and coherent combination of cycle tourism service and product design for the enhancement of territorial heritage (6. System Design for territorial cycle tourism scenario).

2. ECOTOURISM BY TERRITORIAL E.BIKE SHARING

2.1. Ecotourism and Ecotourism Cycling

The phenomenon of Ecotourism developing in the early years of the new millennium is driven by the need to reconcile access to natural, cultural and social resources with their conservation. In 2002 the Québec Declaration on Ecotourism proclaimed by the United Nations defined the principles and clarified the meaning of this term, moving beyond the concept of ecological tourism to incorporate aspects tied to the respect for local communities and economic development.

According to the most commonly accepted definition provided by the International Ecotourism Society, "ecotourism is now defined as responsible travel to natural areas that conserves the environment, sustains the well-being of the local people, and involves interpretation and education". It is characterised by a number of fundamental aspects: a focus on the promotion of sustainable development in tourism; avoiding the deterioration or depletion of resources; promoting and protecting respect for the environment; valorising natural resources by responding to a philosophy that is more biocentric than anthropocentric; it is founded on a direct encounter with the environment and inspired by a dimension of direct cognition. According to the 10° Rapporto Ecotour, released in 2014 by Enit and Istat in collaboration with the University of L'Aquila, ecotourism is a growing phenomenon worth 12 billion Euro per year, with the bicycle being the preferred activity for the second consecutive year: bicycle tourism has leapt to the top of the list of activities preferred by tourists, at 30%, surpassing backpacking (21%) and trekking (18%).

Given this socio-cultural perspective of sustainable tourism and ecotourism, bicycle tourism represents a strategic opportunity for testing new forms of tourism and technologically appropriate service-product concepts. In 2012 bicycle tourism in Europe registered more than 2 million trips and 20 million room reservations, for a total value of 44 billion Euro; the same year, in France, the principal destination of bicycle tourists, bicycle tourism generated more than 2 billion Euro in revenues, and 9 billion in Germany. In Italy, the potential value of bicycle tourism is estimated at 3.2 billion Euro per year (source: Italian Ministry of Infrastructure and Transportation). Given the projected growth of bicycle tourism, there is a need to improve a number of aspects: intermodal connections with other transport systems, such as rail, river and maritime networks; favouring the realisation of interconnections between different bicycle tourism itineraries; developing bike hotels; realising services and products for bicycle tourism that favour inclusion, accessibility and safety.

2.2. From Bike Sharing to Extra-Urban E.bike Sharing

Current solutions to bike sharing, progressively more common in many cities and centres of tourism, present a number of critical elements, above all for users with low to medium physical preparation. On the one hand, they do not favour this form of mobility in hilly and mountainous areas with challenging topographies. On the other hand, they are unsuitable to favouring extra-urban mobility and long-distance travel, both for the characteristics of the bike themselves and the quality and specialization of the services offered. Strategies for the valorization of territorial

resources require new forms of sustainable tourism and ecotourism based on solutions for bicycle tourism that are highly inclusive, accessible and safe. This means rethinking integrated services and products using a System Design and Design for All (DfA) approach.

Furthermore, the feasibility of new extra-urban e.bike sharing solutions can now be guaranteed by technological innovations in the field of propulsion systems. In general, Light Electric Vehicles and, in particular, e.bikes (Electric Bicycles) that can travel without the need to pedal and reach sustained speeds; Pedelec (Pedal Electric Cycle) or EPAC (Electric Pedal Assisted Cycle) that, thanks to assisted pedalling, can reach a maximum allowable speed of 25 km/h, using a motor that must not exceed 250W of continuous power (European Directive 2002/24/EC).

By exploiting the potentials of e.bike sharing it is possible to expand the target market to include those whose abilities vary in relation to age, culture and physical preparation (Design for All). Moreover, recent evolutions in photovoltaic technologies make it possible to charge batteries using renewable energies such as solar and/or wind power Solar Design).

3. METHODOLOGY

The research started with the definition of the intervention context, the problematic area and the thematic area. Specifically, the intervention context has been identified in the territorial areas (extra-urban, hilly, coastal and mountain areas, etc.), the thematic area has been identified with cycle tourism and the research field with the Strategic Design for Sustainability and in particular with Systems Design (service / product / communication mix).

Later on the research has been focused on exploring the state of the art of cycle tourism and analyzing Case Studies and Best Practices. The collected data have been organized through Database records in four bike related areas (economy, infrastructures, intermodality, bike services), as well as the analysis of Best Practices and Case Studies.

Currently the research is heading towards the definition of the Product Brief, concept design (generation of ideas, synthesis and verification of one or more solutions) and concept development (evaluations and development of the general project outline).

The methodological process used in this last phase is the Method for System Design for Sustainability (MSDS), developed and adopted during the LeNS research (2007-10) by the System Design and Innovation for Sustainability Research Unit (DIS) of the Indaco Department at the Milan Polytechnic (Vezzoli, 2007).

The MSDS method is based on phases of strategic analysis (analysis of context and Case Studies), the exploration of opportunities for innovation (system ideas and design orienting scenario) and a set of tools (system orienting scenario, stakeholder motivation matrix, system map and interaction table) that will help the ongoing definition of the system concept and the sustainability assessment.

4. STATE OF THE ART OF CYCLE TOURISM

In order to define the current state of the art of cycle tourism the research has been addressed towards the analysis of four main bike related topics: economy, infrastructures, intermodality and bike related services.

- Economy: the collected data give an estimate of the size and the direct economic impact of current cycling activities in Europe and in Italy (excursions, cyclical journeys, annual revenues, etc.), but also the economic value of the production of bicycles in Italy (traditional bikes and e-bikes), exports and related industries. The value of cycle tourism in Europe is about 44 billion Euros of annual revenues, deriving from 20 millions annual cycling holydays and 2.300 daily cycling excursions (AA.VV.The European Cycle Route Network Eurovelo Study, 2012). In Italy, the potential value of bicycle tourism is estimated at 3.2 billion Euro per year (source: Italian Ministry of Infrastructure and Transportation), while the economic value of the production of bicycles in Italy is about 1.2 millions of Euros, with +48% of E.bikes production, a +19% E.bike market growth and 148.000 E.bikes sold in 2017, making Italy the European leader in bike manufacturing (Confcommercio ANCMA, 2018).
- Infrastructures: the data gathered have provided the dimensions and the capillarity of the infrastructural network linked to cycle tourism in Italy and in Europe, with particular attention to the high traffic propensity cycling networks (landscape, monumental, food and wine, etc.). Some of the most important infrastructural networks worth mentioning are Eurovelo, a network of 15 long-distance cycling routes crossing 42 countries, reaching a total of 70.000 kilometers in lenght once it will be completed and Bicitalia, a project of a tourist cycle network planned by FIAB for Italy, included in the Eurovelo network with the expected overall length of approximately 16,500 km.
- Intermodality: the search for information has been addressed considering it in two main aspects: transporting the bike on other vehicles and exchanging the bike with other veichles. The collected data gave an overview of the possible interactions between Italian and European transport between bikes and other vehicles (bike / train, bike / bus, bike / ferry, bike / plane etc.). In Europe this service is guaranteed by local and regional trains. Instead for long-distance trains that cross national borders, the situation appears more critical: the bicycle slots, where present, are reduced to a few numbers. In Italy, intermodality still presents numerous deficits, although at regional level some administrations have proved more sensitive to the needs of cyclists. In Italy there were 350 thousand bicycles (excluding

folding bicycles) transported on board the regional trains in the first ten months of 2016.

- Services: the information was collected with the aim of defining the current status of the services linked to cycle tourism and their presence on Italian and European territory. The data obtained allowed us to identify the types (receptivity, refreshment, bike sharing services, assistance / rescue, information) and possible interactions between them. The main European bike sharing services have around 150,000 shared bikes available in 31 countries and operating in 472 cities while in Italy, around 200 Bike sharing services were in operation in 2016 with around 13,700 shared bicycles

5. DEFINITION OF CYCLE TOURISM NEEDS

After the data interpretation phase, the research focused on delineating the specific characteristics of the cycle tourism, starting from the identification of the types and subsequently to the definition of the cyclist's needs. The types of cycle touring have been identified through the definition of the following parameters:

- Journey time: The number of holiday days changes several factors such as quantity of luggage, need for hotel, food, distance that can be traveled, use of different means (intermodality), staying in one country or going abroad, etc. Three types of activities can be identified:

- Excursion: one day
- Short stay: two days
- Holiday: more than three days

- Type of journey: You can distinguish two types of travel or itinerary based on the place of overnight stay.

- Petal or star: It is characterized by the presence of only one basic structure to which the cyclist will return at the end of each day to spend the night there. The advantage is that the cyclist can book, with greater convenience and for several days, a single structure where he can leave most of the bags with the advantage of being able to travel very light bringing with him only the bare essentials

- Ring or open: It includes movements along a previously planned itinerary, during which there are some stages and various overnight accommodation facilities. It is more complex than the previous one, but allows you to ride a lot and visit new places every day.

- Types of cycle tourism.

- Guided: practiced by people who do not have enough experience and prefer to opt for a guided journey.
- Self-guided: more free and flexible, going alone or in a group without time or company constraints.
- Self-supported: practiced by those who know how to manage themselves independently

- Types of cycling tourist:

- Proximity cyclist
- Daily cyclist
- Vacation cyclist
- Explorer cyclist
- Sport cyclist

- The cyclist's needs: the common basic needs are essentially those of restoring, resting and sleeping, taking every opportunity to increase one's culture, to relax and enjoy oneself and above all to obtain the necessary information to undertake and lead the journey to the end. The cyclist's needs have been identified through the definition of the following parameters:

- Obtaining information: before the journey, during the journey
- Refreshment: meal, refreshment
- Rest: (bike hotels, hotels, hostels, camping sites etc.
- Infrastructures: cycle routes, cycle tracks, charging stations, etc.
- Assistance: bicycle workshops, first aid
- Culture / Leisure / Relax

5. SYSTEM DESIGN FOR TERRITORIAL CYCLE TOURISM SCENARIO

The research is currently on its way to reach the definition of an advanced system model concept applied to cycling tourism for the enhancement and sustainable fruition of territorial resources. At this stage the process is based on the succession of phases for defining the Product Brief, concept design (generation of ideas, synthesis and verification of one or more solutions) and concept development (evaluations and development of the general project outline).

The previous collected data are currently being elaborated through the Method for System Design for Sustainability (MSDS) in order to to guide and orientate the solution within this fragmented and complex context, to coordinate all the stages and obtaining the necessary results. Specifically the Stakeholder Motivation Matrix is being used to define the role and contributions that each actor can bring to the partnership in general, and to each single actor in particular. The Offering Diagram is being used to define the functions provided by the system to users. Finally, the Interaction Table (Story Board) will visualises and describes the sequence of the principal actions carried out by the user while the services are being provided.

Although the research has still not reach the final definition of an advanced system model applied to cycling tourism, this paper tries to foreshadow what could be a possible future cycle tourism system scenario: an improved E.bike sharing systems in accordance with Design for All criteria; connected and implemented bicycle routes by exploiting rivers valleys and decommissioned roads and railway lines; cycle routes provided with more sustainable supporting services and structures (bike hotels, bike restaurants, bike parking, proper signage), implemented intermodal connections with rail, bus and ferries, communicating the vision towards the territory and promoting the product to the general public. Specifically the research is evaluating the feasibility as well as the potential effectiveness of a system that incorporates specific features described in the following lines.

An E.bike sharing system comprised of rental stations, interactive information totems, solar battery charging stations and variable geometry frame e.bikes. The different configurations of the bike make it possible to adapt the e.bikes to different uses (tourism, sport) and different users body conformations. A safer cycle route infrastructure network provided with intelligent lighting and monitoring system for bicycle-pedestrian paths along the cycle routes consisting in linked network of intelligent "poles" equipped with technological devices such as motion sensors, optical smoke detectors, WI-FI antennas, video cameras and weather stations.

A diffuse hospitality through a smart modular platform for outdoor cyclist accommodation using modular and energy self-sufficient platform modules, provided with bedroom, bicycle storage and mini-repair shop, toilet, bicycle washing station, washer/dryer, photovoltaic system, relax area.

A smart-green-market system that offers local food and wine products in different dining areas: fast food for take-away by bicycle, areas for longer and more comfortable pauses.

A smart information system offering assistance to bicycle tourist consistsing in a mobile device, a smartphone application, a signage system and a energy self-sufficient information device located along the bicycle path, offering a tool that fosters interaction between users and the territory.

6. CONCLUSION

All the successful experiences demonstrate that cycle tourism needs safe spaces and infrastructures, a dedicated product and a consequent communication that knows how to enhance the territory and pierce the imaginary of potential customers. Designing for cycle tourism means planning a system that bring out the qualities and the specificities of the territories. Bicycle routes should enhance the hidden territory's qualities that only with a slow pace can really emerge and be enjoyed. Planning a cycle tourism system should take into consideration how to read the territory, the historical signs, the landscape and present them in such a way that they are attractive to the contemporary tourist. The infrastructures as well as the E.bike Sharing Systems should be designed for different users with different abilities and of diverse ages, from those who want to discover the wonders of the territory, for those who travel with the family, for short and long vacations, to those who are dedicated to large journeys but also for the sporty ones. The design and execution of the infrastructure should go hand in hand with the creation of a product that knows how to put together all the stakeholders who will have to sell it and make it competitive on the market.

The communication of the vision towards the territory and the promotion of the product to the general public are two important aspects that need to be implemented in a strategic way in order to attract tourists in a specific territory. Lastly, particular attention should be given to all those aspects that can decree the attractiveness of a cycle tour, such as signage, connection to public transport and intermodality, support services and reception to the cyclist.

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