PROPOSAL OF INTELLIGENT TRANSPORT SYSTEMS DEVELOPMENT IN MARINAS

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Abstract. *This paper presents the research of analysis of the availability and applicability of new information technologies with the purpose of establishing the intelligent system of marinas. The technologically improved system provides a higher level of functionality and integration of users. New system functionalities refer to the booking system, travel planning, mooring and staying at marinas; further, provision of pre-travel information to the users about the destination, tourist potentials and points of interest, tourist offer. The developed and established system of e-marinas will reflect the competitiveness of the system of marinas and increase the quality of marina services.*

Keywords. Intelligent Transport Systems (ITS), Intelligent Marine System (IMS), marina, navigation tools

1 Introduction

The objective of the process of computerization of marinas is the establishment of the Intelligent Marine System conditioned by the integration of the information system (hardware, software and communication networks) and the transport subsystem of marinas which includes transport infrastructure, technical means and instruments. This includes also the on-line berth booking system, navigation programs and interactive maps as well as additional services provided by the marinas to their customers. No doubt the communication and information technologies have become the basis for the post-industrial society. The latest name for the future developing society is the networked society. The information and communication technologies (ICT) at the marinas represent a set of interconnected components that work together, and the information system is a system that processes, stores and distributes the information, accepts input data from the environment, processes them and sends the processed information back into the environment.

2 Computerization of marinas

The information exchange in the system of marinas is realized through communication channels between the carrier of the activities and the database. The information system is physically located in the headquarters and its basic role is to collect data required for the operation of the E-marinas system.

In the assessment of information system management the criteria are defined which are used to assess the system parameters. The criteria for assessing the reliability, accessibility and user-friendliness are narrowly connected with the availability and formatted for easier implementation. Within the timeliness and availability there are elements of reliability.

The analysis of the availability of information technologies with the aim of computerization of marinas starts from the following assumptions:

- the information system of marinas is a means for establishing interaction channels among elements that form this unit, at all levels of systemic organizing, with the aim of successful managing of adequate technological system (subsystem);

- systemic approach to the construction of a complex system of marinas precedes the building up of the information system;
- computers and telecommunications are only technical components of the information system.

In the computerization phase of marinas care should be taken about the limitations that hinder its building, and are present both as external and internal ones compared to the total technological system.

External limitations in the Republic of Croatia result from:
- general policy of the technological development of the country,
- legal regulations,
- slow building of infrastructure information systems in the country.

Internal limitations of the Republic of Croatia result from:
- undeveloped information systemic approach,
- unadapted organizational solutions,
- occasional dominance of the partial development policy,
- absence of the creative structures and adequate education,
- unsolved financing problems.

In selecting the information system of E-marinas in the system of marinas the following criteria need to be defined:
- costs,
- time necessary to implement the system,
- losses due to the action of unforeseen influencing values,
- simplicity of implementation,
- strategy of further internal development,
- credibility on the market.

In the qualitative sense the advantage of implementing new technologies will be reflected on:
- more reliable and safer system of the ports of nautical tourism,
- improved information flow,
- simpler and faster methods of data collection.

There are a number of currently available technologies which can provide information for boaters. The problem that needs to be considered is deficient connections among them in order to achieve the best possible benefits for the boaters and the information providers. Having a certain web site, telephone information lines, WAP services or interactive voice response do not represent individually a benefit for the user. The information system needs to be integrated, so as to avoid investments in overlapping systems.

The setting of Hotspot would allow wireless access to Internet users of the marinas who would get a password for network access when contracting the service. The infrastructure needs to be organized so as to provide high quality signal across the whole area of the marina.

For the boaters who have no personal computer the opening of an Internet kiosk and Internet centre is recommended, where the users would have 24/7 access to the Internet services. The establishment of the Internet kiosk does not require any additional human resources and its work is simpler to organize and they can be installed at several locations in a marina.

A competitive advantage of a marina would be to include the price of 1 hour Internet usage weekly (by Hotspot or at the Internet centre) in the price of the berth. This should certainly be introduced in the mega marinas since they expect customers who will use the Internet during their stay at the marina.

The application of ICT in ACI marinas, except providing the boaters with the access to the Internet has extreme usefulness in establishing:
- the system of on-line berth reservation,
- navigation programs and interactive maps.

2.1 *Selection of information system of E-marinas by multi-criteria analysis method*

The information system of e-marinas represents support in the business operation of the marina. On the other hand, the influence of the globalization trend, as a phenomenon of constant expansion of the existing and the creation of new markets, can be recognized today in all the areas of human activities. In selecting the information system of E-marinas that will integrate the business processes, allow creation of a stronger network, increase of the market power, and therefore also the possibility of higher quality service for the existing and the future customers. Since each of the mentioned marinas had support of their business processes in their own information system it is impossible to satisfy well the new requirements.

The following criteria have to be defined in the selection of the information system of E-marinas of the ACI marina system:
- costs,
- time necessary to implement the system,
- losses due to the action of unforeseen influencing values,
- simplicity of implementation,
- strategy of further internal development,
- credibility on the market.

2.1.1 Structuring of decision-problem in hierarchical model

The first step in AHP method is the formation of a hierarchical model of the decision-making problem with the goal at the top, criteria and subcriteria at lower levels and alternatives at the very bottom. It is necessary to define the goal at the highest level and it is: select the best information E-marina system, i.e. one that best suits the processes at the marina. Graphical presentation of this model is presented in Figure 1.
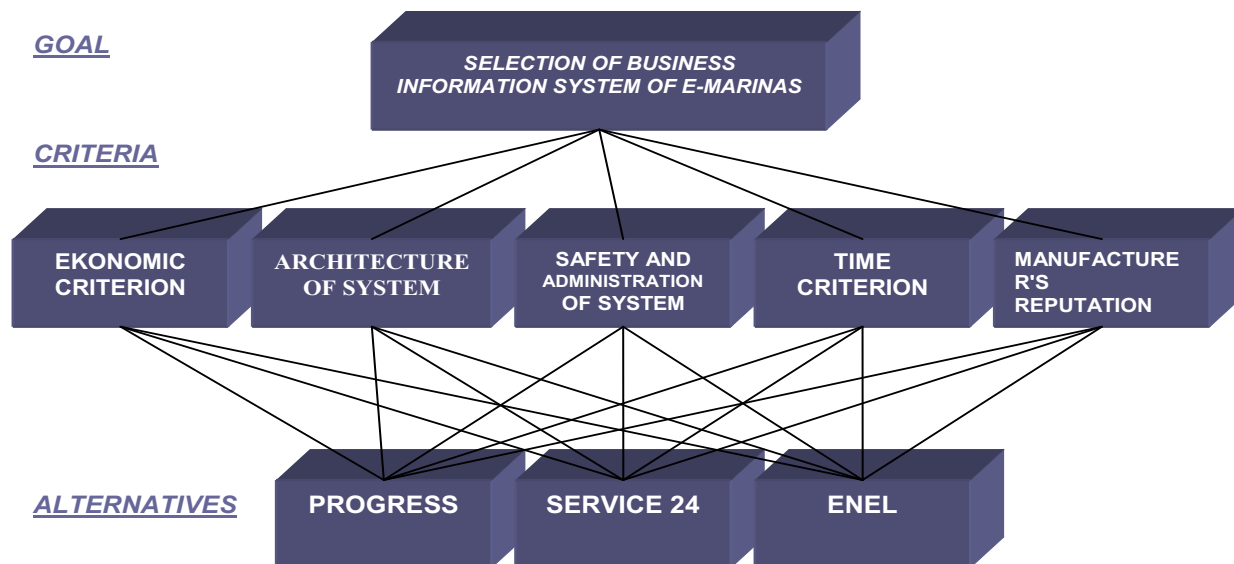
GOAL

SELECTION OF BUSINESS INFORMATION SYSTEM OF E-MARINAS

CRITERIA

| EKONOMIC CRITERION | ARCHITECTURE OF SYSTEM | SAFETY AND ADMINISTRATION OF SYSTEM | TIME CRITERION | MANUFACTURER'S REPUTATION |

ALTERNATIVES

| PROGRESS | SERVICE 24 | ENEL |

Figure 1: Hierarchical structure of selecting the information system of e-marinas

Economic criterion in selecting the information system of e-marinas

The economic criterion (initial cost, cost of maintenance, cost of system upgrade, cost of user education, cost of consulting services) is one of the major criteria that need to be taken into consideration when selecting the information system of e-marinas. Apart from the initial price which depends on the number of user licences and selected modules it is necessary to take into consideration also the maintenance cost, cost of system upgrade, cost of user education and the cost of consulting services in order to make the work in the selected information system as good as possible.

Criterion of information system architecture

The architecture of the e-marinas information system (completeness, efficiency, effectiveness, user-friendliness, data transfer quality, data analysis quality, necessary foreknowledge of the employees) is of great importance for the users i.e. employees. The user-friendliness, low level of the necessary computer foreknowledge and short time for mastering the system are the basic advantages in the selection process. Support to teamwork, cooperation and communication among the users and the adaptability to multi-user environment are some more advantages that may influence the final decision. The table presents some more completeness which marks the possibility of integration of all the operation aspects, efficiency and effectiveness as high level of realization of the set objectives. The quality of data transfer and analysis are very important as the support to business decision-making, one of the crucial aspects of business.

Criterion of system security and administration

Since the information system has to satisfy the conditions of multi-user environment this criterion includes the assessment of the processes of great importance for the very functioning of the system and its security including: authentication and authorization of the users, possibility of access via the Internet and the administration tasks regarding the making of security copies and evidence of changes.

Time criterion

Time of implementation, education, testing and the time necessary to master the functions of business information system are important components that

need to be taken into consideration when making final decisions.

In the qualitative sense, the advantage of implementing new information and communication technologies will be reflected on:

- more reliable and safer system of the ports of nautical tourism,
- improved information flow,
- simpler and faster methods of collecting data.

There are numerous currently available technologies which can ensure the delivery of real-time information for the boaters. The problem is the access to real-time data in order to achieve the greatest possible advantage for the boaters and for the information providers - ACI. Having a certain web site, telephone information lines, services via mobile networks or interactive voice response do not represent individual advantage for the user. The information system needs to be integrated so as to avoid investments into overlapping systems.

3 Pre-travel and travel information system

Convenient usage of maritime assets for the purposes of nautical tourism is in significant correlation with the quality of providing relevant, accurate and useable information by means of providing the users with pre-travel and travel information services.

The pre-travel and travel information system consists of a pre-travel information subsystem prior to the start of travel (when the user makes the decision on the selection of mode of travelling to the destination, route, time of departure and additional services) and the information system of passengers during the trip itself. Its main characteristic is attracting new users into the system by providing them at the right moment with the necessary information in order to make their travelling as efficient and as convenient as possible.

Correct, accurate and user-adjusted information are crucial for the user to make adequate decision about the method, direction and time of travelling prior to the start of travel or during the travel to the destination. Apart from the classical methods of information, the introduction of real-time system is important. Apart from "static" information the system should support dynamic real-time informing of the users which is made possible by processing a huge volume of real-time information and by using mobile telecommunication systems including the third generation of mobile networks and mobile internet. During the distribution of information attention should be paid to the "coverage" of the studied area by the signal of the operator responsible for information distribution. In case of emergencies

reliable methods of information distribution and warning need to be used.

3.1 Specification of user requirements

The function of the pre-travel and travel information is to ensure the availability and user-friendly usage of information in order to make the decisions regarding the destination, route, travel time, usage of additional facilities, etc. It is necessary to consider the expressed and non-expressed user requirements and available technical and technological, organizational and business solutions available to satisfy the user requirements. It is precisely the phase of identifying and evaluating the requirements of the possible users which has been identified as the critical step in the development of the pre-travel and travel information system.

The user requirements regarding pre-travel information services include:

- ▷ the system should provide all users with emergency service information (police, firefighters, etc.) and information on dangers free of charge,
- ▷ the system must be capable of charging a certain fee from the users for providing the information that are not urgent i.e. are not provided by emergency services,
- ▷ the system should provide the users with correct, updated and easy-to-understand information that are of benefit to the users,
- ▷ the system should provide information on alternative routes (faster, shorter, less expensive, etc.),
- ▷ the system should provide the users with the possibility of planning their trip by themselves based on their criteria (time of departure/arrival, selection of route, usage of additional services, etc.),
- ▷ the system should allow the users to plan the trip taking into consideration their limitations (disabled users, i.e. people with disabilities),
- ▷ the system should provide additional information necessary to the user – prices of travelling, predicted incident situations, works on the infrastructure, etc.

Apart from service providers and end users (passengers) there are stakeholders that need to be included in the development process: network operators, port authorities, equipment manufacturers, local authority, etc.

3.2 Information management

The requirements are not related exclusively to providing information to end users, but also to real-time management of pre-travel information. The user requirements are related to <u>information management</u> given further in the text:

    ▷ the system should inform the users about the changes of the provided information distributed to the users based on certain criteria,

    ▷ the system should collect data, analyze them and process them from different (independent) sources,

    ▷ the system should adapt information to individual user groups to whom certain information are necessary and relevant,

    ▷ information have to be displayed textually, graphically (using maps with textual captions) and other methods of presentation (audio/video, interactively, etc.),

    ▷ information should be provided in the mother tongue and in several world languages.

3.3 Information management

In providing information it is essential to realize the interaction between the pre-travel information system and the users:

    ▷ the system should have interfaces for possibly necessary identification of users, if the information includes certain money transactions, reservation, etc.

    ▷ the system should allow booking and pre-paid method of charging for the services,

    ▷ the system should allow the users to reserve a parking place in the capacities located next to the berths,

    ▷ the system should provide personalized services to users in accordance with their requirements,

    ▷ the system should be able to exchange information with other information systems using the standardized protocols.

As a rule, the mentioned user requirements for pre-travel information can be identified also with the information provided to the user during the trip. Additional user requirements specific for travel information are the following:

    ▷ the system should be able to be activated by another system or process (e.g. meteorological service, mountain rescue services, etc.)

    ▷ the system should provide the users with the information within certain time limitations in which the information is even more relevant,

    ▷ the system should provide information not only for the area in which the user is currently located.

4 Security and analytic aspect of marina videosurveillance

The E-marina system must include the activities of video-analytics which today marks a huge trend of growth in the entire world. The goal of implementing the video-analytics in the system of marinas is to cover the protected areas by cameras. Video-analytics substantially reduces the number of required people since it eliminates in a very high percentage false notifications, reduces the need for greater network capacity. In the recent years there was a great step forward in the general availability and use of video-stream. This was started by the multi-media industry, but the use is much wider.

Video-analytics has to be based on the self-learning intelligent systems that, implemented at the marinas, will provide the following:

1. detection of the presence of people,
2. detection of person identification,
3. detection of left items,
4. detection of passage in the wrong direction,
5. detection of unnecessary movement in certain area,
6. automatic removal of register numbers from plates, vehicles, vessels,...
7. detection of smoke, i.e. fire,
8. detection of tides, rain, wind, ...
9. counting of persons, vehicles, vessels.

Video-analytics allows almost everything. It is necessary to define the request, make an adequate algorithm and improve it in practice.

The computer age has resulted in computerization of all the human activities in the industry and outside. The absence of informatics and information technologies leads to lagging behind. There are programs and program solutions, as well as operative systems (Linux) that build their power on the world synergy of individuals. Open source codes are given and they allow everyone to improve but also to degenerate the program solutions, and then by pure natural selection the systems evolve, get better, and from alpha and beta versions become high-quality products available to everyone.

In Croatia the term "energy efficiency system" appeared, which marks the facilities that regarding the available technologies consume little energy. There are already today systems that are energetically

considered sufficient in themselves, but the method of living in them is still limited. The concept itself motivates the individuals to think and act in this direction.

5 Conclusion

The implementation of new ICT technologies and available services can greatly facilitate the organization and the level of the quality of the marinas system. The simplicity of implementation and the availability of well organized and user-friendly tools will contribute to the acceptance of new solutions by the customers. The implementation of new technologies creates competitive advantage in relation to other marinas and raises the level of service. At the same time the availability of navigation tools and systems of digital maps with a rich selection of adapted layers makes it easier for the boaters to manage and plan the trip itself.

The establishment of the system of intelligent marina makes it possible to provide the boaters with additional services. The additional services at marinas refer to the provision of pre-travel information about the destination, tourist potentials and places of interest, tourist offer. The information about restaurants, museums, cultural points of interest in the surroundings of the marina, possible organized excursions, sightseeing, information on possible renting of motorcycles and bicycles, which some boaters find especially interesting. Additional services refer also to free reservations of restaurants, information related to weather forecast and a number of other information that may be useful for the boaters and can make their stay at the marina interesting. Provision of these services is not crucial for the arrival of the boaters but will certainly greatly contribute to the satisfaction of the boaters and their repeated visits.

The intelligent system of marinas has to include the activities of video-analytics, which is showing today a high growing trend worldwide. The goal of implementing video-analytics in the system of marinas is to cover the protected areas by cameras. The video-analytics reduces substantially the number of required people since it eliminates to a great percentage false alarms, reduces the need for greater network capacity. In the recent several years a great step forward was made in the general availability and use of the video-stream. This was started by multimedia industry, but the implementation is much wider.

Video analytics has to be based on self-learning intelligent systems that, implemented in intelligent marinas, will provide: detection of the present persons, detection of person recognition, detection of left items, detection of passes in the wrong direction, detection of unnecessary movement in certain space, detection of smoke, i.e. fire, detection of tides, rain, wind and counting of persons, vehicles, vessels.

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