

Dr. sc. Pero Vidan / Ph. D.

Sveučilište u Splitu / *University of Split*
Pomorski fakultet / *Faculty of Maritime Studies*
Zrinsko-frankopanska 38, 21000 Split

Mr. sc. Ante Mrvica / M. Sc.

Gat Sv. Duje, 21000 Split

Rino Bošnjak, dipl. ing.

Sveučilište u Splitu / *University of Split*
Pomorski fakultet / *Faculty of Maritime Studies*
Zrinsko-frankopanska 38, 21000 Split
Hrvatska / *Croatia*

Pregledni članak

Review article

UDK / *UDC*:
656.615.025.2(497.5)
65.012.34(497.5)

Primljeno / *Received*:

19. srpnja 2012. / *Received: 19th July 2012*

Odobreno / *Accepted*:

1. listopada 2012. / *1st October 2012*

PRIJEDLOG MODELA NADZORA PUTNIKA I VOZILA U POMORSKOM PROMETU REPUBLIKE HRVATSKE

PROPOSAL FOR A MODEL OF PASSENGER AND VEHICLE CONTROL IN MARITIME TRAFFIC IN THE REPUBLIC OF CROATIA

SAŽETAK

Putničke luke u Republici Hrvatskoj otvorene za međunarodni promet dodatno se nadziru sukladno odredbama ISPS kodeksa. Postojeće mjere nadzora i zaštite drže se nedostatnim. Ova manjkavost dolazi do izražaja naročito za vrijeme ljetne sezone kada je povećan promet putnika i vozila u Republici Hrvatskoj, što je ujedno i ograničavajući čimbenik jer bi se primjenom strogih mjera zaštite povećale gužve na terminalima. Stoga, autori predlažu reorganizaciju postojećeg logističkog sustava koji bi omogućio informaciju o očekivanom prometu, optimalno planiranje prometa i korištenje resursa, povećanu razinu zaštite putnika, brodova i luka te smanjivanje troškova koji nastaju zbog nedovoljnog planiranja.

Ključne riječi: sigurnost, zaštita, logistika, putnički promet, nadzor

SUMMARY

Passenger ports in the Republic of Croatia open for international traffic are additionally controlled in compliance with the provisions of the ISPS code. It is considered that the existing measures for control and protection are not sufficient. This drawback is specially enhanced during the summer season when there is an increased number of passengers and vehicles in the Republic of Croatia. The increased traffic in the summer season is the limiting factor, since the implementation of strict protection measures would further enlarge the crowds at the terminals. Therefore, the authors propose the reorganization of the existing logistics system in a way that it could provide information on the expected traffic, optimal traffic planning and use of resources, increase of the level of protection of passengers, vessels and ports, and reduction of the costs that arise due to insufficient planning.

Key words: security, protection, logistics, passenger traffic, surveillance

1. UVOD

Mjere poduzete za brodove i luke u smislu sigurnosne zaštite regulirane su Zakonom o zaštiti brodova i luka otvorenih za međunarodni promet (*International Ship and Port Facility Security Code – ISPS*). ISPS kodeks je prihvaćen kao nadopuna Konvencija o zaštićenim ljudskim životima na moru (*Safety of Life at Sea – SOLAS*) iz 1974. i obavezan je od 1. srpnja 2004. [14] [3] [4]. Pojavom ISPS kodeksa, nadzor u lukama se dodatno poštroyio [7].

Promet brodovima i putnicima se značajno povećava u ljetnim mjesecima. Prema statistikama, broj putnika u Republici Hrvatskoj iznosio je 12,5 milijuna u 2009. godini, od čega se 249 tisuće odnosilo na međunarodni prijevoz putnika [13].

Prometni zastoji nastaju najčešće zbog:

- Potkapacitiranosti luka
- Potkapacitiranosti gradskih prometnica prema lukama
- Zaustavljanja vozila zbog kupovine putnih karata u područjima terminala
- Usporavanja zbog nadzora putnika i automobila prilikom ukrcaja/iskrcaja na brod.

Kako bi se uspješno obavio tranzit putnika za pretpostaviti je da se značajno smanjuje nadzor i zaštita luka. Relativno velik broj putnika i osobnih automobila, uzrokuje prometne čepove u gradovima i putničkim lukama RH [6].

2. ANALIZA POSTOJEĆEG STANJA NADZORA PUTNIKA I VOZILA U POMORSKOM PROMETU RH

Nadzor putničkih pomorskih luka u područjima prekograničnih prijelaza obavlja prekogranična policija i carina. Na terminalima za domaći pomorski promet, lučka uprava usmjerava putnike i vozila prema brodovima za ukrcaj, ili s brodova prema izlazu iz luke. Nadzor pomorskog prometa obavlja se uz pomoć kamera, radara i sustava za automatsko raspoznavanje (*Automatic Identification System – AIS*) [8]. Ovakav nadzor udovoljava zahtjevima propisanim ISPS kodeksom. Postojećim sustavom se nadziru brodovi na prilazima luka te usmjerava promet putnika i vozila unutar luka. Međutim, primjena postojećih mjera ne nadzire u potpu-

1 INTRODUCTION

In the light of security protection, the measures adopted for ships and ports are regulated by the International Ship and Port Facility Security Code – ISPS. This Code has been adopted to supplement the SOLAS Convention (*Safety of Life at Sea -1974*), and has been mandatory since 1st July 2004 [14] [3] [4]. Since the adoption of the ISPS Code the surveillance of ports has become more strict [7].

Ship and passenger traffic has significantly increased in the summer months. According to statistics, there were 12.5 million of passengers in Croatia in 2009, and 249,000 of them belonged to the category of international passenger transport [13].

Traffic jams usually happen due to the following reasons:

- Inadequate capacity of ports
- Inadequate capacity of city roads leading to ports
- Stopping vehicles at the terminal area to buy tickets
- Slowing down due to vehicle and passenger control during loading / discharging of ferries.

It is assumed that for the passenger transit to be successful there must be a significant reduction in the port control and protection. A relatively large number of passengers and cars cause traffic jams in cities and passenger ports in the Republic of Croatia [6].

2 ANALYSE OF THE CURRENT MODEL OF PASSENGER AND VEHICLE CONTROL IN MARITIME TRAFFIC IN THE REPUBLIC OF CROATIA

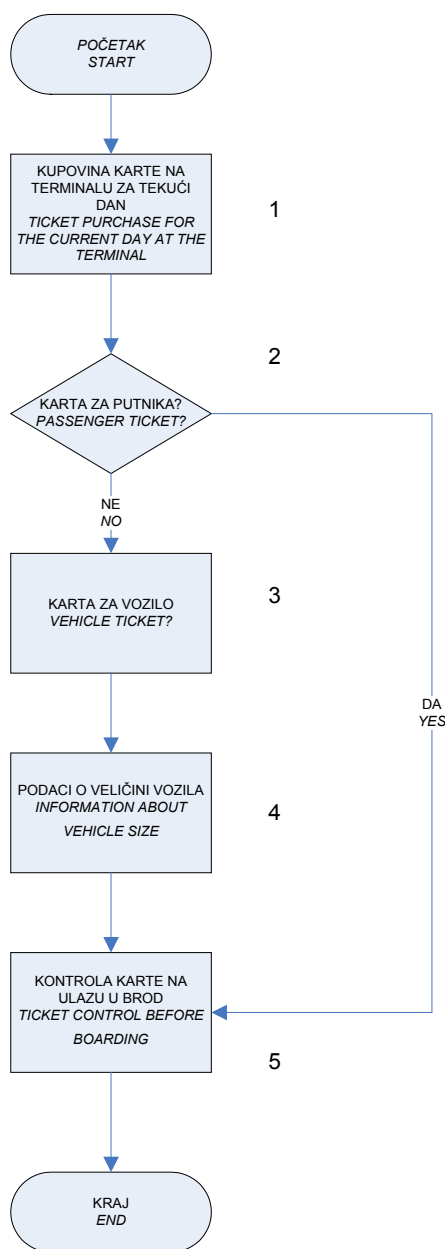
The control of passengers' maritime port in the areas of border crossing ports is conducted by cross-border police and customs. At domestic traffic terminals, the Port Authorities direct passengers and vehicles to the ships for loading / boarding, or to the port exits. The maritime traffic control is conducted by means of cameras, radars and Automatic Identification System – AIS [8]. This control complies with the requirements prescribed by the ISPS code. The existing system controls the vessels approaching the ports, and directs the traffic of passengers

nosti promet putnika i vozila do broda [9]. Nedostatan je pregled osobnih i teretnih automobila uređajima za otkrivanje oružja, eksploziva i drugih sredstava ugrozbe.

U domaćem linijskom prometu ne postoji evidencija putnika i vozila, kontrola putnih isprava i popis putnika kao što je primjerice u međunarodnom pomorskom prometu. Sustav prodaje karata nije usklađen s ciljem nadzora putnika i vozila te uspješnije logistike. Postojeći informacijski sustavi koji koristi najveći nacionalni brodar za putnički promet i promet automobila – *Jadrolinija* ne daju podatak o očekivanom

and vehicles within the port. However, the existing measures do not completely supervise the transport of passengers and vehicles to the ship [9]. The examination of personal and freight vehicles aimed at detecting weapons, explosives and other dangerous objects are insufficient.

In domestic liner trade, there are no records of passengers and vehicles, control of travel documents and passenger lists, as in international maritime traffic. The system of selling tickets is not complementary to the system of passenger and vehicle control, and it does not aim at improving logistics. The existing information system used by the nation's largest operator of the



Slika 1. Sadašnji sustav prodaje i nadzora putničkog i trajektnog prometa u domaćem prometu
Figure 1 Present system of sale and control of passenger and ferry traffic in domestic transport

prometu te je otežano dugoročno planiranje korištenja flote i kapaciteta terminala.

Postojeći informacijski sustavi Jadrolinije (Slika 1) ne daju informacije:

- o prometu putnika i vozila za pojedino odredište za tekući dan
- o veličini vozila
- o registraciji vozila.

Uz navedeno, postojeći informacijski sustav se oslanja na subjektivnu prosudbu koordinatora u nadzoru i otpremi brodova te planiranju brodova i putovanja. Ovakav sustav ne drži se optimalnim jer se oslanja na znanje i iskustvo koordinatora plovnog područja i operatera koji unose podatke.

Postojeći informacijski sustav daje mogućnost kupovine karata samo na terminalima trajektne luke za tekući dan (oznaka 1). Sustav ima mogućnost pohranjivanja knjigovodstvenih podataka s obzirom na odredište putovanja i cjenovni razred, ali nema mogućnost unosa vrste broda za putovanje zajedno s njegovim značajkama. Stoga ne postoji mogućnost dojava o prekobrojnim kartama za predstojeće putovanje. Drugim riječima, ovakav sustav omogućava neograničeno izdavanje karata za putnike i vozila za određeno putovanje, a do podataka o prekapacitiranosti broda dolazi se tek nakon ukrcaja broda (oznaka 5).

Postojeći informacijski sustav u domaćem putničkom pomorskom prometu nema mogućnost izdavanja karata na ime i registraciju vozila (izuzev subvencioniranih otočnih karata u domaćem prometu i karata u međunarodnom prometu).

Sustav sa slike 1. nema:

- Mogućnost rezervacije karata
- Mogućnost kupnje karata unaprijed za sljedeći dan ili određeni dan unaprijed
- Podatak o broju putnika za određeno putovanje
- Podatak o broju vozila za određeno putovanje
- Podatak o vlasniku vozila
- Podatak o teretu na vozilu, prtljazi te masi vozila
- Popis putnika i vozila te *cargo* plan
- Podatak o imenu i prezimenu putnika, broju putovnice, osobne iskaznice ili sl.

passenger and vehicle traffic –*Jadrolinija* do not provide information on the expected traffic, thus making it difficult to produce long-term plans of the fleet and terminal capacity utilisation.

The existing *Jadrolinija's* information systems (Figure 1) do not provide information on:

- Passenger and vehicle transport for specific destinations and specific dates
- Data on vehicle size
- Vehicle registrations.

In addition, the existing information system relies on the subjective judgment of the area coordinator in monitoring and dispatching ships and boats and travel planning. This system does not hold the optimal because it relies on the knowledge and experience of the area coordinator and operators who inputs data.

The existing information system has the option of purchasing tickets only at the port terminals for the current day (mark 1). This system is capable of storing accounting data with regard to the travel destination and price class. There is no ability to input the type of ship for the voyage along with its features. Therefore, there is no possibility of alert for overabundant cards for the upcoming voyage. In other words, this system provides an unlimited ticketing for passengers and vehicles for a specific voyage, and the data about the vessel overcapacity comes only after boarding the ship (mark 5).

The existing information system in domestic passenger maritime transport has no possibility of issuing passenger cards to the name and registration of vehicles (except subsidized island tickets on domestic lines and tickets on international lines).

The System in Figure 1 does not provide:

- Reservation of tickets
- Buying tickets in advance for the next day, or any other specific date
- Data on the number of passengers for any particular voyage
- Data on the number of vehicles for any particular voyage
- Information about the vehicle owner
- Information about the vehicle cargo, luggage and size
- List of passengers, vehicles, cargo plans
- Information about the name, surname, passport / identity card number and the like
- The purchase of tickets at some other location outside the terminal, via the Internet, ATM etc.

- Mogućnost kupnje na dislociranim mjestima, putem interneta, bankomata i sl.

Nedostaci sustava sa slike 1 uzrokuju:

- Otežano planiranja korištenja flote za putovanje
- Otežano planiranje, slaganja vozila u garažama brodova u cilju boljeg korištenja prostora
- Kašnjenje zbog otežanog ukrcaja vozila.

Disadvantages of the System in Figure 1 cause the following:

- Difficulties in planning the utilisation of the fleet for voyages
- Difficulties in planning the vehicles stacking in the vessel garages for better space utilisation
- Delays due to the difficulties with vehicle loadings

Tablica 1. SWOT analiza postojećeg sustava prometa i putnika
Table 1 SWOT analysis of the current traffic and passenger system

Snage/ Strengths	Slabosti / Weaknesses	Mogućnosti / Opportunities	Prijetnje / Threats
Uspostavljen elektronički sustav prodaje karata <i>Installation of the electronic system of ticket sale</i>	Otežano planiranje prometa vozila i putnika, otežano slaganje vozila, izostanak informacije o veličini vozila <i>Difficult planning of passenger and vehicle traffic, stacking of vehicles and lack of information on vehicle size</i>	Nadogradnja postojećeg sustava boljim i učinkovitijim sustavom nadzora i planiranja <i>Upgrade of the existing system by improving the control and planning systems</i>	Povećani financijski izdaci zbog pogrešnog planiranja i odabira brodova poradi izostanka pravovremene informacije o broju putnika i vozila <i>Increased financial expenses due to faulty planning and selection of ships due to lack of timely information on the number of passengers and vehicles</i>
Sustav nadzora ukrcaja vozila i putnika od strane posade <i>The system of supervision of loading vehicles and passengers by the crew</i>	Nedostatak informacije o vrsti i broju vozila i broju putnika koja bi omogućila bolje slaganje vozila i planiranje broja putovanja broda, nedostatak popisa putnika i vozila <i>Lack of information on the type and number of vehicles and number of passengers that would allow better stacking and planning of the ship voyages, the lack of passenger and vehicle lists</i>	Uspostava elektroničke kontrole karata, vozila i putnika korištenjem novih tehnologija. Računalno stvoreni popisi putnika i vozila te cargo plan <i>Establishment of an electronic control of tickets, vehicles and passengers by the use of new technologies. Computer-generated lists of passengers and vehicles, and cargo plan</i>	Ljudska pogreška i privid, povećani izdaci zbog mogućih prijetnji i šteta nastalih zbog pogrešnog ukrcaja, mogući teroristički napadi na brodu, nedostatak ljudi uključenih u nadzor <i>Human error and negligence, increased costs due to possible threats and damages caused by improper loading, possible terrorist attacks on ships, the lack of monitoring staff</i>
Kupnja karte na dislociranim mjestima unutar termina <i>Purchasing tickets at dislocated places within the terminal</i>	Prometne gužve na dislociranim mjestima unutar terminala, nemogućnost kupnje preko interneta i s dislociranih mjesta kao što su bankomati, pumpne stanice i dr., izvan grada <i>Traffic jams at dislocated areas within the terminal, the inability of purchase via the Internet and dislocated places like ATMs, gas stations and others places outside the city</i>	Nadogradnja sustava za kupovinu putem interneta i s dislociranih mjesta na autocesti i dr., mogućnost rezervacija. <i>Upgrading the system for online ticket buying at dislocated places on the highways and the like, the possibility of making ticket reservations</i>	Stvaranje prometnih čepova i gužvi, neujednačenost prometa prodaje karata, neravnomjerno opterećeni terminali za prodaju karata <i>Traffic jams and crowds, unequal flow of ticket sales, unevenly loaded terminals for ticket sales</i>
Nadzor prometa od strane lučke uprave unutar luke (videonadzor, ljudski nadzor), upravljanje prometa ručno <i>Traffic monitoring by port authorities in the port (video surveillance, human surveillance), manual control of traffic</i>	Nedostatak informacije o vlasniku vozila i tipu vozila, nedostatak informacije o vlasniku osobne putne karte, nedostatak ljudskih resursa <i>Lack of information about the owners of vehicles and type of vehicles, lack of information about the owner's personal tickets, lack of human resources</i>	Nadogradnja sustava za kupovinu karte na osobu i na vozilo. Nadzor uporabom novih tehnologija (OCR, CCTV i dr.). Upravljanje prometom unutar luke na daljinu <i>An upgrade of purchasing tickets to the person and the vehicle. Monitoring by the use of new technologies (OCR, CCTV, etc.). Traffic remote control within the port</i>	Mogućnost prijevoza eksplozivnih sredstava, moguće terorističke prijetnje. Nemogućnost upravljanja u slučaju kriznih situacija. Izloženost putnika, brodova i posade. <i>Possibility of hiding explosives, possible terrorist threats; inability of control in case of emergencies; the exposure of passengers, vessels and crew</i>
Kupnja karata prema veličini vozila ili dopuštenoj masi vozila <i>Tickets purchase according to the size of the vehicle or permitted mass of the vehicle</i>	Izostanak informacije o masi vozila, nemogućnost vaganja vozila <i>Lack of information about the mass of the vehicle, the inability of vehicles weighing</i>	Instalacija vage prije ukrcaja vozila <i>Scales installation prior to vehicle loading</i>	Prekrcanost brodova, mogućnost šteta zbog prenakrcanosti teretnih vozila <i>Vessel overload; possible damage due to cargo vehicle overload</i>

Iskoristivost (η_p) za putnički kapacitet, omjer broja putnika (n_p) i ukupnog kapaciteta putnika (k_p):

$$\eta_p = \frac{n_p}{k_p} \quad (1)$$

Iskoristivost za vozila (η_v), omjer broja vozila (n_v) i ukupnog kapaciteta vozila broda (k_v):

$$\eta_v = \frac{n_v}{k_v} \quad (2)$$

Iz prethodnog se može zaključiti da je funkcija prijevoza $f(p)$ učinkovita:

$$f(p) \rightarrow \max \Leftrightarrow n_p, n_v \rightarrow \max \quad (3)$$

Analiza postojećeg stanja prikazana je SWOT analizom u tablici 1.

3. PRIJEDLOG MODELA USTROJA NADZORA PUTNIKA I VOZILA PRIMJENOM ICT-a U POMORSKOM PROMETU RH

Organizacijski učinci odnose se na optimizaciju ukrcaja i iskrcaja putnika i vozila. Vrijeme ukrcaja putnika i vozila računa se prema formuli [11]:

$$t_i = t_m + \sum_{i=1}^n t_i + t_{d3} \quad (4)$$

gdje su:

t_i – ukupno vrijeme ukrcaja/iskrcaja,

t_m – vremenske faze u ciklusu ukrcaja pojedinog putnika ili vozila,

t_{d3} – gubitak vremena pri ukrcaju (zastoj),

t_i – vrijeme efektivnog ukrcaja za putnika (i)li vozilo.

Potrebno je smanjiti komponentu kašnjenja, odnosno optimizirati proces kako bi se smanjili neželjeni financijski gubici. Protok putnika i vozila (φ) preko rampi i broskog siza za ukrcaj, računa se prema formuli:

$$\varphi = \frac{\sum_{i=1}^n Q_i}{t_i} \quad (5)$$

gdje su:

Q_i – količina vozila u operaciji ukrcaja /iskrcaja

t_i – vrijeme ukrcaja/iskrcaja.

The efficiency (η_p) of passenger capacity, number of passengers, ratio (n_p) and total passenger capacity (k_p):

$$\eta_p = \frac{n_p}{k_p} \quad (1)$$

The efficiency for vehicles (η_v), ratio of the number of vehicles (n_v) and a total vehicles capacity of the ship (k_v):

$$\eta_v = \frac{n_v}{k_v} \quad (2)$$

From the above, it may be concluded that the function of transport $f(p)$ is effective:

$$f(p) \rightarrow \max \Leftrightarrow n_p, n_v \rightarrow \max \quad (3)$$

The examination of the current situation, its weaknesses, opportunities and threats are shown in the SWOT analysis in Table 1.

3 PROPOSAL MODEL OF THE ORGANISATION OF PASSENGERS AND VEHICLES CONTROL USING THE ICT IN MARITIME TRAFFIC IN THE REPUBLIC OF CROATIA

Organizational effects refer to the optimization of embarking and disembarking passengers and vehicles. The time of embarking passengers and vehicles is calculated by the formula [11]:

$$t_i = t_m + \sum_{i=1}^n t_i + t_{d3} \quad (4)$$

As follows:

t_i – total time of embarking / disembarking,

t_m – time phases in each cycle of embarking passengers or vehicles,

t_{d3} – time loss during embarkation (delay),

t_i – effective time of embarkation for passengers and / or vehicles.

It is necessary to reduce the component delays and optimize the process in order to minimize the undesired financial losses. The flow of passengers and vehicles (φ) via the ramp or accommodation ladder is calculated by the formula:

$$\varphi = \frac{\sum_{i=1}^n Q_i}{t_i} \quad (5)$$

$$\varphi = \frac{\sum_{i=1}^n Q_i}{tm + \sum_{i=1}^n t_i' + td_3} \quad (6)$$

Kako bi ukrcaj i iskrcaj bio učinkovitiji, $t_i \rightarrow 0$. Ovaj se uvjet može zadovoljiti ukoliko su urađene potrebne predradnje kao što su:

- uspješno planiranje ukrcaja (*cargo plan*, popis putnika, popis tereta, masa tereta i vozila) (p)
- kupnja karte (k)
- odabir pogodnog broda (b)
- nadzor vozila i putnika (n).

Ukoliko:

$$t_i \rightarrow 0, \quad p, k, b, n \rightarrow \max \quad (7)$$

Prilikom proračuna učinkovitosti prijevoza, traži se zadovoljenje uvjeta kriterija η_p, η_v i cijene prijevoza koja uključuje fiksne (l) i varijabilne troškove prijevoza (v). Za učinkovit prijevoz, potrebno je iskoristiti kapacitete brodova te vrijeme boravka u lukama. Stoga bi trebalo biti:

$$f(l, v) \rightarrow 0 \quad (8)$$

Na osnovi iznesenog, može se kazati da je moguće dobiti optimalnu funkciju prijevoza putnika i vozila. Kako bi se zadovoljili uvjeti iz relacija 4 – 8 potrebna je uporaba novih tehnologija. Za pravovremeno kupovanje i rezervaciju putnih karata nužna su softverska rješenja koja će omogućiti kupovanje putnih karata s dislociranih područja unutar RH te putem interneta.

Za nadzor putnika i vozila na terminalima predlaže se primjena inteligentne komunikacijske tehnologije (*Intelligent Communication Technology – ICT*) koja bi omogućila upravljanje prometom prema brodu uz pomoć optičkih čitača (*Optical Character Recognition – OCR*) postavljenih na terminale za parkiranje vozila i na ulazu u brodove. Uz pomoć čitača moguća je automatska regulacija prometa na terminalima, ukrcaj na brod prema *cargo* planu te automatsko generiranje popisa vozila i popisa putnika. Nadalje, *cargo* planovi bi se radili u skladu sa zaprimljenom potražnjama za putovanje što bi omogućilo bolju iskoristivost kapaciteta brodova i odabir brodova za putovanje [1].

Zaštitu od mogućeg krijumčarenja opasnih tvari na brodu moguće je raditi uz pomoć nad-

In which:

Q_i – is the number of vehicles in the embarkation / disembarkation operations

t_i – is time of embarking / disembarking

$$\varphi = \frac{\sum_{i=1}^n Q_i}{tm + \sum_{i=1}^n t_i' + td_3} \quad (6)$$

To make embarkation and disembarkation more efficient $t_i \rightarrow 0$. This requirement can be met if necessary preparations have been made, such as:

- the successful planning of loading/embarkation (*cargo plan*, the list of passengers, cargo list, cargo and vehicle weight) (p)
- purchase of the ticket (k)
- selection of a suitable vessel (b)
- monitoring of vehicles and passengers (n)

If:

$$t_i \rightarrow 0, \quad p, k, b, n \rightarrow \max \quad (7)$$

When calculating the efficiency of transport, the requirements of criteria η_p, η_v are sought and the transport rates which include fixed (l) and variable transport costs (v). For an efficient transport, it is necessary to utilise the capacities of vessels and their stay in ports. Therefore, it should be:

$$f(l, v) \rightarrow 0 \quad (8)$$

Based on the above mentioned, we may say that it is possible to obtain the optimal function of passenger and vehicle transportation. In order to fulfil the requirements of the relation 4-8, we need to use new technologies. For the timely purchase and reservation of tickets, we need software solutions that would enable the purchase of tickets at dislocated places within the country and via the Internet.

The use of Intelligent Communication Technology (ICT) is proposed for the control of passengers and vehicles at terminals. It would allow directing the traffic towards ships with the aid of optical readers of Optical Character Recognition system (OCR), which would be set at the terminal vehicle parking areas and at the points of the vessel (dis)embarkation / (un)loading. These readers would allow an automatic traffic control at terminals, loading in accordance with the cargo plan, and accordingly, the lists of vehicles and passengers would be automatically produced. Furthermore, cargo plans would be made

zornih sustava VACIS i ICIS kakvi se koriste na kontejnerskim terminalima u svijetu. Ovakvi sustavi otkrivaju sadržaj vozila uz pomoć zračenja u X-frekvencijskom pojasu (slika 2 i 3). Sustav je moguće umrežiti sa sigurnosnim sustavom policije, brodarka, carine i vojske koja bi pratila promet putnika i prema potrebama na vrijeme intervenirala.

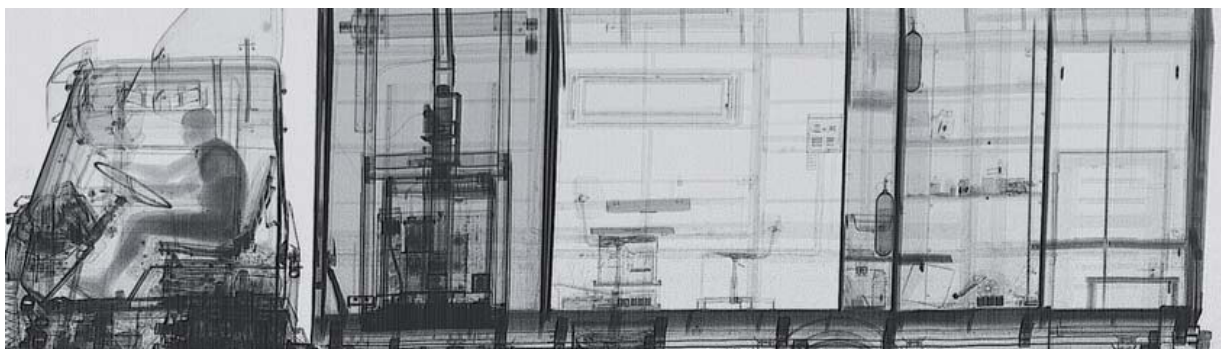
in compliance with the received voyage demand, which would enable a better capacity utilization of ships and an appropriate selection of ships for respective voyages [1].

The protection against potential smuggling of dangerous goods on board would be enabled by the use of the VACIS and ICIS control systems, such as the ones used at container terminals throughout the world. These systems reveal the contents of the vehicle by means of radiation in the X frequency band (Figures 2 and 3). It would be possible for the system to become a part of the network with other systems such as police, shipping, customs and military systems, which would all be able to monitor the passenger traffic and intervene in due course as required.



Slika 2. Mobile Cargo Inspection System
Figure 2 Mobile Cargo Inspection System

Izvor / Source: ADANI [12]

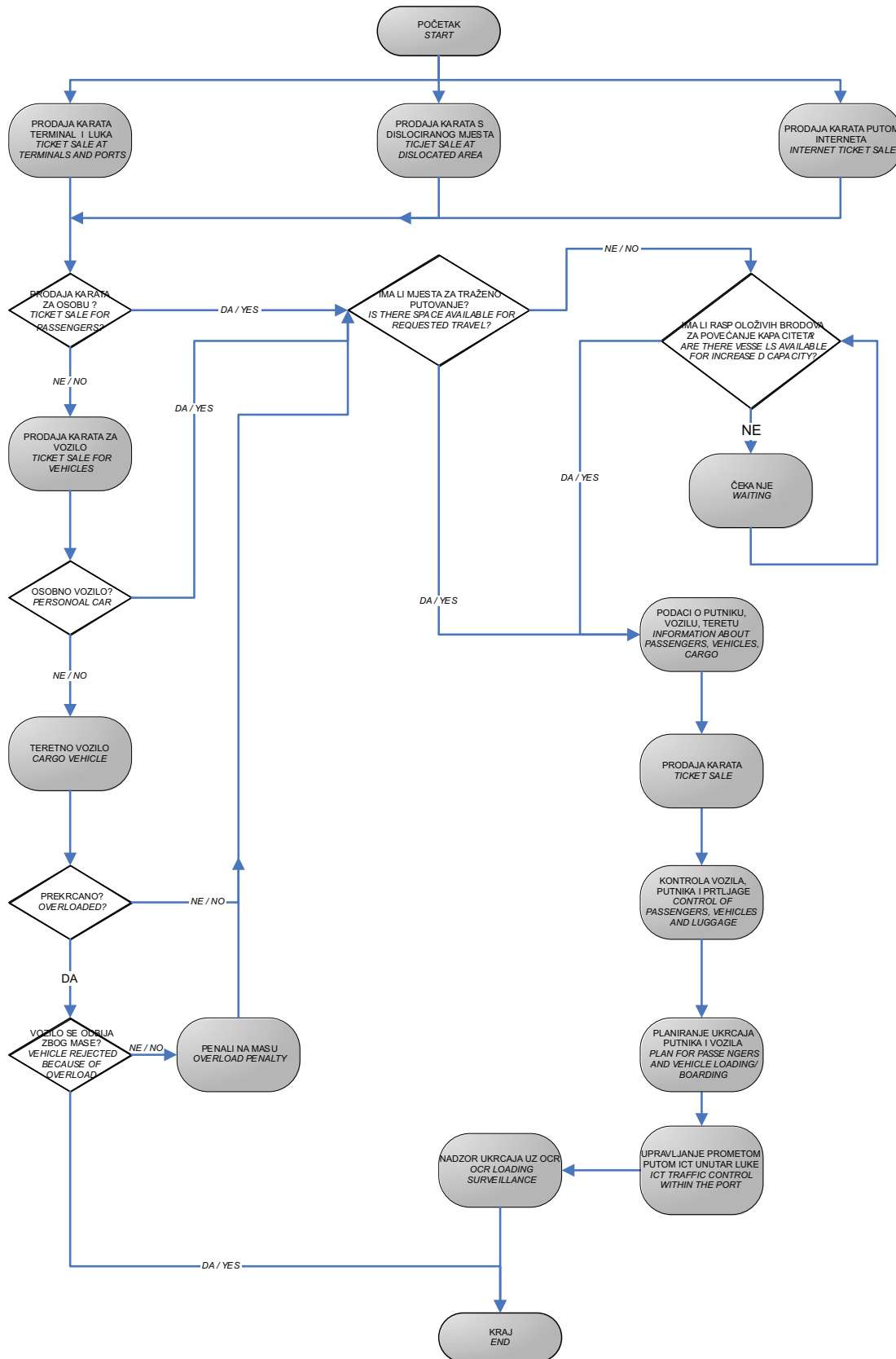


Slika 3. Display of container content
Figure 3 Display of container content

Izvor / Source: ADANI [12]

Također se može predložiti algoritam tijeka prikazan na slici 4.

It is also possible to propose an algorithm of the flow as in Figure 4.



Slika 4. Algoritam tijeka za novi način – Model ustroja
Figure 4 Algorithm of the flow for a new structure model

4. OČEKIVANI REZULTATI PRIMJENE NOVOG MODELA NADZORA U REPUBLICI HRVATSKOJ

Nadogradnjom organizacijske strukture postojećeg sustava moguće je postići znatne uštede vremena otpreme putnika i vozila te podići razinu sigurnosti brodova i luka u smislu zaštite od ugrozbe. Ušteda vremena je moguća ukoliko je dobivena potrebna informacija o očekivanom prometu [2]. Na toj osnovi moguće je kvalitetnije planiranje uporabe dostupnih resursa.

Nadzor putnika i vozila valja organizirati uporabom novih tehnologija, prije svega uporabom OCR uređaja, vage za vozila i sustava za pregled tereta automobila. Nadogradnju sustava moguće je izvesti uporabom postojećeg softverskog rješenja i njegovom nadogradnjom. Primjena nabrojanih tehnologija omogućila bi manje redove čekanja i optimalnu uporabu kapaciteta flote. S tim u vezi očekuje se smanjivanje troškova koji nastaju zbog manje učinkovitog korištenja brodova. Također se očekuje smanjivanje gužvi u područjima trajektnih terminala.

Primjenom predloženog organizacijskog sustava podigla bi se razina sigurnosti putovanja. Nadzorom prije ukreaja dobile bi se informacije o prometu osoba i tereta koje bi bile dostupne policiji i obalnoj straži. U slučaju ugrozbe putovanja, mjerama zaštite bili bi dostupni podaci o osobama i teretu u opasnosti.

5. ZAKLJUČAK

Porast putničkog prometa u Republici Hrvatskoj u ljetnoj sezoni predstavlja problem u nadzoru putnika i vozila prema otocima. Teroristički događaji u Turskoj usmjerili su oči javnosti prema pomorskom putničkom prometu koji se drži nedostatno nadziranim i relativno slabo zaštićenim [15].

Predloženom reorganizacijom postojećeg logističkog sustava moguća su poboljšanja u zaštiti i nadzoru putničkog prometa. Boljim planiranjem moguće je optimalno korištenje resursa i smanjivanje troškova koji nastaju zbog nedovoljnog planiranja.

Stoga se preporučaju nova softverska rješenja, odnosno primjena novih tehnologija koja

4 EXPECTED RESULTS OF THE APPLICATION OF A NEW SURVEILLANCE MODEL IN THE REPUBLIC OF CROATIA

By upgrading the organizational structure of the existing system, it is possible to achieve significant savings in the time of passenger and vehicle dispatch, and raise the level of safety of ships and ports in terms of protection against potential threats. Saving time is possible if the required information on the expected traffic is obtained [2]. In the same way, it is possible to improve the planning of the use of available resources. Surveillance of passengers and vehicles should be organized by using new technologies, primarily the OCR devices, scales for weighing vehicles, and vehicle cargo inspection systems. The improvement of the system could be achieved by the use of the existing software solutions and their upgrade. The implementation of the above mentioned technologies would allow fewer vehicle queues and an optimal use of the fleet capacity. In this view, the reduction is expected in costs already incurred due to a less efficient operation of ships. The reduction of the congestion in the areas of ferry terminals is also expected.

The application of the proposed organizational system would raise the level of voyage safety. Surveillance before embarking would supply the information on movements of persons and goods that would be available to the police and coast guard. In the case of threat to voyage, safety measures would allow us to have information on people and cargo that are in danger.

5 CONCLUSION

The increase in passenger traffic in Croatia in the summer season poses a problem in an effort to control passengers and vehicles departing to islands. The terrorist incidents in Turkey helped raise public awareness concerning the maritime passenger traffic which is insufficiently controlled and relatively poorly protected [15].

The proposed reorganization of the existing logistics system offers improvements in the protection and control of passenger traffic. Improved planning will allow the optimal use of resources and reduction of costs incurred due to insufficient planning.

bi omogućila, među ostalim, manje redove čekanja, nepotrebne gužve u lukama i u gradovima. Primjena softverskog rješenja omogućila bi i uštedu ljudskih resursa u samoj logistici te pristup sustavu od strane policije i carine. Nadalje, u slučaju potrebe omogućila bi se brža intervencija zbog uvida u situaciju i boljeg planiranja odgovora na opasnost.

Procjenjuje se kako bi troškovi nabave novih tehnologija i softvera bili neznatni, ukoliko bi broj putnika i vozila ostao istim ili bi se povećavao.

Therefore, new software solutions are recommended, as well as application of new technologies. This would allow, among other things, fewer queues, and a reduction of traffic jams in ports and cities. The application of a new software solution would allow the saving of human resources in the logistics department.

It would make the access to the system available to the police and customs. If required, it would enable fast interventions due to the insight into the situation and improved planning of appropriate responses to danger.

It is estimated that the cost of the procurement of new technologies and software would be of no consequence if the number of passengers and vehicles remained the same or increased.

LITERATURA / REFERENCES

- [1] Bukljaš Skočibušić, M., N. Jolić, *Functional Analysis of Republic of Croatia for Short Sea Shipping Development*, *Promet*, 22 (2010), 1, str. 53-64.
- [2] Dovečar, R., *Optimization of Multimodal Transportation Chains in the Kaleidoscope of Information Technology*, *Promet*, 16 (2004), str. 133-138.
- [3] Fritell, F. J., *Port and Maritime Security*, CRS Report for Congress, 2005.
- [4] Heathcote, P., *New Measures for Maritime Security Aboard Ships and in Port Facilities, 2005* (available at: <http://www.austlii.edu.au/au/journals/MarStudies/2004/17.html>)
- [5] Jenček, P., E. Tvrđy, *Development of Regional Transport Logistics Terminal – Transport Logistics Approach*, *Promet*, 20 (2008), 4, str. 239-249.
- [6] Kasum, J., K. Baljak, P. Vidan, *Evaluation of the Existing Piracy Protection Measures*, ISEP 2007, Ljubljana, Slovenia, 2007.
- [7] Kasum, J., P. Vidan, K. Baljak, *Threats and New Protection Measures in Inland Navigation*, *Promet*, 22 (2010), 2, str. 143-146.
- [8] Kasum, J., P. Vidan, K. Baljak, *Threats to Ships and Ports of Inland navigation*, POWA, Dubrovnik, Croatia, 2008.
- [9] Kasum, J., P. Vidan, K. Baljak, *Act About Safety Protection of Merchant Ships and Ports Open to International Traffic and its Implementation*, ICTS, Portorož, Slovenia, 2006.
- [10] Vidan, P., J. Kasum, M. Zujić, *Poboljšanje traganja i spašavanja na unutarnjim plovnim putovima (Improvement of search and rescue on inland waterways)*, *Naše more*, 56 (2010), 5-6, str. 187-192.
- [11] Županović, I., *Organizacija i praćenje učinka cestovnih prijevoznih sredstava*, Zagreb, Fakultet prometnih znanosti, 1993.

Korišteni internetski linkovi

- [12] www.adani.by
- [13] www.dzs.hr
- [14] www.zakoni.hr
- [15] <http://www.tportal.hr/vijesti/svijet/159117/Naoruzani-Kurdi-oteli-trajekt-u-Turskoj.html>

