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A SURVEY OF MARINERS' OPINIONS ON USING ELECTRONIC CHARTS

ISTRAŽIVANJE PROVEDENO MEĐU POMORCIMA O KORIŠTENJU ELEKTRONIČKIH NAVIGACIJSKIH KARATA

SAŽETAK

*Novi sastavni dio suvremene navigacijske opreme je elektronička navigacijska karta. Bez obzira radi li se tu o elektroničkom kartografskom i informacijskom sustavu (*engl. *ECDIS) ili o sustavu elektroničkih karata (*engl. *ECS), pomorci mogu upravljati brodom na mnogo sigurniji i učinkovitiji način nego li kad su se oslanjali na papirnate navigacijske karte. U ovome se radu daje pregled povratnih informacija koje su prikupljene kao odgovor na pitanja postavljena pomorcima u okviru provedenog istraživanja.*

Ključne riječi: *sigurnost plovidbe, elektronske navigacijske karte, hidrografija*

SUMMARY

A new component of modern shipborne navigation equipment is the Electronic Chart. Whether it is an Electronic Chart Display and Information System (ECDIS) or an Electronic Chart System (ECS), mariners can now steer their ship more safely and with greater efficiency than relying on paper nautical charts. This paper presents the responses to a survey wherein mariners were asked their opinions and views about the use of electronic charts.

Key words: *safety of navigation, electronic navigational charts, hydrography*

1 INTRODUCTION

Electronic navigational charts are important navigational tools on the ship's bridge. The requirements of modern navigation are very high, therefore safe navigation through complicated waters with dense traffic cannot be imagined without electronic navigational charts or integrated systems on the bridge. In the use of paper nautical charts the user should check a lot of different sources of information in order to determine the course and the way of navigation. Electronic navigational systems are, quite the contrary, related with various ship sensors, which process data and automatically display them on the computer monitors. Nevertheless, the result of the use of electronic charts depends on the level of the user's qualification.

2 SURVEY ANALYSIS

The goal of the survey was to gather the estimation and opinions of the final electronic chart users – seafarers. The target group were above all navigation officers on the bridge; however it also involved hydrographers and others who deal with electronic navigational charts, e.g. manufacturers of the ECDIS, ECS or ENC.

The survey included 14 questions about basic information on the age, type and size of the vessel. Most of the questions offered optional answers and some of them allowed additional comment. Two specific questions enquired about the opinion on advantages and disadvantages of electronic navigational charts. Most of the questions were related to ECDIS - *Electronic Chart Display and Information System),* to the application of data of the ENC – *Electronic Navigational Charts*, and the rest of the questions referred to the RNC – *Raster Navigational Charts*.

The survey was transmitted by e-mail, and to some users aboard ships in the Port of Koper via the Maritime Directorate of the Republic of Slovenia – URSP. To various addresses of shipowners, hydrographic offices and the ECDIS manufacturers, altogether 351 surveys were sent.

3 RESULTS

Of 351 surveys sent 87 were returned (25%). A relatively low response was due to the short period of preparation of the research (2 months). Most of the surveys were returned by the masters of tankers, followed by cargo and RO/RO ships (figure 1). There were 22% returned surveys from hydrographic research vessels, but there was no response from ferries and passenger ships.

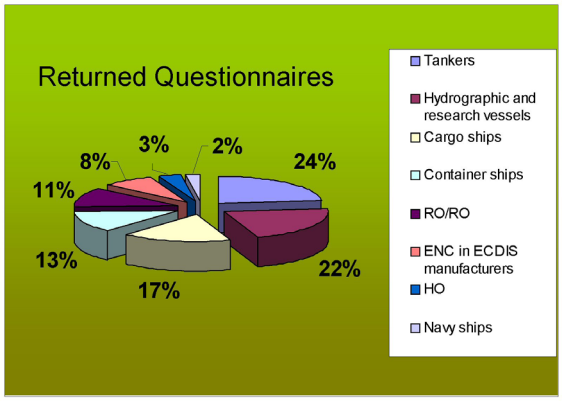

Figure 1: Returned surveys according to the type of vessel
Slika 1: *Povratni rezultati istraživanja s obzirom na tip broda*

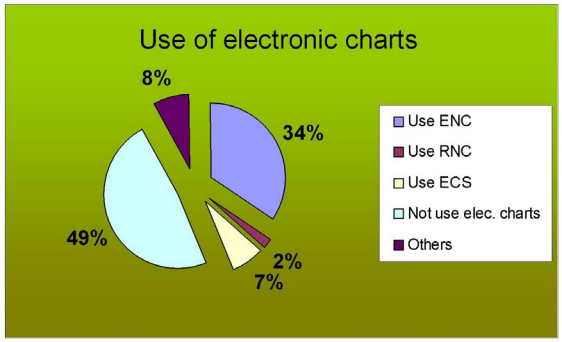

Figure 2: Application of electronic charts according to the type of chart
Slika 2: *Primjena elektroničkih karata s obzirom na vrstu karte*

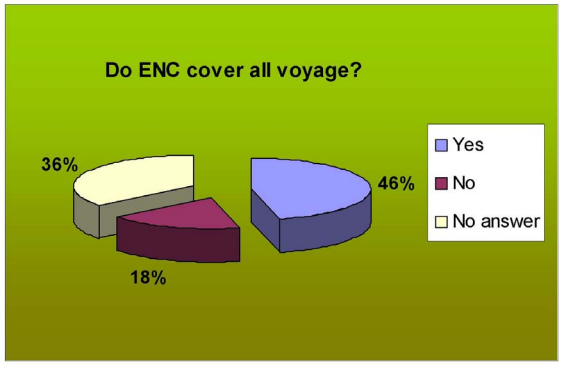

Figure 3: Accessibility to ENC
Slika 3: *Mogućnost korištenja elektroničke navigacijske karte (engl. ENC)*

It was important to research into the application of the ECDIS and the ENC on board ships. Regarding the feedback only 34% of the users use the ENC (figure 2). It seems also important that 49% of the interviewees answered that they did not use electronic charts at all.

4 ANALYSIS

The analysis of the feedback was focused on six main topics:

- What type of charts is used?
- Opinion on accessibility to the ENC.
- Opinion on application of the RNC.
- Clear distinction between the ENC and the RNC?
- Opinion on advantages and disadvantages of the ECDIS and the ENC.
- General satisfaction and eventual problems related to the application of the ECDIS.

Unfortunately 1/3 of the returned surveys are incomplete and the reason for this is unknown. It is possible that those users were not entirely acquainted with the topic, perhaps they did not use electronic charts or they simply had no interest or time to fill in the survey.

5 COVERAGE WITH ENC

It seems that the most important obstacle for a wider application of the ECDIS is minor accessibility to the ENC. Of all responses 46% were satisfied with the number of available ENC on the market (figure 3), whereas 36% of the responses did not mention this topic.

6 APPLICATION OF RNC

The production of RNC is faster and cheaper than ENC. Consequently most of the sea routes are covered with the RNC. About half of the interviewees prefer to use RNC for navigation or as a reserve where ENC are not available (figure 4).

A little share of the interviewees (10%) believes that ECDIS should use only the official ENC, whereas 22% believe that ECDIS would work in both ways, as ENC and RNC. Most of them are of the opinion that ECDIS should use RNC only when ENC are not available (Figure 5).

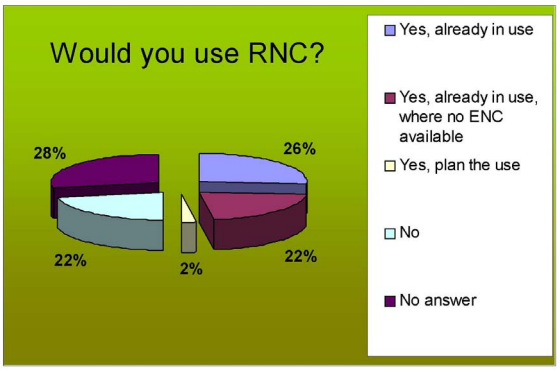

Figure 4: Opinion of the users on the application of RNC

Slika 4: *Mišljenje korisnika o primjeni rasterske navigacijske karte (engl. RCN)*

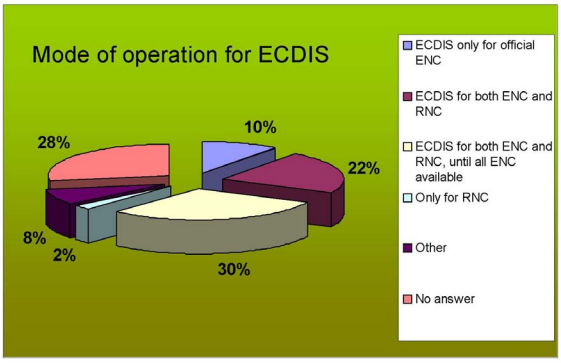

Figure 5: Opinion of the users regarding the way ECDIS work

Slika 5: *Mišljenje korisnika o radu elektroničkog kartografskog i informacijskog sustava (engl. ECDIS)*

There were positive comments on the use of the RNC in the ECDIS or the ECS, which already offer to seafarers more than paper charts and the greatest advantage is in the display of the ship's position in real time.

RNC represented on the computer monitor have similar appearance than traditional paper charts, whereas ENC are completely different 62% (figure 6).

Some disharmony in understanding differences over certain notions was observed, e.g. sometimes unclear distinction between ENC and RNC, what is ECDIS or RDCS, and between the notions "official" and "unofficial" electronic chart.

7 ADVANTAGES

Figure 7 represents the most frequent advantages regarding the received answers from those who already use electronic charts. These

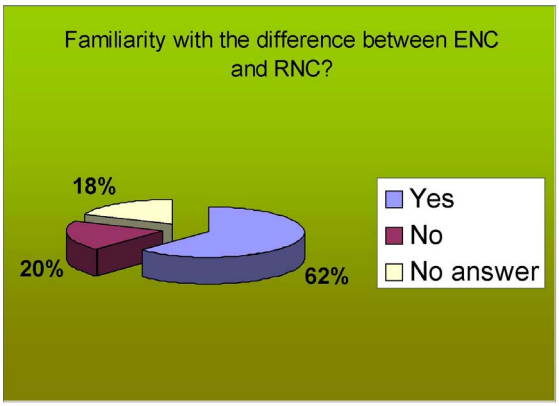

Figure 6: Users' knowledge about the difference between ENC and RNC
Slika 6: *Upoznatost korisnika s razlikom između elektroničke navigacijske karte (engl. ENC) i rasterske navigacijske karte (engl. RNC)*

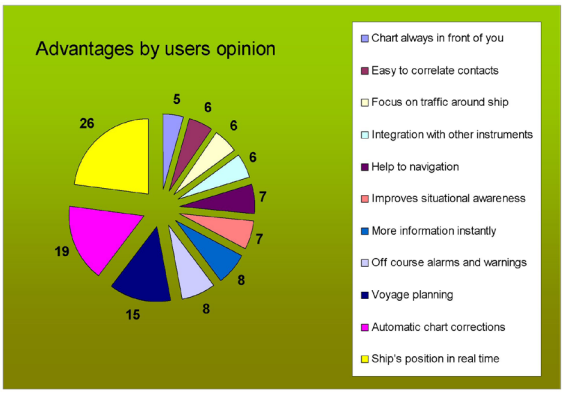

Figure 7: Number of received answers regarding the advantages of the ECDIS application
Slika 7: *Broj dobivenih odgovora koji se odnose na prednosti primjene elektroničkog kartografskog i informacijskog sustava (engl. ECDIS)*

advantages are summarized on the basis of the free answers received from the final users. This way was used in order that the users could freely formulate answers, which would not be the case if they had only multiple choice options.

The greatest advantage over paper charts is the real-time display of the ship's position. This is not a new fact, but it is pointed out because it is believed that this is very important for every day work of the navigating officers. Automatic chart correctors of (although some users miss regular corrections of ENC) and the ordinary voyage planning are also stated as advantages.

Interestingly enough, automatic indicators or alarm signals were not rated high on the importance scale. This was maybe due to the fact that

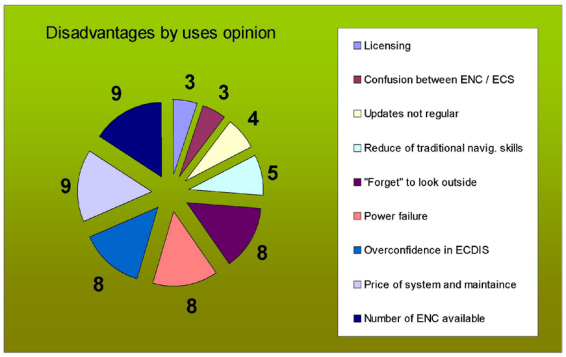

Figure 8: Number of received answers regarding disadvantages of the ECDIS application
Slika 8: *Broj dobivenih odgovora koji se odnose na nedostatke primjene elektroničkog kartografskog I informacijskog sustava (engl.ECDIS)*

the users were not entirely acquainted with this function, in which case more training is needed.

Other advantages are integration with other instruments P (e.g. radar and AIS) and the improved situation awareness.

8 DISADVANTAGES

There were relatively less opinions regarding disadvantages than advantages (figure 8). High prices of the ECDIS/ECS and the shortage of coverage with ENC were most frequently mentioned, followed by an excessive reliance on the ECDIS and the potential failure of the power supply.

9 GENERAL OPINION

Only 16% of the users are dissatisfied (figure 9). The reason may be in certain difficulties in

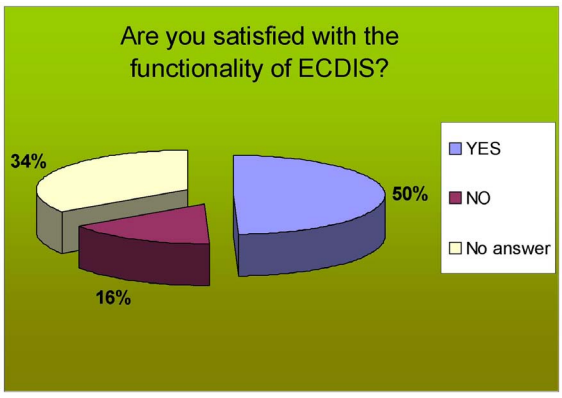

Figure 9: Opinion of the users regarding applicability of the ECDIS
Slika 9: *Mišljenje korisnika o primjeni elektroničkog kartografskog i informacijskog sustava (engl. ECDIS)*

the very system, shortage of ENC, problems interrelated with the GPS and other sensors. Unfortunately, only 2/3 of the returned surveys entirely covered this topic.

The ECDIS is a sophisticated tool; therefore the research comprised questions about the importance of all its functions (figure 10). Only 11% of the interviewees answered that they do not need all possible functions.

Some of them consider that the codifying of ENC is unnecessary; others meant that various settings of the monitor to "day-dusk-night" are unnecessary. About 13% answered, that the ECDIS is too complicated. Some functions were believed to be inapplicable and the whole set of functions occupies too much space on the monitor, which could have been designed for the actual chart display.

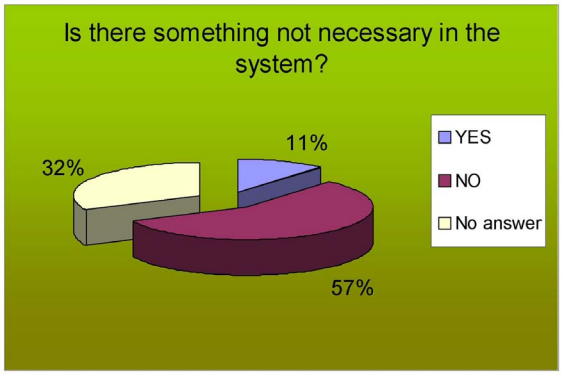

Figure 10: Opinion of the users regarding the unnecessary functions in the ECDIS
Slika 10: *Mišljenje korisnika vezano za nepotrebne funkcije unutar elektroničkog kartografskog i informacijskog sustava (engl.ECDIS)*

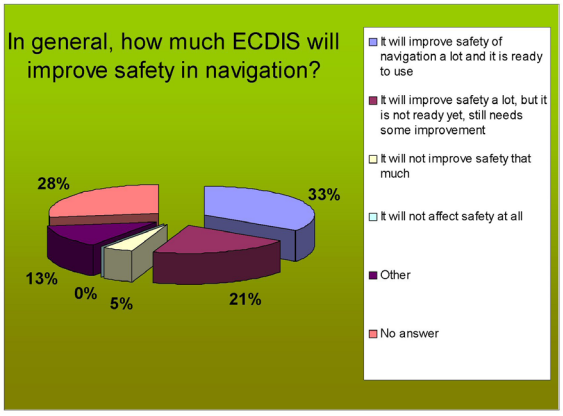

Figure 11: Opinion of the users regarding advantages for the safety of navigation
Slika 11: *Mišljenje korisnika o prednosti vezanoj za sigurnost plovidbe*

Despite the stated disadvantages of the system, most of the users are of the opinion that it offers greater safety of navigation. As a matter of fact some of them answered that safety is already now increased (figure 11). On the other hand 21% of the interviewees believe that the system should be further sophisticated. Nobody stated that the ECDIS does not provide greater safety. There was some comment about a greater safety offered by the ECDIS, however, under the condition that it is properly applied and that ENC are used. Others stress that the navigators' role is still most important. The ECDIS by itself does not ensure safety; it is only the tool which helps the navigator in his decision making.

10 CONCLUSION

Most of the interviewees are in favour of the ECDIS. The greatest advantage of electronic charts over paper charts is the display of the ship in real time, whereas automatic indicators and alarm signals were not pointed out. Other advantages are the voyage planning, integration with other instruments, e.g. radar and AIS, and the improved situation awareness.

There was less opinion given on disadvantages. High prices of the ECDIS/ECS and the shortage of coverage with ENC were mentioned most frequently, followed by an excessive reliance on the ECDIS and the potential failure of the power supply.

Generally speaking, the majority of the interviewees (50%) confirmed the functionality of the ECDIS, however at the same time they expressed doubt about an unavoidable necessity of all offered functions. Almost ¼ of the interviewees (21%) believes that the ECDIS needs some improvements.

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