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Information Paper for Consideration by CSPCWG

Summary of Results from the DQWG Questionnaire to Mariners

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Annex A. Raw Questionnaire Data Relating to Paper Charts

1.0 Introduction

As part of the DQWG's work on designing new methods of representing data quality in ENCs, a questionnaire was produced to investigate the mariners' perception of current methods of representing data quality in nautical charts.

This paper is intended to provide members of the CSPCWG with a summary of the results of the questionnaire and subsequent discussions at DQWG5, ahead of the publication of the full report and presentation in December 2011.

Further, a subset of the raw (unmarked) data is provided for separate analysis by the CSPCWG.

2.0 Summary of Results

2.1 General

The questionnaire was distributed by the IHO to member states, and was available as a PDF and an on-line version via surveymonkey.com. Over 600 responses were received, however due to time constraints the analysis was based on 574 responses.

The questionnaire was made up of both quantitative and qualitative questions. The qualitative questions can be subdivided into two types:

- Those designed to elaborate on or give context to quantitative questions, e.g. ‘other’ and ‘please explain your answer’ free type fields
- Those designed to directly test the respondents’ knowledge of data quality issues, e.g. ‘what does the PA abbreviation mean?’

The qualitative analysis took the form of the identification of recurring themes and the ranking of these themes by their frequency of occurrence.

2.2 Demographics

In terms of the survey sample, the demographic information showed that 74% (421 respondents) had over 10 years navigational experience with 63% (357 respondents) having in excess of 15 years navigational experience. In addition the results showed that a broad range of shipping sectors were represented. As a consequence, it is considered that a strong representative sample has been collected.

2.3 Paper Charts

Respondents who said that they used paper charts were asked whether the charts they use have either a source/reliability diagram or a zone of confidence (ZOC) diagram. The respondents that answered yes to these questions were then asked to indicate whether they used the information in the source/reliability diagram or a ZOC diagram. Figures 2.3.1 and 2.3.2 show that 73% (296 respondents) of respondents use the information in the source/reliability diagram and 75% (82 respondents) of respondents use the information in the ZOC diagram.

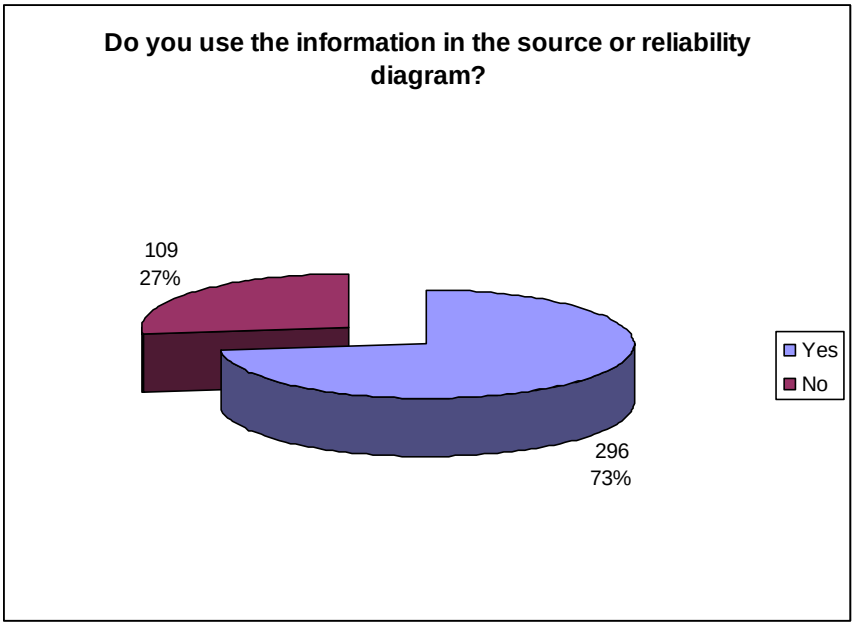

Fig. 2.3.1 Percentage of respondents that use the information in the source/reliability diagram

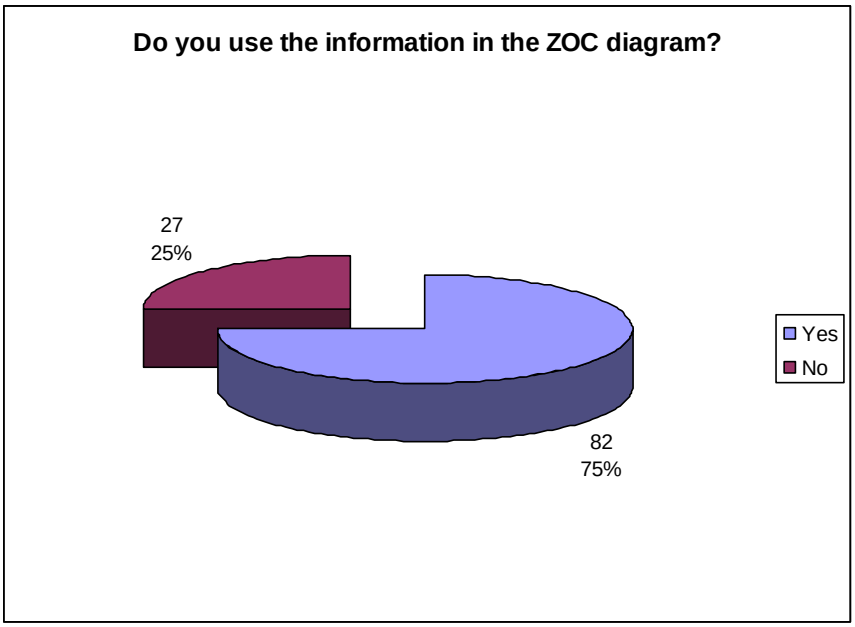

Fig. 2.3.2 Percentage of respondents that use the information in the ZOC diagram

Respondents that indicated that they did not use the information in the source/reliability diagram or ZOC diagram were then asked to explain why not via a multiple choice question. The most common reason chosen by respondents was “because I have travelled the same route many times before”. A number of respondents selected the ‘other’ free type option and the themes arising from these answers are detailed in table 2.3.1. The most common reason cited was that “I trust that the charts are correct”.

Table 2.3.1 Themes and ranks for why respondents do not to use the information in the source /reliability diagram

Theme	**Rank**
“I trust that the charts are correct”	1
“We are restricted by the Pilots limited area of operation and bow to their local knowledge”	2
“We rely upon experience and instruments instead”	3

Respondents were presented with a series existing data quality indicators (DQIs) that appear on paper charts and were asked to indicate whether they understood their meaning. Those that said that they did were then asked to give an explanation of the meaning of the respective indicator. These answers were then marked as either correct or incorrect. Table 2.3.2 shows a summary of these results. Those figures coloured red indicate where the percentage of respondents who gave incorrect explanations is greater than 60%. The figures that are coloured amber indicate where the results were between a 41% to 59% split. The figures coloured green indicate that either the number of respondents who indicated that they understood the DQI or those that gave a correct explanation exceeded 60%.

It should be noted that due to an oversight in the design of the questionnaire, respondents were asked “do you understand the meaning of the Unsurveyed and Depths notes?” This has meant that the values for the first part of the question are the same for both indicators. However, respondents were given the opportunity to explain their meaning individually. Regrettably, the same situation occurred question relating to the PA, PD, ED, SD and Rep’d (1999) notes.

Table 2.3.2 Summary of results to questions relating to mariners' understanding of existing data quality indicators in paper charts

	Do you understand the meaning of…?		**Of those who answered yes, how many gave a correct explanation?**	
Data Quality Indicator	**Yes (%)**	**No (%)**	**Correct (%)**	**Incorrect (%)**
Broken depth contour symbol	56	44	73	27
Broken coastline symbol	66	34	69	31
Dotted danger line symbol	76	24	44	56
Discontinuity between surveys note	53	47	55	45
Unsurveyed note	88	12	94	6
Depths note	88	12	74	26
PA	62	38	98	2
PD	62	38	90	10
ED	62	38	82	18
SD	62	38	79	21
Rep'd (1999)	62	38	36	64
Sounding in an upright font	44	56	36	64
Discoloured water note	59	41	Corrupted	Corrupted
Sandwave symbol	64	36	91	9
Dredged to… note	98	2	98	2
Potentially dangerous wreck symbol	98	2	76	24
Bar above a dangerous wreck symbol	75	25	57	43
Works in progress legend	93	7	100	0

Generally the understanding of existing paper chart DQIs appears to be good, however the understanding of the Dotted danger line symbol, discontinuity between surveys note and the bar above a dangerous wreck symbol appear to be marginal. Further, the respondents' understanding of the Rep'd (1999)

abbreviation and soundings in an upright font could be considered poorly understood.

The poor understanding of the Rep'd (1999) abbreviation is attributed to the fact that answers not including the condition "but not confirmed" were marked as incorrect. At DQWG 5 the question of whether a mariner would react to the rep'd abbreviation in a different way to any other sounding was raised.

The Sounding in an upright font was commonly misinterpreted as indicating that the value was in a different class of units (imperial or metric) to the rest of the data.

It was noted that the marking of these answers was a subjective process and as a consequence it is plausible that a different marker (from a different area of expertise) may generate slightly different figures.

2.4 ENCs

In contrast to the questions relating to source/reliability and ZOC diagrams, the results show that a large portion of ENC users (77%) do not use S-57 CATZOC (Figure 2.4.1). Further, sector analysis showed that percentage is fairly stable regardless of number of years experience.

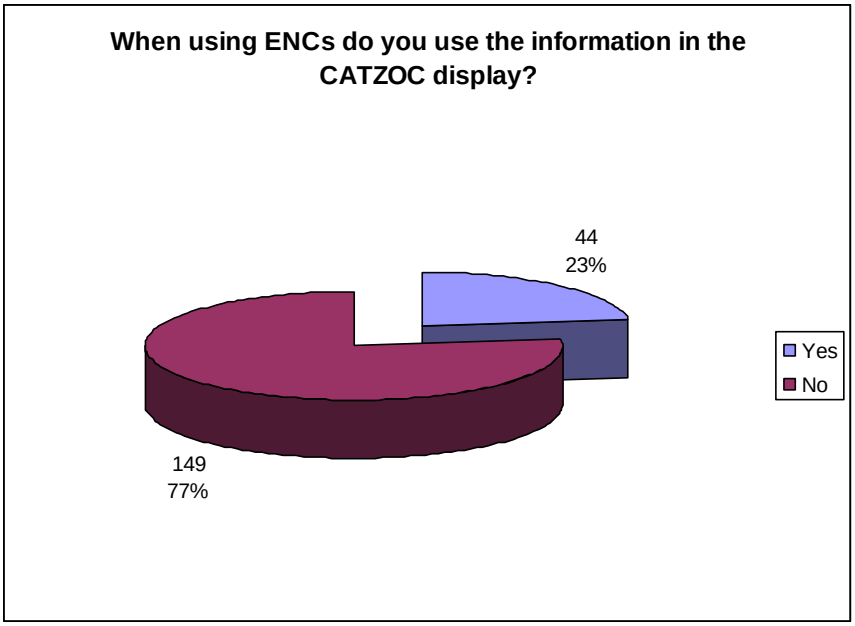

Fig. 2.4.1 Percentage of respondents that use the CATZOC display

As with paper chart DQIs, respondents were asked to indicate whether they understood the meaning of a range of S-57 data quality attributes. Those that said that they did were the asked to give an explanation of the meaning of the respective attribute. The results, detailed in table 2.4.1 show very poor understanding of the S-57 acronyms.

Table 2.4.1 Summary of results to questions relating to mariners' understanding of existing S-57 data quality attributes

	Do you understand the meaning of…?		**Of those who answered yes, how many gave a correct explanation?**	
S-57 Attribute	**Yes (%)**	**No (%)**	**Correct (%)**	**Incorrect (%)**
HORACC	24	76	57	43
POSACC	29	71	60	40
SOUACC	31	69	91	9
VERACC	22	78	78	22
SURATH	42	58	91	9
SURSTA	32	80	94	6
SUREND	21	79	94	6
TECSOU	43	57	96	4
QUASOU	31	69	78	22
QUAPOS	27	73	79	21

2.5 Wider Data Quality Issues and Future Developments

On the issue of training, 66% (183 respondents) indicated that they felt they had received insufficient training on data quality. This was reinforced by 78% (216 respondents) indicating that they would like to receive further training on data quality. The DQWG are currently investigating how training on data quality is delivered and what mechanisms for delivering further training to practicing mariners could be utilised.

Mariners were presented with a variety of conceptual future methods for representing data quality and invited to comment upon the various options. In general respondents seemed to favour an on demand data quality colour overlay.

3.0 Conclusions and Recommendations

In general the preliminary results from DQWG4 were confirmed by the final analysis.

The effort in validating the survey result confirms the following conclusions;

- Large proportions of ENC users are not using the CATZOC information
- The additional S-57 DQ indicator attributes are not understood and not used
- Majority of mariners state that they have not received enough training on data quality issues, and that they would like to receive more training

Using the results from Sam Harpers MSc thesis and the results from the questionnaire, the DQWG has the following recommendations for developing future methods of representing data quality in ECDIS. These recommendations are meant to bring in new possibilities for implementation into ECDIS systems.

- As a minimum the constituent elements of S-57 CATZOC (positional uncertainty, sounding uncertainty, features detected and seafloor coverage) must be encoded in S-101 ENC for depth areas, as separate attributes
- All encoded data quality information must be discoverable
- The data quality of near shore topography (piers/quays, fixed aids to navigation, clearances, etc) should be included, and a method of representing this data quality must be developed
- Temporal degradation of data should be encoded
- New representation methods should be able to accommodate inputs such as dynamic tides, under keel allowance and vessel specific parameters. It is understood that international efforts on standardization of display and mariner training address possible issues with user inputs.
- Where possible ENC attribute names should be more descriptive (eliminate 6 letter acronyms and make use of camelCase)
- Visualisation should take advantage of the mariner’s preference for an on demand colour overlay

- Recommend to add ability for mariners to add notes to specific features, that again changes presentation of the feature (as an addition to the mariners' objects)

- Any representation method should be accompanied by an appropriate education strategy

The DQWG note that the marking of the qualitative questions relating to existing paper chart DQIs is subjective and as a consequence recommend that the relevant raw data be made available to the CSPCWG ahead of their next meeting (28/11/2011 in Finland) for their use.

4.0 Action Required of CSPCWG

1. Mark and analyse the raw data provided in Annex A so that a comparison can be made against the results summarised in table 2.3.2 of this document

2. Consider whether the number of individual data quality symbols, notes, abbreviations and legends are necessary in terms of how the mariner uses them. For example, would the mariner act any differently to a normal sounding as opposed to a sounding with the note 'Rep'd (1999)' associated with it?