Re-use of Public Sector Hydrographic Information: Is the maritime sector a guiding beacon or a slow turning ship?

Frederika WelleDonker
Delft University of Technology
OTB Research Institute for the Built Environment
PO Box 5030
2600 GA Delft
The Netherlands
f.m.welledonker@tudelft.nl

Abstract
In the last decade, there has been ample research to determine the potential economic value of public sector information (PSI), both on national level as well as on European level. Most of this research has focused on the re-use of PSI in the land-based geo-sector but little is known about re-using PSI in the maritime sector. Especially hydrographic information is an important resource for re-use and value adding by the private sector. This paper will provide the first findings of a case study, carried out as part of a PhD study, assessing the impact of the legal framework on value adding public sector hydrographic information.

Keywords: value of public sector information; hydrographic information; ENC; case study.

1 PROBLEM STATEMENT
It has been acknowledged that public sector information (PSI) forms a rich resource for the private sector to create value added products and services (e.g. Pira International 2000; MEPSIR 2006; MICUS 2008). However, in spite of European initiatives to facilitate PSI re-use, the private sector still faces a number of obstacles, such as over-restrictive licences or public sector bodies acting as value added resellers in direct competition with the private sector. Earlier research into public sector spatial data licences (e.g. WelleDonker et al. 2010) suggested that the marine sector might have overcome some of the obstacles faced by the land-based geo-sector. In the marine sector, public sector marine information is disseminated under harmonised licence conditions to the private sector for re-use and value adding. However, have the marine sector managed to clear all obstacles for re-use and value adding or is this a superficial impression? Can the marine sector be viewed as a best practice case? Only by studying the marine sector into more detail can this question be answered.
2 METHODOLOGY
To provide an answer, a single case study into the re-use of hydrographic information was conducted in the Netherlands. The case study first started in 2009 and was finalised between May and June 2010. The case study was limited to re-users of hydrographic information of the Dutch Hydrographic Service and concerned interviewing both public sector and private sector organisations. For the public sector organisations, representatives on senior operational and policy advice level were interviewed. For the private sector, directors or managers of nautical products distributors were interviewed. The distributors included both resellers and value added resellers. The interviews were held using a questionnaire with open-ended questions. Although the interviews were limited to Dutch organisations, the outcomes will probably be representative of Western Europe as the Dutch marine sector operates internationally.

3 HYDROGRAPHIC INFORMATION

3.1 Nature of hydrographic information
Hydrographic information covers a broad spectrum and includes data related to depths, bathymetry, coastlines, tidal data, and obstructions and wrecks. Hydrographic information is used to produce nautical publications. Many maritime nations established national hydrographic offices (NHOs) to carry out hydrographic surveys for the production of nautical publications. Such surveying is time-consuming and expensive as all depth details have to be included. Therefore, most maritime nations deem the collection of hydrographic data to be a public task. This hydrographic information is an important resource for re-use and value adding by the private sector. To illustrate the potential value of hydrographic information, the income from supply of information of the United Kingdom Hydrographic Office (UKHO) – the leading supplier of hydrographic information in Europe – amounted to £116.6m in 2009/10 (UKHO 2010, p.46).

3.2 Nautical Publications
Nautical publications include charts, books and periodicals related to e.g. shipping routes, port entries, regulations, lighthouses, buoys and tide tables. Today, more than 80% of international trade in the world is carried by sea (IHO, 2010 p.4). Thus, maritime traffic is an important part of a nation’s economy. If shipping routes are poorly charted, voyages may be subject to increasing costs. Even worse, the safety at sea may be in jeopardy if shipwrecks or other underwater obstacles are not clearly indicated. Therefore, it is essential that nautical publications be continually updated.

1 Different countries use different names for these types of organisations, such as “maritime administration”. As the International Hydrographic Office, the uses the term “Hydrographic offices” for its member organisations, this paper will follow the same name.
Apart from certified nautical publications, some NHOs also produce so-called half-fabricates, such as paper charts of coastal zones and rivers for non-international shipping, and software applications for pilots.

3.3 Nautical Charts
An important task of an NHO is to produce high quality nautical charts. As seas and oceans do not stop at national borders, NHOs all over the world are authorised to produce the certified international nautical charts mandatory for all international vessels. These certified charts are produced as both paper charts and electronic navigation charts. Electronic navigation charts may be available as raster charts (RNCs, effectively digitised paper charts), or as vector charts, the so-called ENCs. ENCs are databases that contain many features such as coastal lines, depths, buoys and lights. Users can select specific layers, or zoom in and out. Although paper charts are still in use, electronic navigation charts are being phased in on all ships.

Following international rules, ENCs will be mandatory on all ships engaged on international voyages by 2018. A schedule has been set for all ships to be fitted with an electronic chart display and information system (ECDIS). An ECDIS is a system that consists of hardware and software required to display the position of the ship on the relevant charts from its database and to perform navigational tasks. The driving factor behind the mandated use of ECDIS is the major improvement in safety and the reduction of the risk of grounding. Many of the safety benefits of ECDIS are immediately obvious, namely, improved situational awareness, faster and more accurate updating, and reduced workload (Amels 2010).

4 REGIONAL ENC COORDINATING CENTRES AND DISTRIBUTION

4.1 Regional ENC Coordinating Centres
Regional ENC Coordinating Centres (RENCs) were specifically established to produce certified ENCs. These RENCs work on basis of bilateral agreements with NHOs to combine their hydrographic data into ENCs for their members. In 1999, the Norwegian Hydrographic Service (NHS) and the UKHO established PRIMAR as a RENC. In 2002, a number of European NHOs split off PRIMAR and set up the International Centre for ENC (IC-ENC), coordinated by the UKHO. Today, the IC-ENC with its 28 members has, by far, a larger coverage than

---

2 As the legal framework related to certified ENCs refers to them as ENCs, the acronym "ENC" will refer to the certified ENCs only.
3 IC-ENC's members are: Argentina, Australia, Bahrain, Belgium, Brazil, Chile, Colombia, Cuba, Ecuador, Germany, Greece, Iceland, India, Indonesia, Mexico, Mozambique, Netherlands, New Zealand, Pakistan, Peru, Philippines, Portugal, Russia, South Africa, Spain, Turkey, United Kingdom and Venezuela.
PRIMAR with 11 members and is the biggest supplier of ENCs in Europe. The NHS is the coordinator of PRIMAR. Since there are only two RENCs in Europe, the RENCs have an oligopoly with respect to ENCs.

4.2 Distributing of nautical publications
The RENCs use a network of distributors to market their products. IC-ENC has only seven so-called VARs (value added resellers) to distribute their products. VARs are specialist distributors who are allowed to develop their own services based around ENCs. Usually the value adding amounts to adapting the displaying format or facilitating the ordering process. Some VARs are developing innovative web services or mobile phone applications. VARs resell their value added products and ENCs to agents and to end-users. Apart from being IC-ENC’s coordinator, the UKHO also operates as one of the seven VARs as Admiralty Charts and Publications, a full subsidiary of UKHO. PRIMAR has a network of over 50 distributors. As PRIMAR was not included in this case study, it is not clear if all distributors are allowed to add value. All of IC-ENC’s VARs are also part of PRIMAR’s distributor network and as such, add value to PRIMAR’s products.

NHOs distribute their products both directly (usually to other public sector bodies) and through agents (mostly for the private sector). The Dutch Hydrographic Service (DHS) further divides its 18 agents into so-called A-agents and B-agents. A-agents distribute all DHS’ nautical publications to the international shipping industry, including ENCs. B-agents distribute all DHS’ publications except ENCs, RNCs and certified paper charts to the inland shipping industry and recreational shipping industry. In practice, this amounts to distributing the half-fabricate products of the DHS. Almost all A-agents order paper publications from the DHS and ENCs from IC-ENC or one of its VARs. As it is a core task of the DHS to ensure its publications are up to date, the DHS sends regular updates to the paper publications to the A-agents. A-agents must use these updates to revise their paper charts manually, which amounts to a large part of their daily activities. B-agents also receive updates but less frequent than A-agents. B-agents are not allowed to make corrections to charts. Therefore, paper charts sold by B-agents may be out-of-date. Some B-agents also use raw data or half-fabricates of the DHS to produce value added products, such as inland water atlases or coastal RNCs.

---

4 PRIMAR’s members are: Croatia, Denmark, Estonia, Finland, France, Greece, Latvia, Norway, Poland, Russia and Sweden.
5 FRAMEWORK HYDROGRAPHIC SECTOR

5.1 Mandating organisations
There are two international organisations related to institutional aspects of hydrographic information.

5.1.1 The International Maritime Organisation (IMO).
The IMO is a United Nations Organisation specialised in setting standards and regulation for the maritime sector. As safety is one of the principal responsibilities of the IMO, a set of mandatory security measures for international shipping entered into force on 1 July 2004, amending the 1974 Safety of Life at Sea Convention (SOLAS)\(^5\). SOLAS deals, inter alia, with Safety of Navigation, including the mandatory use of ECDIS and ENCs.

\(^5\) SOLAS is a treaty covering aspects related to safety such as life saving applications and warning lights. SOLAS has been accepted by more than 156 countries (http://www.imo.org, accessed 20-06-2010).
5.1.2 The International Hydrographic Organisation (IHO).
The IHO was established to support safety of navigation and the protection of the marine environment. Two of the objectives of the IHO are to coordinate the activities of NHOs and to achieve uniformity in nautical publications, including ENCs. To realise the latter objective, the IHO has developed technical standards related to the digital data format, specifications for ECDIS content and display, and data protection. One of those standards is the S-63 standard for encrypting ENCs. S-63 allows for mass distribution of ENCs on CDs, without losing protection of the data and allows access to only those cells that a user has been licensed for.

5.2 Hydrographic information licences
There are different licence regimes for paper charts and for ENCs. Often, licence conditions prohibit any alterations but in the case of paper charts, A-agents must carry out corrections according to updates sent by the DHS. VARs are not allowed to make any changes to the integrity of the ENCs but are allowed to produce value added services around the ENCs. However, there are limitations to how far they may go. For instance, a Dutch VAR had developed a value added service to overcome the problem with pre-selecting ENCs using a tracking system to activate the appropriate ENC permit only after entering a certain sector. The service had to be severely limited for legal reasons (Amels 2010).

Selective access to individual ENC cells is supported by providing users with a licensed set of permits containing the encrypted cell (IHO 2008, p.3). Once an ENC is loaded into ECDIS, the ENC will remain in ECDIS, even after the licence has expired. Every time a ship sails into another sector, an ENC for that sector is required. Therefore, in the voyage pre-planning phase, all ENCs that may be necessary must be preloaded. However, there are still problems, such as ENC coverage overlaps. It may be hard to determine in advance, which ENCs are required without having access to the actual ENC cells (Amels 2010). A warning will appear on the display only after the ENC cell is activated. In addition, no updates can be uploaded to an ENC with an expired permit. A permit may be taken out for a 3-month, 6-month, 9-month or 12-month period. NHOs receive royalties for every copy of a nautical chart sold to an end-user. If the paper chart covers an area of another NHO, it will receive part of the royalties. Contrary to the UKHO, the Dutch HO does not have to return a profit on sales.

During interviews with VARs, it emerged that S-63 is viewed as a major obstacle to creating value added services. Neither the interviewed agents nor the VARs were aware of an EU legal framework dealing with public sector information. They were fully aware of the IMO and IHO regulations but had never heard of the PSI Directive or of INSPIRE. The VARs were interested in the possibilities offered by services to be developed under INSPIRE. Especially the free-viewing services and the catalogue services were of interest, as it may allow them to find and view
data from alternative sources. The agents were more interested in IMO regulations than EC directives as IMO regulations compel international shipping companies to purchase nautical publications and logbooks more frequently.

6 CASE STUDY OBSERVATIONS
From the case study, a few observations can be made. Firstly, the international shipping sector overall could be considered to be a sector led by traditions. Business models have often been in place for centuries. Most of the interviewed A-agents indicated that, even though nautical publications are shifting from analogue to digital, in fact the old business models are essentially surviving. Most of the A-agents are satisfied with the current system of distributing hydrographic information because they are ensured of a constant quality. As they resell without adding value, they are less hampered by licence restrictions. The dominant position of the UKHO was seen to be an advantage rather than a disadvantage as the UKHO maintains a high standard of products and fast distribution services.

Secondly, the international shipping sector has to adapt to using mandated electronic navigation aids, such as ECDIS and ENCs. Although the international shipping sector has to invest heavily to implement ECDIS, in general they consider that the advantages to outweigh the disadvantages. The VARs view ENCs as a prime opportunity to develop new services and to facilitate the maritime sector. However, the VARs view that they are severely limited by the current licence conditions and digital rights management of the NHOs and RENCs. The VARs see parallels with the music industry: organisations can only hold on to protecting information for so long but eventually new ways of offering information will gain acceptance with the producers. The VARs see the dominant position of the UKHO – especially with its multiple roles of NHO, IC-ENC Coordinator and VAR – as one of the major obstacles.

Thirdly, the inland shipping sector is probably led by traditions to a lesser extent than the international shipping sector. This may be because most inland shipping vessels are owner-operated, whereas international vessels are owned by shipping companies. The international shipping vessels represent a large investment compared to inland shipping vessels. The mandated ECDIS equipment is expensive, thus shipping companies are reluctant to invest in additional state-of-the-art equipment that may not even be allowed to be used in some international waters. From interviews, it appeared that inland skippers are less reluctant to spend money on new navigation systems and services. However, with the current economic downturn, the inland shipping market is stagnating rapidly.

Fourthly, the recreational market is a fast growing market. Although most of the traditional yacht owners still prefer paper charts, the younger generation prefers electronic navigation systems. Again, the VARs and B-agents see opportunities
to develop value added products for this market. However, the obstacles faced in this market, relate more to organisational problems and to quality problems rather than restrictive licence conditions. In the Netherlands, inland waters are the responsibility of many local and some national authorities, all with varying standards, data quality and access regimes. Contrary to international and coastal waters, there is no overarching authority setting standards for all inland waters.

7 SOME PROVISIONAL CONCLUSIONS

If we compare the hydrographic sector with the land-based geo-sector, the private sector faces some of the same obstacles for value adding, such as restrictive licences and public sector bodies acting as VARs. However, there are also some dissimilarities. Unlike land-based geo-data, there are uniform standards in place for hydrographic information. Prices are less of an issue either as the private sector can pass these prices on to the end-user. Due to the IMO’s regulatory framework, the international shipping sector can be considered a captured market. The main obstacle to developing value added services by the private sector is the hydrographic data monopoly position held by the NHOs and the RENCs. The monopolistic position finds its roots in the restrictive licence conditions and digital rights management standards implemented by the NHOs and RENCs. At this stage, there are no alternative data suppliers for hydrographic information for the international shipping market due to the IMO framework. For the inland shipping and recreational markets, there are alternative data suppliers. However, the quality and interoperability of the data is wanting.

The triple role (NHO, RENC coordinator and VAR) of the UKHO may amount to market distortion. As an NHO, because of its reputation and (national) mandates, the UKHO can secure data from third parties to produce better quality charts (OFT 2006). As IC-ENC coordinator, the UKHO sets policy guidelines, determines licence agreements and pricing regimes, and selects VARs for distribution. As Admiralty Charts and Publications, it is also one of only seven VARs. Thus, the UKHO is in effect the RENC as well as one of its distributors. However, the other VARs are reluctant to complain openly, as they do not want to bite the hand that feeds them. VARs are dependant on the UKHO as a major supplier of nautical publications as the coverage of the UKHO’s publications exceeds by far that of PRIMAR. In addition, the network is relatively small: there are only a limited number of VARs, thus the VARs have to protect their position.

The strict framework related to certification and distribution of public sector hydrographic information provides clear guidelines. This framework works well for paper charts. In that respect, the framework is a beacon. However, as the maritime sector becomes more dynamic due to technological advances, the same framework is also limiting the opportunities offered by these technological advances. In that respect, the framework is hampering ships to manoeuvre more quickly.
BIBLIOGRAPHY


