Ireland's Integrated Digital Ocean

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Introduction.

Ireland has a marine resource extending to approximately 10 times its land area. With a renewed national focus on marine development a large number of agencies are operating in the marine sector. In parallel new digital technologies such as cloud computing and the internet of things are creating new opportunities. According to the European Commission[1] "the digital economy…is the single most important driver of innovation, competitiveness and growth" and "how European businesses adopt digital technologies will be a key determinant of their future growth".

If applied effectively digital technologies can enable new marine research and innovation to support sustainable growth in Ireland's marine sector. Porter and Heppelmann (2015)[2] say that "smart, connected products require a whole new supporting technology infrastructure" with the ability to integrate data from multiple sources being particularly important. Digital connectivity is also enabling new approaches to science and innovation with Open Innovation 2.O being "a new paradigm based on principles of integrated collaboration, co-created shared value, cultivated innovation ecosystems, unleashed exponential technologies, and extraordinarily rapid adoption" [3].

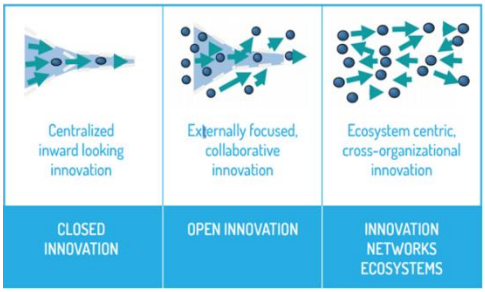

Fig. 1: The evolving innovation landscape (Curley and Salmellin)

In the marine sector digital services can leverage existing and future data assets to provide more timely and relevant information to support offshore operations, research and innovation, and to support the development of new marine-related public services. However the task of creating a coherent picture of the available data and information from these organisations is challenging, as the data originates from many different organisations and in many different formats.

In response to this need, and recognising that users and services often require direct access to data and information rather than to a catalogue, the Integrated Digital Ocean platform and associated portal is being developed with data contributions from fifteen organisations across Ireland.

The Digital Ocean Platform

The Digital Ocean Platform is designed to make it as simple as possible for data providers to contribute their results to the portal. As such, there are no minimum data requirements for a provider to join the network beyond providing a web-based interface for access to the observations or information.

Fig. 2: the Digital Ocean logo

[1] European Commission, 2016, "The importance of the digital economy", [Online] Available at: http://ec.europa.eu/growth/sectors/digital-economy/importance/
[2] Porter, Michael E., Heppelmann, James E., 2015, "How Smart Connected Products Are Transforming Companies", Harvard Business Review, PP.96-114
[3] Curley, M, Salmellin, B, 2013, "Open Innovation 2.0: A New Paradigm - White Paper", [Online] Available at: https://ec.europa.eu/digital-single-market/node/66731

The portal connects to various web services (including: ERDDAP from the Marine Institute; custom Application Programming Interfaces from the Commissioners of Irish Lights and Dublin City University; Open Geospatial Consortium Web Map and Web Feature Services from University College Cork and the Environmental Protection Agency) via a series of ingestion scripts.

These scripts allow the display of the data from the multiple originators in a user interface built on Open Source components (Figure 3): jQuery for the general UI components; Leaflet for the mapping interface; HighCharts for graphing; and three js for WebGL display of 3D modelling of bathymetric features such as bays and shipwrecks and dynamic representation of oceanographic model results.

Fig. 3: Open Source components of the Irish Digital Ocean portal UI

The data is presented to the end user through a combination of maps, charts and card widgets (Figure 4). These cards combine in-situ, model and archived data in a range of formats. They are reusable and can be quickly integrated into other applications.

Map layers come from a range of sources such as the INFOMAR seabed survey, Failte Ireland (the Irish tourist Board) and Dublin City Council's Dublin Bay Biosphere project.

All inputs to the Digital Ocean platform are monitored for data outages in a traffic-light dashboard system.

The Digital Ocean network.

Whilst the Marine Institute has coordinated the Digital Ocean network to date, there are a large number of partner organisations involved in Ireland's Integrated Digital Ocean, including:

- Commissioners of Irish Lights
- Dublin Bay Biosphere
- Dublin City University
- Electricity Supply Board
- Environmental Protection Agency
- INFOMAR seabed mapping project
- Irish Underwater Council
- National Parks and Wildlife Service
- SmartBay Ireland
- Sustainable Energy Authority of Ireland
- University College Cork

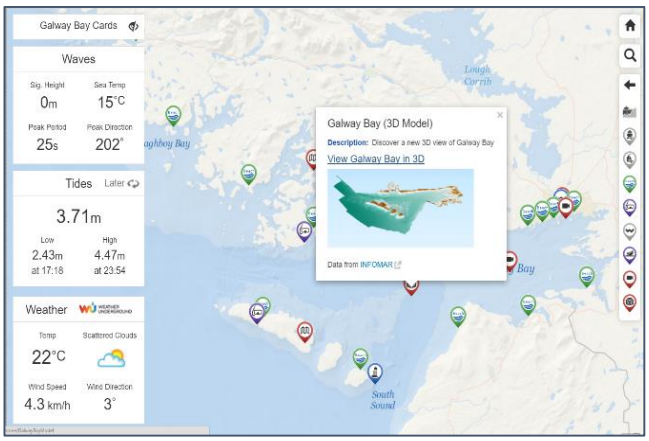

Fig. 4 : Irish Digital Ocean cards displaying various types of information (see www.digitalocean.ie)

This network of data providers has been a key focus of the Irish Digital Ocean project, and while the approach needs to be further elaborated a long-term partnership approach is envisaged.

Conclusions.

Ireland's Digital Ocean provides a flexible integrated platform to explore in data and information about Ireland's marine environment originating from a range of organisations. A significant focus has been on building the initial network of data contributors and developing the pilot portal to illustrate the concept to potential data providers and end users.

The current pilot phase of the portal extends beyond the cataloguing of data to the integrated display of data. The next development phase includes a data access broker which will negotiate various data services to allow end users or services to connect directly access data they have discovered. A series of “widgets” modelled on those provided by Facebook and Twitter will allow the re-use of information components in partner’s websites, thus providing ready access to targetted information.