Evolution of a Laboratory for Design of Advanced Ship Bridges

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Abstract. In this paper we describe the process of constructing a design laboratory oriented towards designers re-conceptualizing ship bridge interaction. We offer a description of the laboratory itself and the rationale for its form and the current experiences from using it.

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1 Introduction

Ship bridges, in particular offshore support vessels (e.g. platform supply vessels - PSVs) are complex and include equipment from multiple vendors that often user entirely different user interface methodologies. To quote an experienced captain working within the Norwegian offshore industry "they are all prototypes, each one is unique".

Recently, technological developments have made it possible to design integrated ship bridges where the ship builder can make an overarching interface steering all equipment on the bridge. Such development opens up for more holistic user oriented design. However, it also means the new design tasks are very complex and needs to take the entire ship bridge into account in the design process. To cope with such a task in a multidisciplinary project there is a need for tools that support multiple design professions to collaborate efficiently in designing a complex system.

In this poster we report one such design and research project from the Norwegian maritime industry. In particular we describe how we created a space oriented towards supporting holistic development of entire ships bridges. We describe why we created the space, how it functions and what we learnt from using it. Key challenges in designing the work space is to bridge the gap between the lab environment and the very different environment of a ship in practice (Lurås & Nordby, 2014). Also, we need to connect and maintain relationship between multiple different research groups in Norway in a seamless way.

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2 The Project

The lab is created in context of Ulstein Bridge Concept, a joint research and design project. The project is sponsored by the Norwegian research council and a large Norwegian ship yard developing advanced PSVs. Designing ship bridges for advanced offshore vessels is complex and demands collaboration between many participants. In the project practitioners and research from industrial, graphical, sound and interaction design collaborate with software and human factors engineers. The research and development project uses a mix of methodologies related to collaborative and participatory design disciplines. Important in this process is to have a place where we collaborate in creating new design proposals. Our project draws on experiences from design and HCI research related design collaboratoriums (Buur & Bødker, 2000; Bødker & Buur, 2002). We do so by creating a lab particularly oriented towards allowing multiple participants to work hands-on with the design problems. Also, we draw on experiences form CSCW (computer supported collaborative work) that outline how we might use video connected spaces as part of our toolbox.

3 The Collaboratoriums

The collaboratarium is distributed over two separate locations. The main lab is in Oslo where we continuously run design processes. The other lab is located in Ålesund where we will conduct usability testing. Ålesund is a city which can be considered the hub of shipbuilding in Norway.

3.1 The Collaboratorium Features

In essence the ship bridge is an enclosed space where we control much of the environmental aspects of the situation. This makes such a space ripe for experiments within the genre of ubiquitous computing. Because of this the collaboratarium is constructed so as to support live experiments with a range of technologies allowing by means of hardware and software infrastructure. Following is an overview of the various elements available for the participants in the lab space.

3.2 Physical Bridge Rig

Central in the lab is a wood rig representing the sloping glasses of a bridge from a Platform Supply Vessel. These are equipped with covers so as to be suitable to represent both front and rear bridge. The glass panes are only made for half the bridge to save space and out of the experiences that most bridges have a symmetrical structure.

3.3 Simulator

The operation of the ship in various environmental conditions are critical I ship bridge design. To introduce marine context to the design processes we have integrated a ship simulator inside the lab. This is done by placing a projection foil on the sloped windows and a projector connected to a computer housing the simulator. This enables a

tighter integration with realistic maritime situations while maintaining the flexibility of the lab environment. Currently we have access to three simulator systems in the lab: A commercial naval simulator, one based on games engines and finally an in-house built custom simulator. In addition to offering visuals, the simulators provide data about the simulated environment and the virtual ship that we use in the interaction design demonstrators.

3.4 Video Communication and Capture System

There are installed three video cameras in the lab. Camera one is located in one corner above a large monitor (46 inch). The camera is used for documenting workshops and for video communication. It is also capable of taking 10mp images.

The second camera is mounted on the bridge rig in front so as to be able to take pictures of console concepts from a side/front position. This camera is also used for video communication. This camera is also mounted for image capture.

The third camera is mounted on a moving arm. This camera is used for capturing images of sketches and models as they are produced in the collaboratorium. It is made easily available to make is possible to scan images as they are created.

3.5 Field Related Data

The lab has access from extensive data captured from both in operations in the north seas. The data have been collected during 1700 hours of field studies and comprise of extensive image, audio and video archives as well as written reports. The use of images are particular important in the lab and work have been carried out to make images easily accessible for design processes. (Nordby et al. 2011)

3.6 Bridge Prints

All equipment from a real life bridge is printed (10x10cm to 60x60cms) and used. This is mainly used for Building low level mock-ups of early concept designs. This system were used in the early phases of our project. However, as the project have matured all preexisting interfaces have been replaced with new systems.

3.7 CAD Station

Three well equipped stationary computers are centrally placed in the lab. They are used to run simulator software, do 3D renderings, CAD work and control experimental screens and projectors.

3.8 Building Equipment

In addition to large workshops including wood, plastic, metal and rapid prototyping workshops close to the lab a number of low end prototyping tools for console mockup is made available in the lab. This include cardboard, plywood and a large number of XPS “bricks” which is used to rapidly build large mockups.

3.9 Software

A software middleware layer is made available for the collaboratorium. The software offers a communication layer between all the ship functions and the interfaces we design as well as offering connection to commercial ship simulators. The system allows for efficient prototyping of novel interface concepts and make them testable in a simulated environment. All new interface technologies introduced in the lab (like gesture sensors, haptic systems or novel display types) are integrated into the labs middleware with the purpose to make their functionality available across the lab network.

3.10 Board Walls

All walls are used for visual communication. The walls facing away from the cameras are used for visual reference material, including ergonomic overviews, ship control systems and inspirational mood boards covering competitors, style guides and current inspirational materials.

In the front facing wall we have mounted a whiteboard. This is positioned to enable the cameras to capture the 'writing on the wall'.

4 Experiences and Reflections

Together the facilities of the lab makes for an efficient environment for collaborate design processes where users, marine experts and designers can work together. The lab has functioned well so far in the project. It offers a great inspirational place as well as a good place for interacting with the emerging design artifacts. We have found that in particular the sharing of digital field data function well in the lab as well as the tools for developing interactive prototypes.

Despite the many tools available in the lab we have experienced that the distance between real life ship bridges and the lab is a concern (Lurås &Nordby, 2014). Although the visual data, mockups and simulator equipment allow much of the marine context to be expressed in the lab, it does not relieve the need for extensive fieldstrips to understand marine settings. The extreme nature of the marine context involves both physical, cultural and psychological factors hard to understand outside the actual marine context. Consequently, our experiences using the lab for designing for marine use is that it ns necessary to combine a rich lab with frequent trips to real life user context.

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