The digital Age of Sail: gamification of maritime heritage

The case study of the *Witsen Scheepsbouw* platform

Ab HOVING, former head of the Navy Restoration Department of the *Rijksmuseum* Amsterdam (1989 – 2012), The Netherlands
Johan OPDEBEECK, Cultural Heritage Agency of the Netherlands, The Netherlands
Tomas SCHUURBIERS, Tijdlab, The Netherlands
Merel VAN DEN HOEK, Tijdlab, The Netherlands

Introduction

Dutch shipbuilding in the 17th century was a technical process that nowadays is hard to understand because of the total absence of design drawings. Ships were built with the use of a set of rules-of-thumb and formulae, developed on the basis of a long-lasting tradition. The first author who wrote about the subject of Dutch shipbuilding was the Amsterdam patrician, lawyer, collector, diplomat, cartographer and lord-mayor of Amsterdam Nicolaes Witsen (1641 – 1717). His book *Aeloude en Hedendaegsche Scheepsbouw en Bestier* (Old and Modern Shipbuilding and Managing) was published in 1671 and contains, apart from the description of the shipbuilding techniques in his days, a wealth of information about all kinds of subjects related to ships and sailing (Witsen 1671). While his work has been the standard work on the subject since its publication, it is extremely inaccessible due to its size (the book counts over 500 pages in ancient Dutch language) and because it often includes rather pointless elaborations, making the work extremely hard to fathom and consequently unapproachable to both professionals and general audiences.

This short paper presents the online *Witsen Scheepsbouw* platform, a case study of how gamification is utilised to make Witsen's original publication from 1671 accessible for a variety of audiences with an interest in shipbuilding. The program, a tool for both scientists and general audiences, offers both a web-application and downloadable program with a virtual reconstruction of the 'pinas of 134 feet', a type of ship which Witsen described in detail in his publication. The development of the platform was funded by the Cultural Heritage Agency of the Netherlands.

Firstly, this paper gives a brief overview of how the *Witsen Scheepsbouw* online platform came to be. It will then go on to outline the different function of the current platform, and what purpose they serve, as well as discuss the future plans for the platform. The last chapter will focus on the lessons learned by using gamification in the (maritime) heritage sector.

Witsen Scheepsbouw platform: the past, the present, the future

In 1994 Ab Hoving (head of the Navy Models Restoration Department of the *Rijksmuseum* Amsterdam from 1989 to 2012) published a 'translation' of the most important part of Witsen's book which describes into each tiny detail both all ship's part and the building sequence of the construction of an example ship. This translated work (Hoving 1994) was written after Hoving reconstructed the drawings from the text of Witsen's original publication and after he built a model of the ship in the '80 (fig. 1).

Fig. 1. Original model of the 'pinas of 134 feet' built by Ab Hoving in the '80.

An English translation of Hoving's publication followed in 2012 called *Nicolaes Witsen and Shipbuilding in the Dutch Golden Age* (Hoving & Wildeman 2012)*.* The data Hoving used originated from the part where Witsen described the building of his example ship, a pina of 134 feet. A pinas was an armed trader with three masts and a flat tuck, the well-known icon of Dutch ships of the era. Witsen's choice for this particular vessel is important, because in this single ship he describes both a merchant and man-of-war 'of average size' making it key to the technique of Dutch shipbuilding in the 17th (and 18th and 19th) century.

The idea for a virtual reconstruction of the pinas ship originates from 2006. After a few false starts, Hoving and his Belgian co-operator, Rene Hendrickx, started in 2013 and worked for almost 4 years on the data to produce a 3D image of the ship in all its parts, using the free downloadable virtual shipbuilding program DELFTship, created by Martijn van Engeland. However, the DELFTship software is originally intended to perform hydrodynamic calculations on ship hulls, not as a 3D presentation software. Additionally, the model created in DELFTship was vector-based, while a polygonal-based model is preferred for presentation purposes. After initial attempts by students, on behalf of the Cultural Heritage Agency of the Netherlands, the archaeological presentation agency Tijdlab

succeeded in creating a digital version of the pinas that can be viewed by the public. In order to realize this, the DELFTship vector-based model was converted to a polygonal model in the Unreal Engine. This newly created model was the basis for the current *Witsen Scheepsbouw* platform (Tijdlab 2021). Over the course of three years (since 2019), the platform was further developed and expanded.

Currently, the platform consists of 5 modules. Users can download the program in its entirety and run it on their personal computer, or they can choose to run the different modules in an online web-application. The 5 modules of the current platform are:

1. Reconnaissance (fig. 2, a)

   This module allows users to virtually walk on the pinas ship in order to view the interior. They can virtually visit all the decks and location. To view the exterior of the ship, users can enter a sloop and sail around the ship.

2. Construction stages (fig. 2, b)

   This module shows users in 14 phases how Dutch ships in the 17th century (and well beyond) were built.

3. Intersection (fig. 2, c)

   This module is an addition to the module with construction phases. It presents a cross-section segment from the midships of the pinas, and specifically focuses on the fasteners that were used to attach the different parts of the ship.

4. Encyclopaedia (fig. 2, d)

   This module contains a list of shipbuilding terms. When a term is selected, an explanation of the term is given, and it is highlighted on the reconstruction of the pinas where the part is located in the construction of the ship. Additionally, this module also allows to view every component separately in a 3D viewer.

5. Reconnaissance flute (fig. 2, e)

   A new addition to the *Witsen Scheepsbouw* platform is the virtual reconstruction of a flute ship. As with the Reconnaissance module of the pinas, it allows users to view the interior and exterior of the flute ship type. This type of ship is not as extensively described in Witsen's publication as the pinas.

The development of the *Witsen Scheepsbouw* platform is still ongoing. Future plans include enhancing the experience of the Reconnaissance module of the pinas ship type by adding furnishings to the interior and increasing the interactivity of the current Reconnaissance module by adding features such as allowing users to fire a canon. Additionally, there are plans to develop a new Reconnaissance module of a *watership* ship type, also described in Witsen's publication, including wind simulated rigging.
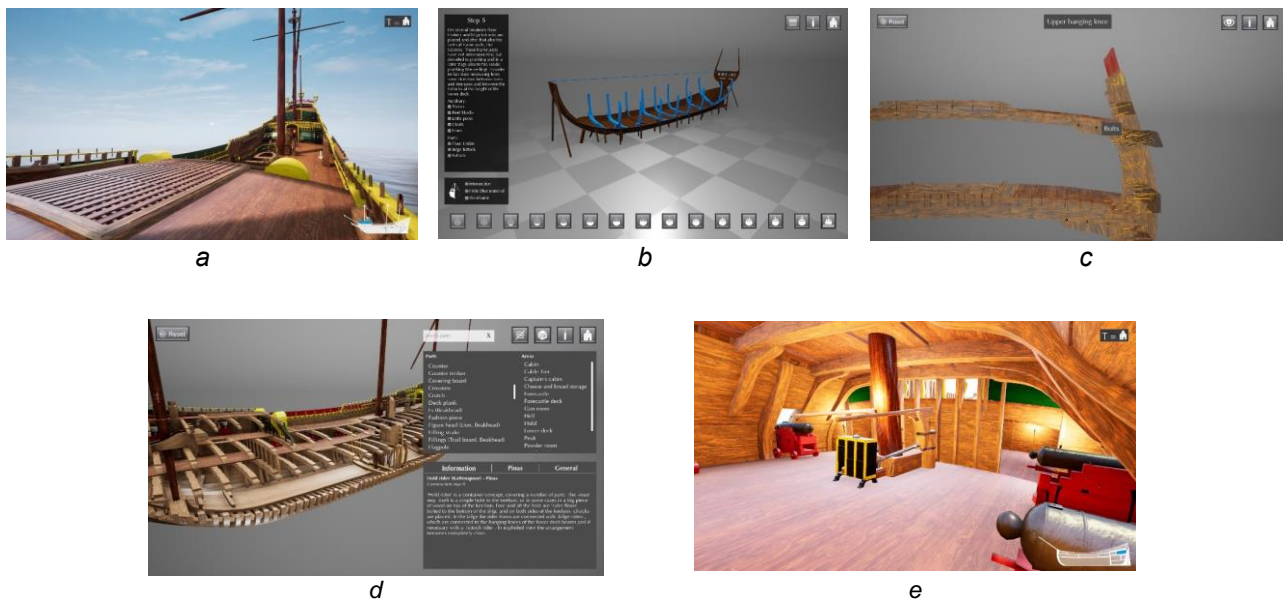
Fig. 2. The 5 modules of the Witsen Scheepsbouw platform. a) Reconnaissance module; b) construction stages module; c) intersection module; d) encyclopaedia module; e) Reconnaissance module of flute

Gamification of (maritime) heritage: results and lessons learned

The project of *Witsen Scheepsbouw* online platform is positively received. The platform is regularly used by students during lectures presented by the Dutch Cultural Heritage Agency, and online the platform is shared amongst enthusiasts of (17th century) (model)shipbuilding. Even though the platform has been live for over a year, the website still sees unique pageviews every month. Interestingly, when the Reconnaissance module is used as a 'showcase' project on events, children seem to immediately understand how to navigate around the ship. Younger generations grew up using similar 'gaming environments', and this has potential for education (or 'edutainment') purposes as well.

During the development of the *Witsen Scheepsbouw* platform valuable lessons of utilising gamification in order to develop a tool for both scientists and the general public were learned.

First of all, the *Witsen Scheepsbouw* platform was created by a (small) team including both a content expert and a 3D designer (with a background in game design). This multidisciplinary is to be recommended when utilising gamification for presentation purposes of (maritime) heritage. Each of the team members is a specialist in their discipline, ensuring that the ''final'' product is both historically accurate, and approachable in a game engine.

Another recommendation is to start with establishing a clear scope for the project. When working on such a platform there are always many ideas of how to expand it, but by first developing one (small) module or part will prevent that too many 'modules' or components are developed at the same time and making the development disorganized. At the same, at the start of development the potential of the program might not be clear. The *Witsen Scheepsbouw* platform is therefore still regularly being updated and expanded. As an example, in the early version of the Reconnaissance module the rigging of the ship was deliberately not modelled in the game environment, as it was not described

by Witsen in his publication. However, currently there are plans to include rigging to a new Reconnaissance module of a watership, to see what the platform is capable of and how the experience can be made more historically accurate.

Ensuring the historical accuracy of a virtual (maritime) heritage model, such as the 'pinas of 134 feet', can be problematic. While the content experts strive to keep the model as accurate as possible, the 3D artist/game designer also needs to consider what is technically feasible. This asks for regular communication between the team members.

Through gamification Witsen's publication from 1671 has now become accessible to anyone who is interested in 17th century shipbuilding. Both the separate online modules as the downloadable package of all five modules can be used without charge. Whether they are professionally interested or simply curious to walk around on the well-known icon of Dutch ships of the era, everyone is welcome on board.

References

Hoving, A.J. (1994). *Nicolaes Witsens scheeps-bouw-konst open gestelt.* Franeker: Van Wijnen.

Hoving, A.J. and Wildeman, D. (2012). *Nicolaes Witsen and Shipbuilding in the Dutch Golden Age.* College Station: Texas A&M University Press.

Tijdlab (2021). *Witsen Scheepsbouw.* [online] Available at: <https://witsenscheepsbouw.nl/> [Accessed 27-6-2021].

Witsen, N.C. (1671). *Aeloude en hedendaegsche scheeps-bouw en bestier.* Amsterdam: Casparus Commelijn & Broer and Jan Appelaer.