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**VTS-Bot: analysis and implementation
of a student-centred learning approach
by using a ChatBot computer programme
to provide for outcome-based
maritime communication training**

By

Jade University of Applied Sciences (JUAS)

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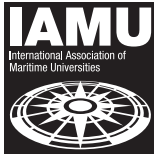
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TEL : 81-3-6257-1812 E-mail : info@iamu-edu.org URL : <http://www.iamu-edu.org>

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Jade University of Applied Sciences (JUAS)

Contractor : Ralf WANDELT, Dean, JUAS

Research Coordinator : Peter JOHN, JUAS

Research Partner : Naoyuki TAKAGI, TUMSAT

Alison NOBLE, Autwerp Maritime Academy

Peter BJÖRKROTH, Novia University of Applied Sciences

Bejamin BROOKS, AMC

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**VTS-Bot: analysis and implementation of a student-centred learning
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outcome-based maritime communication training**

Jade University of Applied Sciences, Germany

Research Co-ordinator:

Peter JOHN

Senior lecturer of Maritime English, peter.john@jade-hs.de

Research Partners:

Prof. Dr. Naoyuki TAKAGI

Tokyo University of Marine Science and Technology, Japan

Alison NOBLE

Antwerp Maritime Academy, Belgium

Peter BJÖRKROTH

Novia University of Applied Sciences, Finland

Dr. Benjamin BROOKS

Australian Maritime College, Australia

Abstract: This document constitutes the final report of the maritime project entitled VTS-Bot: Analysis and implementation of a student-centred learning approach by using a ChatBot computer programme to provide for outcome-based maritime communication training which aims to exploit the innovative use of computer dialogue systems (aka ChatBots) to assist future Officers of the Watch (OOW) in acquiring maritime communication skills based on the IMO (International Maritime Organization) SMCP (Standard Marine Communication Phrases). As part of their training, deck and engineering cadets in the Merchant Marine are required to obtain a mandatory range of communication competencies in line with the IMO STCW code (Standards of Training, Certification and Watchkeeping, chapter II, table A-II/1). The VTS-Bot developed within the project is divided into three categories, namely SMCP, VTS communication in the approach to Tokyo Bay and medical emergency cases. The VTS-Bot is freely available online and allows students to practise the relevant maritime communication at their own individual learning pace, thus establishing a student-centred educative approach. The exercises contained in the ChatBot target the compulsory Part A of the IMO SMCP used in VHF communication, and the authentic maritime scenarios provided permit the cadet to conduct in real time a simulated maritime conversation with the ChatBot.

keywords: MET, Maritime ChatBot, SMCP, VTS, STCW

Executive summary

This document forms the executive summary to the final report on the project “VTS-Bot: analysis and implementation of a student-centred learning approach by using a ChatBot computer programme to provide for outcome-based maritime communication training” (hereafter referred to as VTS-Bot). The project, from 1 May 2015 to 31 May 2016, was sponsored by the International Association of Maritime Universities (IAMU), under the auspices of the Nippon Foundation. The project coordinator was Peter John (Jade University of Applied Sciences, Germany). Other project partners were Prof. Naoyuki Takagi (Tokyo University of Marine Science and Technology, Japan), Alison Noble (Antwerp Maritime Academy, Belgium), Peter Björkroth (Novia University of Applied Sciences, Finland) and Dr. Benjamin Brooks (Australian Maritime College, Australia).

The VTS-Bot project aims to exploit the innovative use of computer dialogue systems (aka ChatBots) to assist future Officers of the Watch (OOW) in acquiring maritime communication skills based on the IMO (International Maritime Organization) SMCP (Standard Marine Communication Phrases). As part of their training, deck and engineering cadets destined for the Merchant Marine are required to obtain a mandatory range of communication competencies in line with the IMO STCW code (Standards of Training, Certification and Watchkeeping, chapter II, table A-II/1). In order to hone communicative skills, the VTS-Bot invites the cadet to engage in authentic maritime scenarios and conduct, in real time, simulated conversations appropriate to each situation.

Matching recent trends, whereby huge advances in computer technology have prompted a revision of didactic practices, the VTS-Bot project departs from teacher-centred learning to apply a more constructivist approach. Ultimately the VTS-Bot provides student-centred stepping stones to learning the IMO SMCP and, subsequently, to building seamless maritime communication. Once logged in to the corresponding website¹, the learner is able to pursue and manage a learning trajectory tailored to his or her own needs. The VTS-Bot is divided into three categories, offering authentic dialogues: SCMP training, VTS radio dialogues for an approach to Tokyo Bay and dialogues in medical emergency cases. Once the learner has mastered the SMCP in his or her own time, s/he can progress to the extended dialogues (VTS and medical emergency). The learning outcomes of these exercises and dialogues are manifold. The cadet acquires vocabulary and the SMCP needed for specific maritime situations; internalises the structure of maritime dialogues; masters how to elicit crucial information in a concise way; and learns how to supply crucial information.

Partners presented the VTS-Bot at three conference workshops.² Conference participants were able to see the VTS-Bot in action and to trial it for themselves. Data gathered from evaluative questionnaires following two of these workshops proved encouraging. Over 90% of participants stated that they enjoyed interacting with the VTS-Bot and would encourage their students to use it. A similarly high percentage agreed that the VTS-Bot would enhance usage of the IMO SMCP and Maritime English at sea. The results were thus extremely positive for a tool in the early stages of development and provided both a validation of the VTS-Bot as well as opportunities for its improvement.

It can be very challenging to study a language, especially on one's own. Apart from the pedagogical, course-embedded advantages of the VTS-Bot, economical aspects can also be considered. The VTS-Bot is a suitable tool for Open and Distance Learning (ODL) and seafarers on board can study with or without an Internet connection.

¹ The VTS-Bot is hosted on the website www.smcpeexamples.com and is available free of charge.

² IAMU Annual General Assembly, Croatia, October 2015; International Maritime English Conference (IMEC27) in Malaysia, October 2015; Japanese Institute of Navigation in Kobe, May 2016.

The project partners believe that the VTS-Bot will help cadets, seafarers, and MET³ establishments of the future to embrace computer technology, especially ChatBots, as a valid way of providing learners of Maritime English with the opportunity to act in a natural discursive manner in maritime contexts.

Acknowledgements

This research project VTS-Bot: Analysis and implementation of a student-centred learning approach by using a ChatBot computer programme to provide for outcome-based maritime communication training has been funded by the Nippon Foundation as an IAMU (International Association of Maritime Universities) capacity building project. We would like to acknowledge the support received from The Nippon Foundation and from the IAMU. The research team would like to thank in particular Professor Dr. Takeshi Nakazawa (Secretary), Ms. Etsuko Komatsu (Coordinator), and Yutaka Emi (Deputy Executive Director) for their kind support and guidance throughout this research.

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Finally, thanks go to our students who participated in simulation trials and surveys.

³ Maritime Education and Training

Glossary and Abbreviations

AI	Artificial Intelligence
CALL	Computer-Assisted Language Learning
ChatBot	Computer dialogue programme built on Artificial Intelligence which simulates spontaneous communication
ESP	English for Special Purposes
HCD	Human-Centred Design
IAMU	International Association of Maritime Universities
IMEC	International Maritime English Conference
IMLA	International Maritime Lecturers Association
IMO	International Maritime Organization
ISO	International Organization for Standardization
MET	Maritime Education and Training
OOW	Officer of the Watch
SMCP	Standard Marine Communication Phrases
STCW	Standards of Training, Certification and Watchkeeping
UT	Usability Testing
VHF	Very High Frequency
VTs	Vessel Traffic Services

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1. Introduction

Over the last few decades, language teaching has undergone a qualitative transformation, shifting from a teacher-centred (*behaviouristic*) to student-centred (*constructivist*) approach and thus forcing a revision of didactic practices. The move has prompted teachers to vacate centre stage, encouraging learners to step into the spotlight where they manage – almost improvise! – their own learning trajectories. In combination with these changes, the seemingly inexorable march of computer technology has revolutionised the way in which both teachers and learners access and use corresponding materials. Almost by default, this empowerment has led the learner to adopt a more central role in the educational process. By placing students at the forefront of the learning process, the teacher's role has gradually changed to that of a facilitator or '*scaffolder*' of learning. As a result the teacher merely assists the student in a personalised, constructivist environment, which often embraces new media technology, Chatbot included.

2. Pedagogical approach

In the literature the move from a teacher-centred or *behaviouristic* learning environment towards a student-centred, *constructivist* didactic model is considered highly significant. The traditional teacher-centred approach assigns a receptive role to the learner whereby the latter listens passively to the lecturer, considered an expert in the field. In contrast, an environment based on learner-oriented activities motivates the student to construct skills and knowledge in an experiential setting. Such an environment allows the learner to choose his or her subject matter, to set the pace of learning and to select the learning methods used. It ultimately bestows autonomy upon the learner and thus empowers the individual. The literature reveals, in general, that student-centred methods have improved learning processes. Within the context of a course on Public Policy Research Methods⁴, Barraket [1] comes to the conclusion that, although formal teaching methods (teacher-centred) are still considered desirable by the student, the use of student-centred techniques "*facilitate a strong social context for learning and provide learners with a common experiential framework from which to explore the technical aspects of the curriculum*".

Student-centred techniques, or constructivist learning, is based on an understanding that learners construct knowledge for themselves [2]. As mentioned in the introduction above, a range of techniques used by the instructor to guide students progressively towards stronger understanding and greater independence in the learning progress may be termed '*scaffolding*'. Similar to '*differentiation*'⁵, techniques, scaffolding is widely employed in today's classroom. Just like its physical namesake, educational scaffolding offers the learner temporary support as s/he builds a strong platform from which to acquire or construct additional knowledge and skills. Once the holistic competence has been achieved, the so-called '*scaffolding*' may be successively removed. Thus the teacher's or facilitator's role is even further reduced as s/he gradually transfers more responsibility over the learning process to the student. With the student now positioned at centre stage, the teacher is relieved to some extent of a didactic role, freeing up time to guide slow-progression students who require more assistance with the learning process; in other words a win-win situation.

⁴ The research was undertaken with a diverse student cohort at the University of Melbourne, Australia.

⁵ '*Differentiation*' refers to the use of a wide range of teaching techniques and lesson adaptations used by instructors to teach a diverse group of students with diverse learning needs.

Turning specifically to maritime education and training (MET) and Maritime English in particular, it should be noted that the latter has established itself as a discrete⁶ and key subject in the nautical curriculum. The subject's identity as a *language* for specific purposes – or English for Specific Purposes (ESP) – means that it is primarily shaped by the target needs and professional outcomes of the learners, the latter in this case comprising future deck and engineer officers in the Merchant Marine. (Maritime) English is, moreover, regarded as a key competence for the OOW and is noted as such in the IMO STCW code (Standards of Training, Certification and Watchkeeping, chapter II, table A-II/1). Although the STCW code lacks clarity as regards which specific language criteria are required to perform the job of OOW, the broader message is nevertheless clear. The minimum standard for an officer in charge of a navigational watch of ships of 500 gross tonnage or more is to “*use the IMO Standard Marine Communication Phrases and use English in written and oral form*”⁷. The IMO SMCP are singled out as a key item within this ESP discipline. In fact the Maritime English syllabus, with its distinct inventory of dedicated maritime vocabulary, standardised phrases (SMCP) and nautical terminology, lends itself very well to a constructivist approach, combining or blending both the aforementioned scaffolding and differentiation techniques.

Moreover a constructivist approach is also highly appropriate due to the nature of both learner and instructor in the Maritime English classroom. Examination of the profile of the Maritime English instructor reveals that this so-called expert is very often self-made. Novice Maritime English instructors tend to derive from an academic background far removed from a ship and thus may arrive in the classroom feeling inadequate and exposed. Cole et al [3] note that “*‘Maritime’ English instructors consist mostly of qualified teachers holding a university degree in English language literature. They are enthusiastic lovers of the beauty of the English language and its literature but less enthusiastic towards applied linguistics, especially ESP and the variety called Maritime English, as they are not trained or motivated for the task.*” This feeling of inadequacy felt by Maritime English teacher may be alleviated to some extent by encouraging the instructor to give some rein to the learner. Instead of adopting the traditional belief that knowledge is transmitted strictly from instructor to learner, in the Maritime English classroom it may not be out of place to consider a contrasting situation whereby some transfer of knowledge from learner to instructor is accepted and welcomed. Across the classroom, examination of the maritime student reveals an adventurous, independent, motivated, sometimes mature individual, driven by the prospect of a well-paid, highly responsible career, not without risk, in a competitive sector. A passive, traditional learning environment thus fails to satisfy the expectations of such a student. In the authors’ opinion the Maritime English classroom should thus be a place of fluid learning, where both the student and the instructor engage in shared experiential, constructivist processes. In other words the teacher moves into the role of facilitator, previously mentioned, and the maritime student constructs his/her own learning process, in accordance with professional STCW needs, under the guidance of the instructor.

Within the context of student-centred learning, self-study plays an important role. Computer-Assisted Language Learning (CALL) clearly offers the learner autonomy over his or her learning process. Provided a computer is available, the student may select the time, the place, the length and the intensity of the learning to be undertaken. In this sense the ChatBot operates in parallel to the teacher as facilitator, providing support in the form of self-study options.

⁶ ‘Discrete’ is used in the context to mean a separate and distinct item.

⁷ IMO STCW Chapter 2, Table A-II/1: Specification of minimum standard of competence for officers in charge of a navigational watch on ships of 500 gross tonnage or more. Function: Navigation at the operational level

Maritime English instruction has fully embraced computer-assisted learning trends, mostly through the integration of multi-media content [4], [5], [6] and e-learning exercises [7]. Other innovative maritime teaching methods involve the use of full-mission simulators for collaborative teaching or ‘twinning’ with instructors of navigation [8], [9] and the use of web conferencing software in low-fi simulation exercises [10], [11], [12]. The present research introduces yet another new technology that allows students to interact with a computer, the (maritime) ChatBot.

2.1 ChatBot technology as an e-learning tool

The IAMU-funded VTS-Bot project employs a computer technology known as *ChatterBot* or *ChatBot*. ChatBots are computer dialogue systems which build on Artificial Intelligence (AI) and are already being used online, especially in the retail sector. Essentially they allow users to interact with computers in a natural discursive manner by providing authentic dialogues. Examples of online ChatBot services include assisting customers to select products online (e.g. Ikea's *Anna* ChatBot, Messaging App *Kik*) and helping library users. They are also programmed to function as virtual communication partners in chatrooms (Microsoft ChatBot *Tay*).

It is relevant to note that there has recently been some adverse publicity surrounding ChatBot technology. In March 2016, after less than 24 hours in service, Microsoft was obliged to disable its innovative AI ChatBot *Tay* after online teenagers led her into making inappropriate comments and, at one stage, explicitly racist remarks. *Tay*, intended to be a chat partner for teenagers, was designed to learn from interactions and to react intuitively. *Tay* was taken offline but Microsoft remains convinced that the future will see people managing their entire social agenda via ChatBot. By contrast, a similar ChatBot in China, Xiaolce, experienced no such problems.

To date very few attempts have been made to use this innovative technology for teaching purposes, and, as far as the authors are aware, no project has yet been undertaken to deploy ChatBot computer dialogues in Maritime Education and Training (MET). This challenge has been taken on by the VTS-Bot research project supported by the International Association of Maritime Universities and funded by the Nippon Foundation of Japan. The project's aim is to develop a series of computer dialogue exercises which provide realistic scenarios of maritime communication in which students can practise their communication skills individually and at their own pace.

2.2 ChatBots for simulating maritime communication

An aspirant OOW, who is certified under STCW and who may, nowadays, hold a Bachelor's degree in Nautical Sciences, is qualified to work at operational level on board a ship of the Merchant Marine. Effective (maritime) communication, including use of the IMO SMCP, constitutes one of the principal learning outcomes of his or her training. A major challenge for the Maritime English instructor is to create or find material which facilitates the cadet's path to effective communication on board. The material has not only to promote learning of the specialised language, Maritime English, but has also to approximate reality on board the ship. It therefore has to be authentic. In addition and as already stated, a constructivist environment in which the maritime student manages his or her own learning process is desirable.

The maritime ChatBot developed within the framework of this project meets the above criteria. It offers a selection of content pertinent to the competencies described in STCW, namely IMO SMCP and use of English for communication on board. It caters for a cognitive and constructivist learning environment, in which the learner, working at his or her own pace, is able to interact with a maritime environment (SMCP, VHF communication in the fairway, medical emergency situations) and thus

build knowledge. The ChatBot transforms previously non-communicative, computer-assisted learning activities into communicative real-time simulations, thus achieving some degree of authenticity. Equally important is the element of entertainment provided by the ChatBot. The IMO SMCP are notoriously difficult to learn, especially for non-native speakers with only an intermediate level of English. Gustafsson [13] notes that *“the SMCP uses quite rare vocabulary items which are hardly likely to have been acquired at school”*. She describes the document as *“a commendable attempt at providing a collection of items for maritime communication in English”* but refers to its enormous volume, stating that *“the enterprise obviously grew too large to be of practical use for non-native speakers of English”*. Using state-of-the-art technology in the form of messaging (chatting) encourages learning, especially amongst a young, predominantly male, population and facilitates the acquisition of difficult content. In addition, the technology employed by the ChatBot provides students with instant feedback on their learning progress.

3. Design considerations of VTS-Bot exercises

The VTS-Bot is a ChatBot with various different options for the interlocutor. The name “VTS-Bot” was chosen to alert a message to the users to its objective, namely communication with, in particular, VTS stations. According to the SCTW this form of communication should take place using the IMO Standard Marine Communication Phrases. Committing these phrases to memory is not an end in itself, but a means to achieving an seamless and effective communication on board. Naming the ChatBot “VTS-Bot” sends a clear signal to the learner: using the SMCP is the way to communicate with the VTS. From there effective communication will spread to other areas of maritime interaction, such as ship-to-ship communication.

In total, three groups of exercises have been implemented which showcase the functionality of maritime ChatBot dialogues: SMCP training, a VTS radio dialogue for an approach to Tokyo Bay and communication in medical emergency cases. The SMCP training consists of three parts: the phrases, the glossary and the message markers. The Tokyo Bay Approach consists of three communicative situations with Tokyo Martis, the Uraga Channel Pilot and with Yokohama Port Radio (see 3.2 *Tokyo Bay Approach* and *Appendix 5: Tokyo Bay Approach Scenario and Communication Samples*). The Medical Emergency training consists of three different cases, called MediBot 1 to 3 (see 3.3 *The medical cases* and *Appendix 6: MediBot Communication Samples*).

Welcome Bot		
↓		
SMCP training	Medical emergency	Tokyo Bay Approach
<ul style="list-style-type: none"> • SMCP Message Markers • SMCP Glossary • SMCP Phrases 	<ul style="list-style-type: none"> • MediBot 1 • MediBot 2 • MediBot 3 	<ul style="list-style-type: none"> • (Tokyo Martis) • (Uraga Channel Pilot) • (Yokohama Port Radio)

3.1. SMCP training

The Standard Marine Communication Phrases consist of numerous phrases and the vocabulary used is vast; thus it is not an easy task to master it. Research demonstrates that learning the SMCP involves the time-consuming process of memorising a considerable amount of fixed phraseology while at the same time recognising the underlying system employed by the SMCP.

The ChatBot is a tool which facilitates practice of the SMCP including other maritime English phrases and vocabulary crucial for VHF communication. Although learning the SMCP demands time and input, it is to the benefit of seafarers. It is not possible for teachers of Maritime English to spend as much lecture time on drilling the phrases as ideally would be needed, especially if the learner's level of English when entering maritime education is relatively low. A lot of the practising must therefore take place in the learner's own time. However, motivating learners to put in the time required is difficult and the learner must be really determined to learn the SMCP alone. In order to overcome this obstacle new methods need to be developed. The initial concept of a maritime ChatBot thus aligns with the authors' experience that students are willing to spend substantial amounts of time working with computer-based learning programs. The ChatBot has been created with this in mind.

3.1.1. SMCP phrases

This exercise deals with the routine task of learning and retaining the compulsory Standard Marine Communication Phrases (SMCP). It may be misleading to use the term "this exercise", since this section of the SMCP option consists of more than one thousand different phrases with which the learner can work. The part could have been split into several different exercises, according to situational use of SMCP, but this was deemed unnecessary. Learners can repeat the exercise at will, and the likelihood that a learner feels that he is practising the same phrases again and again is very small. The number of randomly appearing phrases is, after all, 1,222!

The exercise has been designed as a "correct the false phrase" exercise. The ChatBot prompts the learner to replace incorrect terms with correct phrases or words according to the SMCP. For example, the Chatbot might produce the 'false' phrase "*Big berth is requested*". The learner should then correct the phrase with "*Wide berth requested*". As the example shows, care has been taken to create plausible alternatives to the correct phrases. Very long phrases from the SMCP were excluded and phrases that were too difficult or impossible to change in a suitable way were omitted. The number of omitted phrases was, however, relatively low. Six individuals worked with the phrases, ensuring variety in how the phrases were changed. The different language backgrounds of these individuals also added to the variety in a positive way. The two native speakers in the project guaranteed that the alternative 'false' phrases constituted reasonable alternatives.

From the learner's perspective several different learning outcomes are achieved when completing the exercise. The learner has demonstrated the ability to identify

- a specific phrase, enabling recognition of the phrase in e.g. a radio message;
- the structure of the phrase;
- the vocabulary in the phrase;
- the proximity of synonyms or closely-related words such as "big" and "wide";
- the pronunciation of the phrase.

In addition to the aforementioned, an especially important language skill is promoted by this exercise. This is the ability to change the strategy chosen when expressing a thought. Proficient language users possess this ability, whereby they anticipate the development of a linguistically problematic situation and consequently self-correct before running into difficulty.

Example: If one wants to express that a certain part of a fairway needs to be avoided due to salvage operations the following phrase might be used: “There has been an explosion in position Salvage operations in progress. Wide ... “

In the example the last phrase is cut short, due to the inability to recall the maritime term "berth". The speaker thus needs to change strategy and use another phrase such as "Keep clear of area." The alternative phrase, or strategy, may not necessarily originate from the SMCP since the word the person did not know – in this case “berth” – was an SMCP key word, but it is of course better to have an alternative strategy than not to! The SMCP exercise in the ChatBot helps the learner to broaden his or her register, in other words to create alternative strategies for communicating. In many cases the register will be broadened in terms of general English, e.g. “I need help”, to the SMCP "I require assistance". In the exercise many examples have been designed exactly to promote this, i.e. a Maritime English phrase has been re-written in more general English and the learner is then to produce the more exact maritime English phrase.

The exercise might, perhaps, be construed as too simple or, on the contrary, laborious, but completing it entails knowledge. Once a person becomes familiar with a phrase, s/he will recognize it when encountering the phrase. The context will then in many cases supply the extra-linguistic information needed to fully comprehend the phrase. The aforementioned phrase could e.g. be included in a series of messages forming a warning given by a VTS-unit as shown in the example below.

- Warning: Vessel on fire in position
- Information: Salvage operations in progress.
- Information/Advice: Wide berth requested.

The meaning of the phrase "Wide berth requested" is fairly obvious in the context. The learners can, when studying, also check the meaning themselves, or, alternatively, the meaning can be demonstrated, taught or tested in class. Figure 1 shows an example dialogue between the ChatBot and a user.

SMCP Phrases

Part A of the IMO SMCP contains phrases for mandatory use in external communications from ship to shore, shore to ship and ship to ship.

Task:

Replace the mistake embedded in the standard phrase with the correct SMCP word. Your score increases by 1 if you give only the correct word. It increases by 2 if you reproduce the full, correct SMCP.

To start this exercise you need a minimum score of 1 point.

SMCP Coach:	Welcome to the S M C P Phrases briefing.
Peter:	hello
SMCP Coach:	This exercise is a bit tricky. I will say a standard phrase which includes a wrong word and you repeat the phrase and replace the wrong word with the right word. Do you want me to give you an example?
Peter:	yes
SMCP Coach:	Okay, here it goes: I say: "Motor vessel Challenger needs assistance". The wrong word here is "need", so you have to say: "Motor vessel Challenger requires assistance". Right?
Peter:	yes, this is correct
SMCP Coach:	So, let's start the exercise now, Peter.
Peter:	yes
SMCP Coach:	Adjust the radar to true-motion north-up.
Peter:	ok
SMCP Coach:	The I M O is not happy with that phrase. The correct phrase is: "Change the radar to true-motion north-up". Area: "Pilot on bridge. A2/3.3. Radar"
Peter:	Ok
SMCP Coach:	Aircraft ETA at twelve hours UTC to help in search.
Peter:	Aircraft ETA at twelve hours UTC to assist in search
SMCP Coach:	Good job with this phrase! "Aircraft ETA at twelve hours UTC to assist in search". That'll give you another point or two, your score is now 4 points.
Peter:	ok
SMCP Coach:	I need the pilot card.
Peter:	I want the pilot card
SMCP Coach:	I am sure you can do better Peter. The correct phrase is: "I require the pilot card". Area: "Pilot on bridge. A2/3.1. Manoeuvring"

Fig 1: SMCP phrases exercise example

3.1.2. SMCP Glossary

The SMCP Glossary is an integral part of the Standard Marine Communication Phrases. It “includes a limited number of technical terms which do not appear in the text of the IMO SMCP, but might be useful in case the content of a given standard Phrase requires modification” [14]. Based on the 168 terms included in the SMCP Glossary, a total of 652 ChatBot volleys (communication exchanges) have been developed. A number of exercises ask the user to provide the correct term for a given Glossary definition. In other dialogues, the ChatBot asks the user to state if a given definition for a specific term is correct or false. The latter may seem to be a rather simple exercise but given the complexity of the definitions, the user has to listen to the computer output and/or read it very carefully to determine whether the definition contains a mistake or not.

Figure 2 delivers an overview of the question types and the chatty type of communication the computer dialogue system encourages.

SMCP Glossary

The SMCP glossary includes a limited number of technical terms which do not appear in the text of the IMO SMCP, but might be useful in case the content of a given standard phrase requires modification.

Task:

Answer the questions. Some questions may be answered simply by yes or no. Others require a short written answer.

To start this exercise you need a minimum score of 1 point.

SMCP Coach:	Welcome to the S M C P Glossary exercises, Peter.
Peter:	Hello
SMCP Coach:	Your score is now 4 points. Your score is high enough to start with this exercise.
Peter:	ok
SMCP Coach:	Here, you simply answer the questions by saying "yes" or "no" or by explaining the correct Glossary term. You will get one point for each correct answer.
Peter:	ok
SMCP Coach:	Let's start then with the first Glossary item: Is "oil clearance" an area devoid of oil spill or leakage?
Peter:	yes
SMCP Coach:	Nice try, but... No, oil clearance is oil skimming from the surface of the water.
Peter:	ok
SMCP Coach:	Is a restricted area a deck, space, area, et cetera?
Peter:	it is
SMCP Coach:	That response is for seafarers. Nice! Your score continues rising, up to 5 points.
Peter:	ok
SMCP Coach:	Does "T S S" mean Traffic Separation Schedule, a routing measure aimed at the separation of opposing streams of traffic by appropriate means and by the establishment of traffic lanes?
Peter:	no, it does not
SMCP Coach:	Good job with this answer! You'll receive another point, so in total 6 points.

Fig 2: SMCP phrases exercise example

3.1.3. SMCP Message markers

This exercise focuses on the use of the so-called message markers and the compulsory spelling of ship names using the international spelling alphabet.

The SMCP puts a lot of emphasis on the so-called Message Markers. The idea is that the receiver will immediately recognise the purpose of a message from the marker, as when a seafarer hears the distress call "MAYDAY". When receiving a MAYDAY call, all seafarers know what the content of the subsequent message will be. Message Markers work in the same way: the marker "Question:" is followed by a question, the marker "Warning" by a warning and so on. The usage of message markers follows a certain logic described in the SMCP. A warning for example is to be transmitted to vessels in immediate danger. Thus it would not be acceptable, for example, to communicate a warning to a

vessel not in the vicinity of the area where salvage operations are in progress (see aforementioned scenario). It could be given as information, for example in a situation where a vessel could clearly see the smoke from an explosion or similar. Another example is the usage of the marker 'Advice'. It is used when the sender wants to influence a vessel (see Example 2a below). If the sender has no intention of influencing the vessel, the marker should not be used (see Example 2b below).

Example 2a: Vessel in danger of grounding is warned and given advice

Warning: shallow water ahead of you.

Advice: alter course to starboard immediately.

Example 2b: Vessel approaching a TSS is informed about the situation

Information: you are entering a TSS.

Information: course of reference line is 255 degrees.

The information is of course advisory in its character, but the function is more comparable to providing a service than to controlling the traffic.

The training in this exercise is done by selecting the correct Message Marker for a given phrase. The ChatBot gives an SMCP standard phrase, and the learner must then choose and reply with the correct Message Marker. The learner thus practises the phrases as well as the usage of the Message Markers. The ChatBot not only assists the learner with the Message Markers, but it also underpins comprehension of the underlying intention of the message in the phrases. In many cases two or even more message markers can be used in the same situation. This had to be taken into consideration when programming the ChatBot, i.e. when feeding the correct values.

The exercise with the Message Markers thus makes the learner drill the phrases and, at the same time, learn to combine the correct marker with a message. Using markers in radio communication makes it easier to understand the content of a message.

The following dialogue example (Figure 3) displays a conversation log of a user in the Message Markers exercise.

SMCP Message Markers

The SMCP message markers make it easier for others to understand during radio communication. There are eight message markers. These indicate the type of message that follows. Click on this link for more information about the message markers.

Task:

Give the best message marker for each phrase.

To start this exercise you need a minimum score of 1 point.

SMCP Coach: Welcome to the S M C P Markers exercises, Peter.

Peter: hello

SMCP Coach: Your score is currently 1 points. Your score is high enough to start with this exercise.

Peter: good

SMCP Coach: Here, you simply answer the questions by giving the correct marker. You will get one point for each correct answer.

Peter: I will

SMCP Coach: Would you like me to introduce the concepts of markers first?

Peter: no

SMCP Coach: Good, we'll start with an easy exercise. I'll use a phrase and give you a choice of two possible markers. You tell me which one is correct.

Peter: ok

SMCP Coach: Let's start then with the first item: What kind of assistance is required? Is this a Question or an Information?

Peter: This is a question

SMCP Coach: Yes, this is correct, but this was an easy one, of course. Question. What kind of assistance is required? Your score is now 2 points.

Peter: ok

SMCP Coach: I intend to overtake you on your port side. Is this an Intention or an Information?

Peter: this is an information

SMCP Coach: Oh, come on, Peter, how can this be an information if the phrase includes the word INTEND? The correct answer is: Intention. I intend to overtake you on your port side.

Fig 3: Message markers exercise example

3.2 Tokyo Bay Approach

The Tokyo Bay Approach simulates an entry to Tokyo Bay via the Uruga Traffic Route and involves VHF radio communication with Tokyo Martis (Uruga transit), Uruga Channel Pilot (pilot arrangement), and Yokohama Port Radio (berthing instructions). Taking full advantage of the interactive nature of ChatBot, students can practise standard communication with shore-side stations using the SMCP. The exercise involves reporting ETAs at the channel entrance, pilot station, and harbour entrance and receiving information about queuing, pilot boarding arrangement, harbour traffic, etc.

The Tokyo Bay Approach is designed to help Maritime English learners practise ship-to-shore communications as they enter Yokohama Port after passing through the Uruga Traffic Route. The user

is given his/her own ship name and her particulars as well as the time entering the Uraga Traffic Route, the time picking up the pilot, her anchorage, and berth (see below.)

The user is instructed to refer to the Tokyo Martis User Manual, available on the Internet in order to learn the navigation rules and reporting procedures in the area.

(http://www6.kaiho.mlit.go.jp/tokyowan/others/tokyo_guide/tebiki_en/userguide.pdf)

Also available to the user is the port entry manual prepared by the Port of Yokohama, which shows all the berth names, reporting procedures and navigation rules in the port.

(<http://www.city.yokohama.lg.jp/kowan/business/business-support/manyuaru/tebiki201512-english.pdf#search='yokohama+port++anchorage+Y2'>)

Vessel Name	Josco Lily
Call Sign	VRBZ7
Flag State	Hong Kong
Gross Tonnage	9890 grt
LOA	142.7 m
Beam	22.6 m
Draft Forward	7.3 m
Draft Aft	7.4 m
Destination	Yokohama
Anchorage	Y2
Berth	Honmoku C7
ETA at Uraga Pilot Station	1730 (reported to Tokyo Martis and Uraga Channel Pilot)
ETA at Uraga Center #1 buoy	1745 (reported to Tokyo Martis)
Pilot boarding time the morning	After 0830
ETA at Yokohama Passage	0900

From English teachers' perspective, these manuals constitute highly practical reading materials for skimming, as the learners must find out, for example, whether they should take a pilot, use a particular passage/route, what radio station to contact, etc.

This ChatBot consists of three exercises, reflecting what ships entering Tokyo Bay must do. First, the vessel contacts Uraga Channel Pilot for picking up a pilot at the pilot station, which is located south of the traffic route entrance. The next step is to call Tokyo Martis in position 10 miles south of the US line (position reporting line) as required by Tokyo Martis and report her ETA at Uraga Center #1 buoy, which is at the southern entrance of the Uraga Traffic Route. The third and final part is to contact Yokohama Port Radio and inform her ETA at Y2 anchorage.

When contacting the three stations, learners can practise the standard VTS procedures set forth in the SMCP. The contents of the communication are highly standard at present. Uraga Channel Pilot confirms the ETA, requests the pilot ladder arrangement and the boarding speed. Tokyo Martis confirms the time entering the Uraga Traffic Route, provides the queuing information, asks for the intended route to the destination, and questions if the vessel is getting alongside directly or anchoring. Yokohama Port Radio, after obtaining the ETA, asks arrival drafts, and informs the pilot boarding time next morning, since the vessel is going to anchor and wait, and the queuing information at that time. Yokohama Port Radio also relays a message from the pilot to wait for him with the anchor cable at short stay, and further requests the vessel to call again before letting go the anchor to check the anchor position. (For Tokyo Bay Approach exchange samples, see *Appendix 5: Tokyo Bay Approach Scenario and Communication Samples*).

For advanced learners, of course, one can “inject” more challenges such as a VTS operator reminding that there is a risk of collision, or fishing nets completely blocking the traffic route, etc. but as the first exercise after going over the SMCP, what we have currently set up will be sufficient. Knowing the radio procedure and correct SMCP phrases is one thing, but actually using them is quite another, and the VTS-Bot is an ideal learning tool for doing this repeatedly on one’s own.

Another advantage of the ChatBot technology is that the learners can either listen to or read messages from these stations, and even foreign accents can be introduced to the computer generated speech sounds. VTS operators always speak with their own accents, and sometimes this can be a challenge. Obviously, the ChatBot cannot produce all kinds of foreign accented English, but nonetheless, it can be used to remind our learners that accents can impair successful communication. The ChatBot can also be a good evaluation tool since we can save whatever the user types or record what they say in a realistic communicative situation.

3.3 The medical cases

Apart from distress situations, additional medical emergencies can arise when vessels need assistance. With this in mind the MediBot is designed to help Maritime English learners practise medical emergency communications using the ChatBot technology. The user is assumed to be on the bridge and receives a report, over the radio or telephone, on a medical emergency that has taken place somewhere else on board. The vessel is in port at anchor, and it is also assumed that the port radio station knows her position. The user, after finding out what has happened and the condition of the patient(s), must report the medical emergency to the port agency and ask for hospital transfer.

Although medical emergencies do not occur very frequently, they do take place, and once they do, they require effective on-board and ship-to-shore communications. There are many factors that could hinder successful medical emergency communication and we have included those challenges in the exercise.

In an emergency people panic, and in order to obtain accurate information on the nature of the medical emergency, one may need to apply appropriate communication skills. Lack of sufficient medical vocabulary could be fatal. As the learner goes through the MediBot, he or she can learn all of these without actually hurting anyone, leading to a full realisation of the importance of medical emergency communication in real-life situations, should some medical incident occur.

Another challenge in ship-to-shore communication is that a ship officer may have a good command of English but the shore party may be limited in their knowledge of English. In such cases, especially in a medical emergency, one has to do one’s best so that a communication failure or delay does not lead to a loss of life. Thus, we have deliberately introduced cases where the shore party does not understand a

key medical term or phrases and the user must somehow make the message understood, by using simpler words or phrases or spelling important words.

We now have three cases incorporated in the MediBot. Case 1 involves a life boat accident that has taken place as its onload release mechanism is being tested. The boat is released when it is too high from the water, and the fall has broken the backbone of a crew member in the boat. In case 2, someone is hit by a wave and knocked unconscious with a deep cut in his thigh. Case 3 involves an explosion in the engine room while igniting the auxiliary boiler and a crew member is severely burned. (For further details and MediBot samples, see *Appendix 6: MediBot Communication Samples*).

For novice or intermediate learners, the MediBot should be used after introducing key medical terms and expressions. This could be done by way of a download of a worksheet or standard form for gathering and supplying medical information, listing the facts to be determined. The learner then is forced to act both as the radio medical expert, and as the person requesting medical advice. Being forced to think as the medical expert is beneficial for the learner since it prepares him or her for the way the expert might reason; thus the learner must try to reason according to the expert's logic.

For advanced learners, the MediBot can be assigned after going over medical cases that appear in accident reports, for example, those offered by the Marine Accident Investigation Branch (<https://www.gov.uk/maib-reports>). In so doing, cadets will inevitably realize serious accidents do take place. People fall from an open hatch cover into a hold, enter enclosed spaces and faint, get their fingers and hands amputated, get caught in a hawser bite, have their hands penetrated by squirting pressurized hydraulic oil, get hit by a parted line, etc. This will make them cautious as mariners should be on board.

The learning outcomes of the medical case exercises are manifold. The learner can internalize

- vocabulary needed in medical consultations
- the structure of a medical consultation
- how to elicit crucial information in a concise way
- how to supply crucial information

4. Sharing project outcomes on the Internet

In order to give students an unlimited access to the exercises developed in the VTS-Bot project, a dedicated Internet site has been installed. For interested teachers and researchers the project homepage of Jade University of Applied Sciences lists relevant details of the research project.

4.1 Exercises homepage

The exercises developed in the framework of the VTS-Bot research project have been made available permanently and free of charge on the Internet at www.smcpeexamples.com/ChatBot (see *Figure 4: Screenshot of VTS-Bot Internet start page*). The [smcpeexamples.com](http://www.smcpeexamples.com) Internet page is dedicated to self-learning activities and e-learning exercises of the Standard Marine Communication Phrases (SMCP) and is co-authored by the co-ordinating researcher. It can be displayed on computers and mobile devices such as tablets and smart phones.

All VTS-Bot scenarios provide students with an introductory text which contains a brief description followed by the task of the exercise. In some exercises, additional material is provided as pdf files or as links to other Internet sites (e.g. to the official IMO SMCP document).

Students have the option to display the exercise text and to activate a computer-generated speech output. By activating or deactivating the text and/or speech output learners can improve their reading

and/or listening competencies. Reading and listening to the exercises simultaneously aims at improving comprehension through pronunciation issues for students who have primarily studied the English language by reading and writing it. By deactivating the text output and using the speech output only, students can increase the difficulty of the exercises, as they have to concentrate on the auditory information without being able to refer to the written text. Should this mode prove too difficult for individual students, they can re-activate the text output and check their listening comprehension by reading the logged computer output.

All student input is recorded and stored in a dedicated database. The empirical information gathered from the students' self-learning activities will be used by the research team to continue improving the VTS-Bot scenarios after completion of the research project. Real communicative acts by students will be analysed and suitable responses created for a more natural response by the computer dialogue system.

4.2 Project homepage

Further to the VTS-Bot exercise homepage, the co-ordinating university maintains a webpage dedicated to the VTS-Bot research project itself (see <https://www.jade-hs.de/en/departments/maritime-and-logistics-studies/research/vts-bot/>). This Internet page includes details on the project objectives, its innovation and originality and the project partners. It also lists all publications in relation to the VTS-Bot project.

Maritime English ChatBot

The Chatbot exercises have been developed within the **VTS-BOT project**, for the analysis and implementation of a student-centred learning approach by using a chatbot computer programme to provide for an outcome-based maritime communication training. The project is funded by the **International Association of Maritime Universities (IAMU)** and **The Nippon Foundation**.

The project partners are **Jade University of Applied Sciences** (Peter John, Sylvia Beshar), **Tokyo University of Marine Science and Technology** (Naoyuki Takagi), **Antwerp Maritime Academy** (Alison Noble), **Novia University of Applied Sciences** (Peter Björkroth), **Australian Maritime College** (Ben Brooks). Publications related to the project are available [here](#).

Follow us on ResearchGate: [Peter John](#), [Alison Noble](#), [Peter Björkroth](#), [Ben Brooks](#).

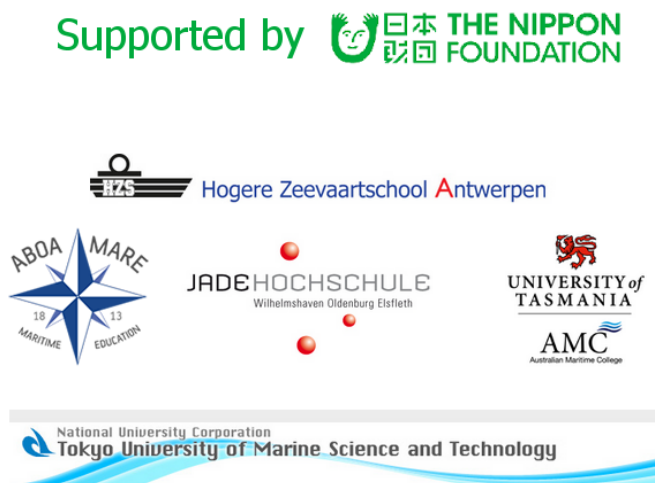


Fig 4: Screenshot of VTS-Bot Internet start page

5. Bachelor's thesis at Jade University of Applied Sciences

While validating the designed scenarios with participating students, a student volunteered to write a Bachelor's thesis on ChatBot programmes for maritime communication training. This thesis was written in the winter semester of 2015/16 with the aim to design a suitable exercise for training bridge team communication in an emergency situation.

The scenario involves a shipmaster coming to a ship's bridge well after the watch handover time. He finds the officer of the previous watch still performing his duties on the bridge and asks for the watch handover. The shipmaster is informed that the relieving officer has not shown up and the officer who is still on watch is too fatigued to have called for assistance. Together they initiate a roll call and have the crew search for the disappeared officer.

The Bachelor's thesis shows that the ChatBot technology is very appealing to students. Upon completion of the research project, active student involvement in writing new scenarios may enrich the existing exercises whilst delivering learning materials deemed important by the students themselves. The design phase of a ChatBot scenario itself will serve as a useful exercise as different

communication scenarios have to be considered and alternative ways of interacting with other crew members have to be studied.

6. Evaluation of learning and teaching experience

In order to assess the ChatBot learning tool from a number of different user groups, the ChatBot was presented at two conference workshops, and trialled with a group of students participating in a Maritime English course. In the design of any technology, the aim of the designer is to make their design *usable*. This concept of usability has also been a focus for the ChatBot, and the team followed the only example of this process that has been implemented in the maritime domain – the Human-Centred Design (HCD) and Software Quality Assurance Guideline for E-navigation (MSC.1/Circ.1512) developed by the International Maritime Organisation [15]. Although this is a learning tool, not a navigational aid, the process is generic and can be applied to any design activity. The results indicate that the majority of those surveyed considered that the ChatBot is relatively easy to *walk-up and use*, and a valuable pedagogical tool. Other results, and some suggestions for the improvement of this innovative learning tool are indicated below.

6.1 Assessing Usability

The concept of usability can be traced through a series of transitions in focus from semantics, to features and operations [16]. As the concept emerged in the 1970s it was associated with terms such as user friendliness and ease of use, rather than a formal definition as such.

The term *user-friendly* is widespread in the maritime domain, being present both in regulatory documents and in operators' jargon. Nielsen [17] has previously argued that the term "user friendly" is not appropriate because it is unnecessarily anthropomorphic (users must get the job done without the need for machines being friendly to them), and because it implies that the relationship between users and the system used can be described in terms of a single parameter.

The feature-based approach (popular in the 1980s) defines usability in terms of the presence or absence of desirable features of the user interface. Its weakness is represented by the assumption that usability is part of a specific interface, and not an independent construct. With the operations-based approach (starting in the 1990s) usability is defined in terms of task performance and user satisfaction, taking into account operational contexts.

Shackel and Richardson [18] provided one of the first modern definitions of usability of an interactive system: "*the capability in human functional terms to be used easily and effectively by the specified range of users, given specified training and user support, to fulfil the specified range of tasks, within the specified range of environmental scenarios*" (p.10). Similarly, ISO 9241-11 [19], which defines usability as "*the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction*". In his seminal book "Usability engineering", Nielsen [11] frames usability within the broader concept of system acceptability, which refers to whether the system is good enough to satisfy all the needs of the users and of the organizations to which they belong.

Efficiency, Effectiveness and User-Satisfaction have been retained as key usability concepts in the maritime domain. For the ChatBot this means that the tool should make the task of delivering the associated training more efficient than current approaches (*efficiency*), should be able to deliver on the associated learning outcomes (*effective*) and should leave the user with an experience that is generally free from negative experience (*satisfaction*). In order to deliver *usable* systems or tools it is necessary

to follow a design process sympathetic to these principles. Given that usability in this context is all about the interaction of humans with technology, that process has been referred to as Human-Centred Design (HCD).

“The basic premise of HCD is that systems are designed to suit the characteristics of intended users and the tasks they perform, rather than requiring users to adapt to a system. UT [Usability Testing] is a key component of HCD and uses methods that rely on including users to test the ability of systems to support user needs. UT helps to identify potential problems and solutions during design and development stages by using an iterative approach to testing where the design evolves through rounds of prototyping, testing, analysing, refining and testing again” [x].

The HCD process is described in the figure below. The current chapter does not report on the early stages such as concept development, planning and analysis or the design – which can be found in earlier sections of this report. This section focuses on Stage 4: Integration and Testing.

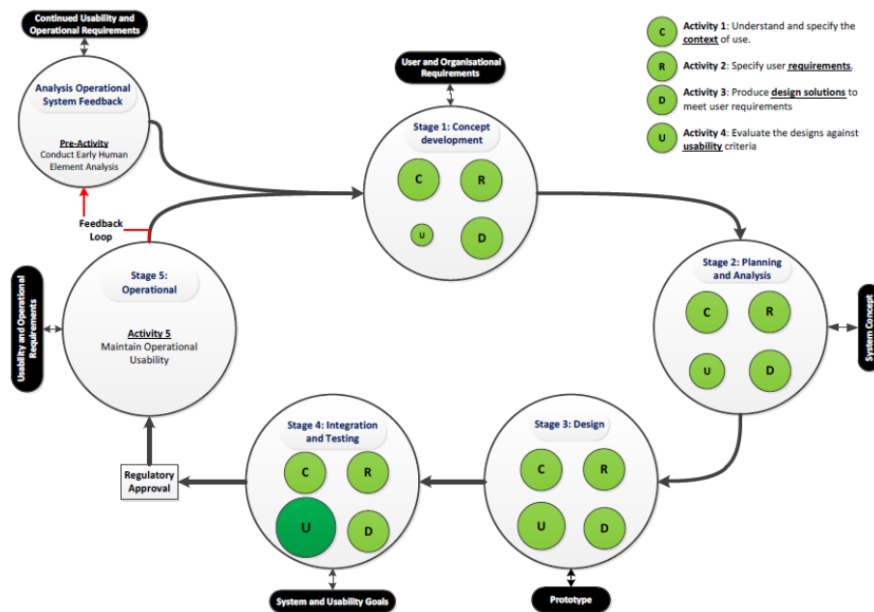


Fig 5: Human-Centred Design

Activity 4 is the basis on which Usability Testing (UT) is carried out as appropriate to the particular stage in the life cycle. The evaluation of the design against usability criteria should be conducted before a system is deployed operationally and should, as a minimum, employ test participants who are representative of user groups.

Planning the UT involves:

- selecting scenarios and test cases;
- identifying and recruiting testing participants;
- choosing methods, techniques and documentation for collecting and analysing data; and
- determining acceptance criteria.

6.2 Method

6.2.1 Participants

Firstly, the VTS-BOT was presented at the International Maritime English Conference (IMEC27) held in Malaysia in 2015. The tool was also presented at the International Association of Maritime Universities (IAMU) Annual General Assembly in Croatia in 2015. The aim of the testing at this stage of development was therefore to focus on the *teacher-as-user*. Although they are not the end-users, the maritime English lecturer is the person likely to initiate the use of the ChatBot by students. In this regard if the teachers did not consider the ChatBot useful, it would not be integrated into the curriculum and usability for the end-user is moot at this point.

Subsequently, the VTS-Bot was presented to a group of students studying at the Maritime Faculty of Jade University under the direction of the co-ordinating researcher of the current project. These represented the VTS-Bot's 'end users'.

6.2.2 Procedure

For all groups the process was the same. Participants viewed a presentation of the VTS-Bot, were able to log on and interact with the VTS-Bot and then completed a questionnaire. The questionnaire contained responses about context of use issues as well as perceptions of usability. Given that student use is in a slightly different context to teachers, the questions were frames to accommodate this difference.

The surveys can be found in Appendix 4: Survey questionnaire.

6.3 Results

Both the IMEC and the IAMU AGA provided a useful insight into users' technical knowledge and their use of the ChatBot exercises.

6.3.1 IMEC and IAMU Surveys

In total we received 23 responses at IMEC and 17 at IAMU. The results are summarized below:

- 90% of participants from the 2 conferences enjoyed using the VTS-BOT.
- 91% of participants found the VTS-BOT easy to use even though only 66% of participants considered themselves to be very or somewhat 'technologically-savvy'.
- 92% of the participants mentioned their students would have access to the technology necessary to use the ChatBot.
- 91% would encourage their students to use the VTS-Bot as a learning tool.
- 97% responded 'yes' to the statement "In general, do you think that the ChatBot will enhance usage of the IMO SMCP and Maritime English in general at sea?"

Opportunities for improvement were also identified during these interactions. 70% of participants thought that there should be more instruction for teachers to assist with the use of the ChatBot. 81% thought that additional exercises could be created for specific sections of the IMO SMCP and 72% thought that it would help if the ChatBot were divided into different sections according to the IMO SMCP.

These results are extremely positive for an educational tool in the early stages of development and provided both a validation for the tool as well as opportunities for its improvement. In any technology design the interaction with end-users, and from this an understanding of the context of use, is important to develop a product with high levels of usability.

6.3.2 Student Surveys

Key questions were associated with usability related to ease of use, desire for more exercises (an indication of effectiveness) and enjoyment (a measure of satisfaction). Students were also asked about how ‘technologically ‘savvy’ they were (a measure to assess perceptions of digital literacy), whether they have access to the appropriate technology to use the ChatBot, and for feedback on how to improve the ChatBot.

Question	Mean	St.Dev
(From Yes, very much =1; Yes, quite =2; No, not very much =3; No, not at all =4)		
Did you find the ChatBot easy to use	1.89	0.79
Did you enjoy using the Cha-Bot?	1.65	0.70
Do you consider yourself a technologically ‘savvy’ individual	1.96	0.70

These results indicate that students, on average, find the ChatBot quite easy to use and enjoy using the ChatBot. They consider themselves quite ‘technologically savvy’ and therefore have a reasonably high level of perceived digital literacy.

Question	% YES	% NO
Do you have access to the appropriate technology in order to use ChatBot.	96.4	3.6
Would you like to have more ChatBot exercises as a learning tool?	88.9	11.1
In general, do you think you the ChatBot will enhance your English language skills?	80.8	19.2

Access to Internet services can be an issue for seafarers, however it was not a significant issue for the vast majority of the surveyed students. The students indicated they would like to have more exercises using the ChatBot and generally thought it would enhance their English language skills. The final result here needs to be considered in the context of current language proficiency. Some students in the sample could already be considered of a high level of English language proficiency, and therefore the opportunity to improve language skills is necessarily lower than the opportunity for those students who are less proficient. These results remain extremely positive for a first version of a learning tool. Students did identify opportunities for improvement such as:

- Providing more direction to the student before commencing use of the ChatBot.
- The ChatBot could be smarter!
- Real-time identification if errors are made in writing words.

Students were also asked which other areas of language communication could be covered in ChatBot exercises. Their responses included:

- Job interviews;
- Telephone and radio calls;
- Booking ships or wrong cargoes on the ship;
- Short email ‘conversations’.

6.4 Conclusions

The results presented in this chapter clearly suggest that the ChatBot is consistent with the fundamental elements of usability. Maritime English language educators, researchers and students all consider the ChatBot to be efficient and effective and are satisfied following use. They generally have the digital literacy and the access to information technology necessary for use of the ChatBot. Usability testing is not just a process of validation, however, but also an opportunity for improvement. In this regard all three groups have offered valuable suggestions for improvement of the ChatBot which will be integrated into future iterations of the learning tool.

7. Discussion

The advantages of using the VTS-Bot in teaching can be discussed and described from different points of view. We will begin by discussing how the proficiency level of the learner gives an idea about the advantages of the ChatBot. After that we will briefly consider the typical obstacles to language learning that seafarers encounter. Finally we will discuss general related issues, such as the gaming industry.

7.1. Proficiency Level

Maritime English learners can be divided into different groups according to their proficiency. There are many different ways to describe different learners and referring to proficiency is not the only way. However, most Maritime English teachers will recognise the following way of grouping learners:

- Group 1. Native speakers of English and near-native speakers
- Group 2. Proficient or advanced level of (Maritime) English
- Group 3. Intermediate level of (Maritime) English
- Group 4. Elementary level of English

It is possible that learners have a fairly good command of English without knowing the SMCP and in some cases learners may know a lot of SMCP without having a good command of standard English, but it can be assumed that the different groups have some common needs when it comes to learning the SMCP. Moreover, the groups clearly have different needs when it comes to practising Maritime English. For teachers the different levels of proficiency constitute different kinds of challenges.

Group 1

For the near-native or native speaker, learning the SMCP can be frustrating for several reasons. Firstly, the phrases do not always follow the normal structure of the English language and the Group 1 learner might experience conflicting feeling when learning a kind of English that, in his mind, is not grammatically correct. Secondly, s/he might be convinced that the phrase is "wrong", that a particular phrase would never be used, or that a synonym would be a better choice. Finally s/he could experience frustration over having to produce shorter sentences without, for example, subordinate clauses or conjunctions. Other similar issues might arise for the learners in this group, but these examples already offer an idea about why for this group learning the SMCP in class is difficult. Teaching this group is correspondingly challenging. A Maritime English teacher might spend a lot of lecture time discussing all the aforementioned issues. This is not necessarily a bad thing, but the discussions are hardly fruitful. Changing a phrase or set of phrases established by the International Maritime Organization would be a very long process indeed!

Another issue worth considering is related to groups where the level of English is relatively high. For these groups the teacher will probably have a lecture plan covering a greater range of topics, perhaps more difficult, but the learners still have to know the SMCP and be assessed on their knowledge. These more demanding Maritime English requirements could even be included in the curriculum and thus be part of the official course. Lecture time has to be allocated also for this, and lecture time is not always sufficient.

For this group of learners the ChatBot offers the opportunity to practise the phrases without having to spend time in class doing it. The ChatBot makes it possible for the teacher to tell the students to practise on their own, something that s/he might hesitate to do if the only method for the learner was to read the phrases and learn them by heart. The ChatBot thus also enables the teacher to use lecture time on other issues rather than use precious time 'haggling' over whether a phrase is correct or not.

Group 2

Many of the characteristics of Group one are reflected in Group two. Here the need to spend time on more difficult issues in class is greater and the extra time the ChatBot frees up for the teacher is an important resource for learning. Learners in Group two could be characterized as also having a lower command of the vocabulary in the SMCP. Thus they would need to learn new vocabulary when learning the phrases, and to practise it. It goes without saying that different students have different needs when it comes to how much they need to practise new skills. The ChatBot allows the students to spend as much time practising the phrases as they like. Vocabulary is probably easier to learn when it is in a context - in a phrase - rather than as single separate words.

Group 3

Learners in Group three can be characterized by experiencing difficulty with the structure in the phrases and, more especially, with the vocabulary. The vocabulary is vast and the phrases do not consist of the most frequent words in English, c.f. 'require' (SMCP) vs 'need' (general English). It is therefore likely that the learner in this group will encounter many words s/he has not used before. Therefore the vocabulary-introducing feature is emphasized more in Groups three and four than in Groups one and two.

For learners for whom language structure is also difficult, the SMCP phrases presented in the ChatBot provide the opportunity to learn at least some structures. The phrases will be learned without necessarily understanding the structure in them, but knowing the phrases will support language proficiency also on a structural level.

Group 4

A group with students who have a low level of General English (and therefore also of Maritime English) is a challenge for the Maritime English teacher. A lot of time must be spent on the SMCP in class and still the students might not learn enough. It goes without saying that students need to practise a lot on their own and as has been described it can be difficult to motivate the students to practise phrases only by reading. The exercises provided by the ChatBot will keep them motivated longer.

It will also be possible for the learner to keep on practising and learning the phrases by heart. Whether the student has "learned" a phrase or not, if s/he is only able to repeat it without understanding, is doubtful, but at least s/he knows the phrase. The meaning can be explained in class in less time than it takes to teach and learn a particular phrase. It is also possible to use the ChatBot in class when the meaning of a particular phrase can be explained immediately.

It can thus be said that the ChatBot offers different elements to different learners, depending on the latter's starting level. All features are of course available to all users, but the value may be described as a continuum. One end of it consists of repetition and drilling of phrases and structures that the learner either knows or learns quickly, while the other end provides new information in the form of language structure and vocabulary. All learners benefit from all of these features, but there is probably a difference in degree: a native speaker will not learn as much new vocabulary as a beginner.

More Advanced Levels	Repetition And Drilling = > Vocabulary and Structure
Group 1	X
Group 2	X
Intermediate & Beginners' Levels	Repetition And Drilling < = Vocabulary and Structure
Group 3	X
Group 4	X
<i>X = Where the greatest advantage of the ChatBot from the learner's point of view lies</i>	

Fig 6: Advantages of ChatBot technology for different learner groups

7.2. Seafarers and language learning

Learning to speak a language is different to, for example, learning to operate radio equipment. A GMDSS course can be realized during two intense weeks after which the learner has the knowledge and skills needed to operate the equipment and to obtain the required certificate. Seafarers can therefore participate in these courses and acquire the necessary skills during their leave from the vessel. This is not possible when it comes to learning Maritime English. Learning a language is a cumulative process and takes time. It is simply not possible for seafarers to stay ashore for a long enough time to learn or improve their language skills. Languages should thus be also studied while on board.

As was discussed in the passages concerning the SMCP, it can be very challenging to study a language on one's own, without the 'carrots' or 'sticks' wielded by a teacher. Other methods are needed, and the ChatBot is one such method. Apart from the pedagogical advantages discussed in earlier parts of this paper, economical aspects can also be considered. The ChatBot is a suitable tool for Open and Distance Learning (ODL). ODL enables students to study in their own time and without geographical

limitations. Under optimal circumstances students can study on board with or without an Internet connection.

The relatively poor English skills of seafarers from certain parts of the world have often been mentioned as a stumbling stone to maritime progress. English is both the *lingua franca* on board and the language of command. It is a sad fact that many capable seafarers might find their careers at a standstill, because they cannot master the language used on vessels with multilingual crews. This fact is of course more of a personal misfortune for the seafarer in question, but for the crew at large language skills are also an important safety factor. The ChatBot now offers the possibility to increase safety at sea in an economically sustainable way, also facilitating English learning to seafarers from countries where the onboard periods are a lot longer than their time ashore.

In practice the studying could proceed as follows: since the SMCP (part A) is required to obtain an operational level CoC, in practice seafarers with a lower CoC will benefit from the ChatBot. They can study the SMCP while at work as ratings, or while they study for higher CoCs. When they then do their studies for watchkeeping officer or watchkeeping engineer (operational level), the English teaching can focus on other, more advanced things. This underpins their careers. In addition seafarers with higher CoCs also benefit from the ChatBot. It is for example a useful tool for officers who would like to move from vessels in more domestic traffic to vessels in international traffic. For example, it can be very important to learn how to pronounce the phrases and to understand the phrases when they are used on the radio. The computer-generated speech makes this possible. The pronunciation so far is only standard English and different accents or dialects cannot be generated, but in the future this will also be possible. There are numerous possibilities for further development of the ChatBot.

7.3. Reflections on the future of language learning

With technological advances the nature of learning changes. A trend that cannot be denied is the extensive use of smartphones. This trend is seen all over the world, among rich and poor, old and young, and cannot be ignored in an educational context. Another trend, adjacent to the usage of smartphones is edutainment⁸. Smartphones are used extensively for education and even though we do not always recognise it as such, these products constitute entertainment. For example it would not be surprising if the Angry Birds games were to be used for teaching trajectories for e.g. artillery soldiers, if not for doing exact calculations, then for visualizing and giving an understanding about a phenomenon such as gravity.

The line between education and entertainment is starting to blur. One example is Fun Academy Ltd (<http://www.funlearning.com>), a spin off company from Rovio, best-known for the Angry Birds games. Fun Academy Ltd produces games that enable learning. The products may still be for younger learners only, but when they grow up, they will not be particularly used to studying and learning in "the old way". It is therefore important also for the maritime field to develop modern teaching methods. Using the possibilities ITC offers is one way of doing it. Fun Academy produces material in collaboration with, amongst others, NASA, National Geographic, CERN and the University of Helsinki and the material should thus not be considered too light, childish or somehow "wrong". This is also the reason why it is important for MET establishments to take part in these developments. It is important to produce high quality edutainment, otherwise the material will not be of use and could even, in the worst case, be harmful for learning. The ChatBot may perhaps not be classified as edutainment, but it utilises technology that moves in that direction.

⁸ *Edutainment* as opposed to *entertainment* refers to the use of computer games, television programmes or similar intended to be both educational and entertaining.

It is not only the technology of the ChatBot that can be said to be getting closer to edutainment. The underlying ideas behind the MediBot, for example, are close to edutainment. As described earlier, the idea behind the MediBot was among other things to elicit crucial information about a particular case in order to solve it. This is similar to the game "Escape Room" where groups of people are locked into a room and have to solve problems (elicit information) in order to get out (solve the case). As humans we seem to be keen on solving mysteries and out-smarting a computer or someone who has created an intellectual challenge for us. It is -reasonable to say that the ChatBot is a step in this direction.

The ChatBot and similar concepts are thus a means to satisfy the needs and wishes of present, and especially future learners. The ChatBot answers to the challenges of edutainment as well as to the challenges of open and distance learning. Maritime English learning and teaching should accommodate future learners, on their smartphones or PCs, wherever they are, whenever they are ready.

8. Limitation of this research

The research is subject to several limitations that are worth mentioning.

The first relates to the lack of a systematic evaluation of the tool with respect to traditional methods of teaching in order to identify if there is a significantly better educational outcome for students by using the ChatBot. Sometimes technology conveys an ‘aura of validity’ simply because it is technology, whereas the validity required should be related to producing better educational outcomes.

The research used relatively small sample sizes of end users to evaluate the ChatBot. Larger samples would have provided for more robust data, however, in keeping with the technological design process called ‘rapid prototyping’ we made the decision to evaluate quickly and regularly, trading off the validity that comes with large sample sizes for the speed and regularity of the feedback. This is common practice in technology design.

The limitations in the design of the ChatBot itself have been discussed elsewhere in this report – issues such as the ‘intelligence’ of the ChatBot technology are clearly limitations, especially for native or near-native speakers. However as indicated in the previous section, even that cohort of users can find the ChatBot useful to achieve certain learning outcomes.

This work is therefore still in the early stages of development, and the limitations identified above are likely to be resolved through the future research efforts of the authors as both the technology and the learning-related issues continue to be developed and investigated.

9. Future research

The VTS-Bot research project set off to exploit the innovative use of computer dialogue systems to assist future Officers of the Watch in acquiring maritime communication skills based on the IMO SMCP. The project's outcomes suggest that the developed exercises are both very useful and appealing to students. The ChatBot technology has been found suitable for providing sufficiently realistic scenarios whereby students can practise external communication with VTS stations, Maritime Rescue Coordination Centres (MRCC) and other ships thus increasing their fluency in SMCP-based verbal interaction.

However, this verbal interaction is still limited to the speech output given by the ChatBot system, with students still needing to type their response into the computer. Given that in real life situations the

simulated verbal exchange would exclusively be *spoken* language, a speech input needs to be developed and integrated into the existing and future scenarios.

Providing future nautical officers and shore-based personnel of VTS centres, MRCCs and others with a tool to improve both their listening and speaking competencies in a student-centred, constructivist learning environment would definitely constitute a further step towards a more effective maritime communication. Better communication and reduced miscommunication on the world's oceans would contribute to IMO's mission of “Safe, secure and efficient shipping on clean oceans”.

References

- [1] Barraket, J., “Teaching Research Method Using a Student-Centred Approach? Critical Reflections on Practice”, *Journal of University Teaching & Learning Practice*, Vol 2/Issue 2/Article 3, (2005).
- [2] Hein, G.E., “Constructivist Learning Theory”. CECA (International Committee of Museum Educators) Conference, Jerusalem Israel, 15-22 October 1991, (1991).
- [3] Cole, C., Trenkner, P. & Pritchard, B., “The professional profile of Maritime English instructor (PROFS)”, *Maritime Security and MET*, Proceedings of the International Association of Maritime Universities (IAMU), Sixth Annual General Assembly and Conference. (2005), pp 65-71.
- [4] Noble, A., “Ports of CALL: computer-assisted language learning (CALL) as a means of focussing language goals within the maritime sector. The MarEng Project.”, *Proceedings of International Maritime English Conference (IMEC19)*, Shipping & Transport College, Rotterdam, the Netherlands. 9-12 October 2007, (2007), pp 52-63.
- [5] Ferreira, A., “The Maritime English MOOC: Using MOOC Technology to flip the Classroom”, *Proceedings of International Maritime English Conference (IMEC26)*, Maritime Institute Willem Barentsz, Terchelling, the Netherlands. 7-10 July 2014, (2014), pp 85-101.
- [6] de Wet, M., “Implementing a blended learning approach to Maritime English”, *Proceedings of International Maritime English Conference (IMEC25)*, Piri Reis University, Istanbul, Turkey. 23-26 September 2013, (2013), pp108-117
- [7] Garcia de la Maza, C., “Multimedia Maritime English learning tools: an experience in the classroom”, *Proceedings of International Maritime English Conference (IMEC21)*, Szczecin Maritime University, Szczecin, Poland. 6-9 October 2009, (2009), pp 129-138.
- [8] Eliasson, J. and Gabrielli, A., “Language taught as language used, integrating Maritime English in the teaching of Mechanical Engineering”, *Proceedings of International Maritime English Conference (IMEC23)*, Constanta Maritime University, Constanta, Romania. 10-14 October 2011, (2011), pp 114-119.
- [9] Sihmantepe, A., Sernikli, S. and Ziarati, Z., “Building Maritime English by event simulation”. *Proceedings of International Maritime English Conference (IMEC23)*, Constanta Maritime University, Constanta, Romania. 10-14 October 2011, (2011), pp 102-113.
- [10] John, P., Noble, A. and Björkroth, P., “Low-fi simulation in Maritime Communication”. *World Maritime University Journal*, forthcoming, (2016).
- [11] John, P., Noble, A. and Björkroth, P., “Making SMCP count!”, *Proceedings of International Maritime English Conference (IMEC25)*, Piri Reis University, Istanbul, Turkey. 23-26 September 2013. (2013), pp 40-49.
- [12] Noble, A., Björkroth, P. and John, P., “Exploiting the didactic possibilities of low-fi simulation in virtual bridge-team communication exercises”, *Proceedings of International Maritime English Conference (IMEC26)*, Maritime Institute Willem Barentsz, Terchelling, the Netherlands. 7-10 July 2014, (2014), pp 159-174.
- [13] Gustafsson, M., “Simplification of special language: a case study on Standard Marine Communication Phrases”, *Approaches to style and discourse in English*, Eds Hiltunen, R. and Watanabe, S. Osaka University Press, Japan, (2004), pp 177-178.
- [14] International Maritime Organization (IMO), “Resolution A.918(22) – IMO Standard Marine Communication Phrases”, London, (2001) p 19.
- [15] International Maritime Organization (IMO), “Guideline on Software Quality Assurance and Human-Centred Design for e-navigation. MSC.1/Circ.1512”, London, (2015), p 1.

- [16] Dillon, A, “Usability evaluation”. W. Karwowski (ed.) Encyclopedia of Human Factors and Ergonomics, London: Taylor and Francis, AP Professional.
- [17] Nielsen, J., “Usability Engineering”, AP Professional, (1994).
- [18] Shackel, B., & Richardson, S. J., “Human Factors for Informatics Usability”, Cambridge University Press, (1991).
- [19] International Standardisation Organization (ISO), “Ergonomic requirements for office work with visual display terminals (VDTs), ISO 9241 Part 11: Guidance on usability”, (1998).

Appendices

Appendix 1: Paper presented at the Japanese Institute of Navigation (JIN) conference

VTS-Bot: Using ChatBots in SMCP-based Maritime Communication

Member

Naoyuki TAKAGI (Tokyo University of Marine Science and Technology, Japan)

Non-Member Peter JOHN (Jade University of Applied Sciences, Germany)

Non-Member Alison NOBLE (Antwerp Maritime Academy, Belgium)

Non-Member

Peter BJÖRKROTH (Novia University of Applied Sciences, Finland)

Non-Member Benjamin BROOKS (Australian Maritime College, Australia)

Summary

The paper focuses on the maritime project entitled “VTS-Bot” which aims to exploit the innovative use of computer dialogue systems (aka ChatBots) to assist future Officers of the Watch (OOW) in acquiring maritime communication skills based on the IMO (International Maritime Organization) SMCP (Standard Marine Communication Phrases). As part of their training, deck and engineering cadets in the Merchant Marine are required to obtain a mandatory range of communication competencies in line with the IMO STCW code (Standards of Training, Certification and Watchkeeping, chapter II, table A-II/1). The VTS-Bot developed within the project is freely available online and allows students to practise the relevant maritime communication at their own individual learning pace, thus establishing a student-centred educative approach. The exercises contained in the ChatBot target the compulsory Part A of the IMO SMCP used in VHF communication, and provide authentic maritime scenarios wherein the cadet conducts in real time a simulated maritime conversation with the ChatBot.

keywords : *MET, Maritime ChatBot, SMCP, VTS, STCW*

1. Introduction

Over the last few decades, language teaching has undergone a qualitative transformation. Huge advances in computer technology have led to a revision of didactic practices, prompting teachers to vacate centre stage and permitting learners to adopt a more central role in the educational process. By placing students in the spotlight, the teacher's role has changed to that of a facilitator or 'scaffolder' of learning who assists the student learning in a personalised, constructivist environment which embraces the new media technology.

In the literature the move from a teacher-centred or *behaviouristic* learning environment towards a student-centred, *constructivist* didactic model is considered highly significant. The teacher-centred approach assigns a receptive role to the learner whereby the latter passively listens to the lecturer's presentation of certain topics and concepts. In contrast, an environment based on learner-oriented activities motivates the student to construct skills and knowledge in an experiential setting, thus empowering the learner. With the student now positioned at centre stage, the teacher is relieved to some extent of his or her didactic role, freeing up time to guide slow-progression students who require more assistance with the learning process; in other words a win-win situation.

Maritime English teaching has embraced computer-assisted learning trends, mostly through the integration of multi-media content^{1), 2), 3)} and e-learning exercises⁴⁾. Other innovative maritime teaching methods involve the use of full-mission simulators for collaborative teaching or 'twinning' with instructors of navigation^{5), 6)}, and the use of web conferencing software in low-fi simulation exercises^{7), 8)}. The present research introduces yet another new technology that allows students to interact with a computer.

2. ChatBots for Simulating Maritime Communication

The IAMU-funded VTS-Bot project employs a computer technology known as *ChatterBot* or *ChatBot*. ChatBots are computer dialogue systems which build on Artificial Intelligence (AI). Essentially they allow users to interact with computers in a natural discursive manner by providing authentic dialogues. ChatBots are widely used on the Internet; examples include assisting on-line customers to select products (e.g. Ikea's *Anna* ChatBot) and helping library users. They are also programmed to function as virtual communication partners in chatrooms.

To date very few attempts have been made to use this innovative technology for teaching purposes, and, as far as the authors are aware, no project has yet been undertaken to deploy ChatBot computer dialogues in Maritime Education and Training (MET). This challenge has been taken on by the VTS-Bot research project supported by the International Association of Maritime Universities and funded by the Nippon Foundation of Japan. The project's aim is to develop a series of computer dialogue exercises which provide realistic scenarios of maritime communication in which students can practise their communication skills individually and at their own pace. Maritime ChatBots cater for a constructivist learning environment, thus transforming previously non-communicative, computer-assisted learning activities into communicative real-time simulations. In addition, the technology employed by the ChatBot provides students with instant feedback on their learning progress.

3. VTS-Bot Exercises

In total, three exercises have been implemented which showcase the functionality of maritime ChatBot dialogues: SMCP training, a VTS radio dialogue for an approach to Tokyo Bay and communication in medical emergency cases.

3.1. SMCP Training

The first exercise deals with the routine task of learning and retaining the compulsory Standard Marine Communication Phrases (SMCP). Research demonstrates that learning the SMCP involves the time-consuming process of memorising a considerable amount of fixed phraseology⁹⁾ while at the same time recognising the underlying system employed by the SMCP. This exercise focuses on the use of the so-called message markers, the compulsory SMCP Glossary, the spelling of ship names using the international spelling alphabet and the correction of 'false' phrases which include one or more incorrect terms.

The Standard Marine Communication Phrases consist of numerous phrases and the vocabulary used is vast; thus it is not an easy task to master it. The ChatBot is a tool which facilitates practice of the SMCP including other maritime English phrases and vocabulary crucial for VHF communication. Learning the SMCP demands time and input, yet it is to the benefit of seafarers. It is not possible for teachers of Maritime English to spend as much lecture time on drilling the phrases as ideally would be needed. Especially if the level of English when entering maritime education is relatively low, a lot of the practising must therefore take place in the learner's own time. However, motivating learners to put in the time required is difficult. A learner must be really determined to learn the SMCP alone. In order to overcome this obstacle new methods need to be developed. It is the authors' experience that students are willing to spend substantial amounts of time working with computer-based learning programs and the ChatBot has been created with this in mind.

The ChatBot prompts the learner to replace incorrect terms with correct phrases or words according to the SMCP. For example, the Chatbot might produce the 'false' phrase "*Big berth is requested*". The learner should correct phrase with "*Wide berth is requested*". From the learner's perspective several different learning outcomes are achieved when completing the exercise. The learner has demonstrated the ability to identify

- a specific phrase, enabling recognition of the phrase in e.g. a radio message;
- the structure of the phrase;
- the vocabulary in the phrase;
- the proximity of synonyms or closely-related words such as "*big*" and "*wide*"
- the pronunciation of the phrase

The exercise may, perhaps, be construed as too simple or, on the contrary, laborious, but completing it entails knowledge. Once a person becomes familiar with a phrase, s/he will recognize it when encountering the phrase. The context will then in many cases supply the extra-linguistic information needed to fully comprehend the phrase. The aforementioned phrase could e.g. be included in a warning given by a VTS-unit:

- Warning: Vessel on fire in position ...
- Information: Salvage operations in progress.
- Information/Advice: Wide berth is requested.

The meaning of the phrase is fairly obvious in the context. The learners can, when studying, also check the meaning themselves, or, alternatively, the meaning can be demonstrated, taught or tested in class.

The SMCP puts a lot of emphasis on the so-called Message Markers. The idea is that the receiver will immediately recognise the purpose of a message from the marker, just like when a seafarer hears the call of "MAYDAY". When receiving a MAYDAY call, all seafarers know what the content of the subsequent message will be. Message Markers work in the same way: the marker "Question:" is followed by a question, the marker "Warning" by a warning and so on.

One exercise focuses on the Message Markers. The ChatBot gives an SMCP standard phrase, and the learner must then choose and include the correct Message Marker. The learner thus practises the phrases as well as the usage of the Message Markers. The ChatBot not only assists the learner with the message markers, but it also underpins comprehension of the underlying intention of the message in the phrases.

3.2 Tokyo Bay Approach

The VTS ChatBot simulates an entry to Tokyo Bay via the Uruga Traffic Route and involves VHF radio communication with Tokyo Martis (Uruga transit), Uruga Channel Pilot (pilot arrangement), and Yokohama Port Radio (berthing instructions). Taking full advantage of the interactive nature of ChatBot, students can practice standard communication with shore-side stations using SMCP. The exercise involves reporting ETAs at the channel entrance, pilot station, and harbour entrance and receiving information about queuing, pilot boarding arrangement, harbour traffic, etc.

3.3 The Medical Cases

Apart from distress situations, additional medical emergencies can arise when vessels need assistance. Miscommunication can have fatal consequences when time is scarce. Two ChatBot exercises have been included covering radio medical services. In the first scenario the patient suffers from hypothermia. The learner has two tasks. First he needs to find out what has happened and what the patient's symptoms are. He must do that in order to be able to describe the situation for Radio Medical communications.

The second task is to find out the instructions that radio medical gives concerning care of the patient. This is important since the right care must be given to the patient.

The learning outcomes of these exercises are also manifold. The learner can internalize

- vocabulary needed in medical consultations
- the structure of a medical consultation
- how to elicit crucial information in a concise way
- how to supply crucial information

The learner is given a worksheet, a kind of standard form for gathering and supplying medical information, listing the facts he needs to find out. In this exercise the learner is forced to act both as the radio medical expert, and as the person in need of the medical advice. Being forced to think as the medical expert is also beneficial for the learner since it prepares him for the way the expert might reason; thus the learner must try to reason according to the expert's logic.

4. Validation of VTS-Bot Exercises

In order to assess this learning tool across a range of variables the ChatBot was presented at two conference workshops. Firstly, the VTS-Bot was presented at the International Maritime English Conference (IMEC) held in Malaysia in 2015. The tool was also presented at the International Association of Maritime Universities (IAMU) Annual General Assembly in Croatia in 2015. The workshop participants, who were mainly Maritime English instructors (IMEC) and technical

instructors (IAMU), viewed a presentation of the VTS-Bot, were able to log on and interact with the VTS-Bot and then completed an anonymous questionnaire so that candid responses could be elicited. No personal data were collected except for the affiliation of each respondent. In total we received 23 responses at IMEC and 17 at IAMU from the conference participants, who were mainly Maritime English instructors (IMEC) and technical instructors (IAMU). The results are summarized below:

- 90% of participants from the 2 conferences enjoyed using the VTS-Bot.
- 91% of participants found the VTS-Bot easy to use even though only 66% of participants considered themselves to be very or somewhat ‘technologically-savvy’.
- 92% of the participants stated that their students would have access to the technology necessary to use the ChatBot.
- 91% would encourage their students to use the VTS-Bot as a learning tool.
- 97% responded ‘yes’ to the statement “In general, do you think that the CB will enhance usage of the IMO SMCP and Maritime English at sea?”

Opportunities for improvement were also identified during these interactions. 70% of participants thought that there should be more instruction to assist teachers to use the CB. 81% thought that additional exercises could be created for specific sections of the IMO SMCP and 72% thought that it would help if the ChatBot were divided into different sections according to the IMO SMCP.

These results are extremely positive for an educational tool in the early stages of development and provided both a validation for the tool as well as opportunities for its improvement. In any technology design the interaction with end-users, and from this an understanding of the context of use, is important to develop a product with high levels of usability.

5. Discussion

Language learning is different from e.g. learning to operate radio equipment. A GMDSS course can be realized during two intense weeks after which the learner has the knowledge and skills needed to operate the equipment and to receive the required certificate. Seafarers can therefore participate in these courses and acquire the necessary skills during their leave from the vessel. This is not possible when it comes to learning Maritime English. Learning a language takes time and it simply is not possible for some seafarers to stay ashore for a long enough time to learn or improve their language skills. Languages should thus be studied while on board.

As was discussed in the passages concerning the SMCP, it can be very challenging to study a language on one's own, without the ‘carrots’ or ‘sticks’ wielded by a teacher. Other methods are needed, and the ChatBot is one such. Apart from the pedagogical advantages discussed in earlier parts of this paper, economical aspects can also be considered. The ChatBot is a suitable tool for Open and Distance Learning (ODL). ODL enables students to study in their own time and without geographical limitations. Under optimal circumstances students can study on board with and without an Internet connection.

The relatively poor English skills of seafarers from certain parts of the world have often been mentioned as a stumbling stone to maritime progress. English is both the *lingua franca* on board and the language of command. It is a sad fact that many capable seafarers might find their careers at a standstill, because they cannot master the language used on vessels with multilingual crews. This fact is of course more of a personal misfortune for the seafarer in question, but for the crew at large language skills are also an important safety factor. The ChatBot now offers the possibility to increase safety at sea in an economically sustainable way, also facilitating English learning to seafarers from countries where the on-board periods are a lot longer than their time ashore!


7. Conclusion

In this paper, we have presented three VTS-Bot exercises (SMCP, Tokyo Bay Approach, and medical cases) and the questionnaire results from 40 respondents (both technical and Maritime English instructors from different MET institutions of the world) at two international conferences (IMEC and IAMU) suggesting that the VTS-Bot is fun and easy to use, accessible to and recommendable for their students, and will enhance the usage of the IMO SMCP and Maritime English at sea. We believe that this new tool will help cadets and seafarers improve their Maritime English both ashore and on board, thus contributing to the safety at sea.

8. References

- 1) Noble, A. (2007). "Ports of CALL: computer-assisted language learning (CALL) as a means of focussing language goals within the maritime sector. The MarEng Project." In: Proceedings of International Maritime English Conference (IMEC19), Shipping & Transport College, Rotterdam, the Netherlands. 9-12 October 2007. 52-63.
- 2) Ferreira, A. (2014). "The Maritime English MOOC: Using MOOC Technology to flip the Classroom". In Proceedings of International Maritime English Conference (IMEC26), Maritime Institute Willem Barentsz, Terchelling, the Netherlands. 7-10 July 2014. 85-101.
- 3) de Wet, M. (2013). "Implementing a blended learning approach to Maritime English". In Proceedings of International Maritime English Conference (IMEC25), Piri Reis University, Istanbul, Turkey. 23-26 September 2013. 108-117.
- 4) Garcia de la Maza, C. (2009) "Multimedia Maritime English learning tools: an experience in the classroom". In Proceedings of International Maritime English Conference (IMEC21), Szczecin Maritime University, Szczecin, Poland. 6-9 October 2009. 129-138.
- 5) Eliasson, J. and Gabrielli, A. (2011). "Language taught as language used, integrating Maritime English in the teaching of Mechanical Engineering". In Proceedings of International Maritime English Conference (IMEC23), Constanta Maritime University, Constanta, Romania. 10-14 October 2011. 114-119.
- 6) Sihmantepe, A., Sernikli, S. and Ziarati, Z. (2011). "Building Maritime English by event simulation". In Proceedings of International Maritime English Conference (IMEC23), Constanta Maritime University, Constanta, Romania. 10-14 October 2011. 102-113.
- 7) John, P., Noble, A. and Björkroth, P. (2013). "Making SMCP count!" In Proceedings of International Maritime English Conference (IMEC25), Piri Reis University, Istanbul, Turkey. 23-26 September 2013. 40-49.
- 8) Noble, A., Björkroth, P. and John, P. (2014). "Exploiting the didactic possibilities of low-fi simulation in virtual bridge-team communication exercises". In Proceedings of International Maritime English Conference (IMEC26), Maritime Institute Willem Barentsz, Terchelling, the Netherlands. 7-10 July 2014. 159-174.
- 9) Noble, A. (2015) "The IMO SMCP 15 years on: current perceptions and realistic recommendations" In Proceedings of International Maritime English Conference (IMEC27), Netherlands Maritime Institute of Technology, Johor Bahru, Malaysia. 12-15 October 2015. 126-144.

Appendix 2: Presentation slides presented at IAMU AGA/IMEC



IAMU VTS-Bot workshop

VTS-Bot: Analysis and implementation of a student-centred learning approach by using a ChatBot computer programme to provide for an outcome-based maritime communication training

Theme 1: Improving MET within the context of STCW

IAMU FY2015 Research Project no. 20150104
May 2015 to May 2016

IAMU AGA 2015, Opatija (Croatia), October 2015



IAMU VTS-Bot workshop

Participating partners:

- Peter John, Sylvia Beshar Fahkry Beshar Farag
Jade University of Applied Sciences (Germany)
- Alison Noble
Antwerp Maritime Academy (Belgium)
- Prof. Dr. Naoyuki Takagi
Tokyo University of Marine Science & Technology (Japan)
- Peter Björkroth
Novia University of Applied Sciences (Finland)
- Dr. Benjamin Brooks
Australian Maritime College, University of Tasmania (Australia)

IAMU AGA 2015, Opatija (Croatia), October 2015

IAMU VTS-Bot workshop



Progress report:

- Initial meeting in Elsfeth, Germany
 - definition of simulated scenarios ✓
 - definition of structure and design of software ✓
 - inclusion of relevant details including date, place, ship information, sea charts used, degree of difficulty ✓
 - design of questionnaire for participants ✓
 - implementation of Internet platform ✓
- preliminary exercises to assess validity and reliability ✓
- Presentation of interim report at IAMU AGA 2015, Croatia ✓
- Second partner meeting at IMEC 2015, Malaysia

IAMU AGA 2015, Opatija (Croatia), October 2015

IAMU VTS-Bot workshop



What is a ChatBot?


- computer dialogue systems
- built on Artificial Intelligence (AI)
- interaction with computers in a natural discursive manner

What is the research objective?

- provide realistic maritime dialogues
- provide for a student-centred, constructivist learning process

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Learning environments

classroom teaching	low-fi sim: e-learning	low-fi sim: ChatBots	full mission simulation
<ul style="list-style-type: none"> • teacher-centred • natural dialogues • university 	<ul style="list-style-type: none"> • student-centred • at home 	<ul style="list-style-type: none"> • student-centred • natural dialogues • at home 	<ul style="list-style-type: none"> • student-centred • natural dialogues • university

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Selected IAMU VTS-Bot scenarios

Special Maritime English:


- training & drilling of SMCP
- simulation of VTS communication
- simulation of medical emergency case

General Maritime English:

- phone call simulation

(cf. IMO Model Course 3.17 on Maritime English)

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IAMU VTS-Bot

What is covered by this workshop?


Special Maritime English:

- training & drilling of SMCP
- simulation of VTS communication
- simulation of medical emergency case

General Maritime English:

- phone call simulation
- participants' feedback


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What is covered by this workshop?

www.smcpxamples.com



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Appendix 3: Workshop description at IMEC

Using Computer Dialogue Systems for Providing a Student-Centred Teaching Approach in SMCP-Based Maritime Communication (workshop)

Peter John, Jade University of Applied Sciences (Germany), *peter.john@jade-hs.de*

Alison Noble, Antwerp Maritime Academy (Belgium), *Alison.Noble@hzs.be*

Naoyuki Takagi, Tokyo University of Marine Science & Technology (Japan),
takagi@kaiyodai.ac.jp

Peter Björkroth, Novia University of Applied Sciences (Finland), *peter.bjorkroth@novia.fi*

Abstract

The workshop focuses on training SMCP-based maritime communication with the help of computer dialogue systems (aka ChatBots). The communication competencies put forth in the STCW code (chapter II, table A-II/1) are acquired by practising relevant maritime communication at the student's own individual learning pace thus catering for a student-centred education approach. On the one hand, the exercises presented in the workshop will target the compulsory part A of the SMCP in their use in communication on VHF. On the other hand, a simulated phone call challenges participants to develop an efficient communication strategy in order to obtain relevant details on a navigational accident. Response from conference participants will be used to further improve the developed exercises. In addition participants will be trained to use the ChatBot technology and exercises as teaching material in the classroom once the computer dialogues are freely available on the Internet.

keywords: *computer-assisted learning, Maritime ChatBot, SMCP training*

Workshop Rationale and Outline

In recent years, language teaching has experienced a major qualitative shift. The massive advance of computer technology has enabled teachers to take a step back from the classroom's centre stage and leave it to a newly structured didactic design which assigns more central roles to learners. By handing over protagonism to students, the teacher's role changes into that of a promotor or scaffolder of learning who assists the students in a personalised, constructivist learning environment which extensively applies new media technology.

Academic research has reported this highly significant trend away from a teacher-centred or behaviouristic learning environment and towards a student-centred, constructivist didactic design⁹. A learner-oriented environment supports students in constructing skills and knowledge in an experimental setting, instead of being assigned a rather passive role as listeners of lectures which are centred around the teacher's presentation of the topics to be studied. While positioning the learners in the foreground, the new design simultaneously reduces the teachers' speaking time in class which allows them to attend to slow-progression students who are most in need of help in their learning process.

Maritime English teaching has widely adopted computer-assisted learning trends, mostly by integrating multi-media content^{[1] [2] [3]} and e-learning exercises^[4]. Other innovative teaching methods involve the use of full-mission simulators for collaborative teaching or twinning with navigational instructors^{[5] [6]}, and the use of web conferencing software in low-fi simulation exercises^{[7] [8]}.

The revised version of the IMO Model Course 3.17 for Maritime English¹⁰ recognises the need for a student-centred learning approach by recommending active student involvement and suggesting an Individual Learning Plan (ILP) which "should contain the learner's long-term goals in terms of items to be learned and communicative abilities the learner wishes to achieve"^[9]. In order to accomplish required communicative abilities, the Model Course makes reference to videos, e-learning and Internet resources, among other learning material.

Another educational aspect highlighted by the revised Model Course 3.17 is the requirement for a communicative approach in Maritime English teaching. For this reason, it provides "explanations and suggestions for practical, communicative classroom activities to assist the instructor to implement this model course effectively"^[9].

The outlined communicative approach is easily attainable in a classroom environment. However, it poses serious challenges for self-study activities by means of e-learning, video material, etc. While the new media enable learners to practise relevant maritime terminology, fixed expressions, grammar and so on, to the author's knowledge they do not cater yet for a truly communicative approach where relevant communication skills be applied in simulated discourse exercises which resemble the communicative situation future nautical officers will encounter onboard their ship.

⁹ A Google scholar search for the term "student-centred" revealed over 2,400 occurrences in the first semester of 2015 alone.

¹⁰ Model Course 3.17 Maritime English has undergone extensive revision over the last twelve months (2014-2015). The revised version was validated by the IMO HTW (Human Element, Training & Watchkeeping) in February 2015 and is due to be published at the end of October 2015.

Maritime Communication exercises using ChatBot technology

At this workshop, a computer technology known as ChatterBot or ChatBot is presented. ChatBots are computer dialogue systems which build on Artificial Intelligence (AI). They allow users to interact with computers in a natural discursive manner by providing realistic dialogues. ChatBots are widely used on the Internet, for example to assist on-line customers in selecting products (e.g. Ikea's Anna ChatBot) and to help library users¹¹. They are also programmed to function as virtual communication partners in chatrooms¹².

However, very few attempts have been made so far to use this fascinating technology for teaching purposes in general, and no project is known to have been undertaken yet to deploy ChatBot computer dialogues in Maritime Education and Training (MET). This challenge has been taken on by the VTS-Bot research project supported by the International Association of Maritime Universities and funded by the Nippon Foundation of Japan¹³. The project's aim is to develop a series of computer dialogue exercises which provide realistic scenarios of maritime communication in which students can practise their communication skills individually and at their own pace. Maritime ChatBots close the gap between communicative classroom activities on the one hand and non-communicative, computer-assisted learning activities on the other hand. They cater for a constructivist learning environment while providing students with an instant feedback on their learning progress.

Exercises presented at the IMEC workshop

At the time of this workshop, two exercises have been implemented which are intended to display the functionality maritime ChatBot dialogues are capable to offer. The first exercise deals with the routine task of learning and retaining the compulsory Standard Marine Communication Phrases (SMCP). It is understood that learning the SMCP involves the time-consuming process of memorising a considerable amount of fixed phraseology while at the same time understanding the underlying system the SMCP employs. The SMCP ChatBot exercise focuses on the use of message markers, the spelling of ship names using the international spelling alphabet and correcting phrases which include one or more incorrect terms.

The second ChatBot exercise allows students to practise General Maritime English (GME) in a simulated phone call. Here, participants enter a discourse with a crew member on board a ship which has been involved in a navigational accident. The objective is to enquire all relevant information necessary to prepare an incident report. As the communication partner is not very forthcoming, different communication strategies have to be tried out to achieve the required information.

While the SMCP exercise shows the possibility of using ChatBots for simple memorisation and drilling purposes, the phone call simulation includes a number of highly complex communication patterns, such as questions and answers, user input as variables the system remembers, provocative

¹¹ Chapter 1 of Library Technology Reports (vol. 49, no. 8), "Streamlining Information Services Using Chatbots," makes for interesting reading. It presents a brief history of ChatBots, computer programs that use natural language to interact with users. They have existed for nearly fifty years and have been used in libraries since the mid-2000s; ChatBots from ELIZA (1966) to Pixel (2010) are introduced.

¹² See <https://www.ChatBots.org>

¹³ Nippon Foundation research grant. <http://www.nippon-foundation.or.jp/en/>

dialogue, and others. Suggestions will be given for a possible integration of the exercises into classroom teaching.

Response from conference participants

The workshop will provide an on-line questionnaire to seek the feedback from conference participants upon completion of the two ChatBot exercises. It is expected that this response will provide valuable hints at improving the computer dialogues as well as outline further areas for the development of exercises. The conference feedback will be included into the IAMU Research Final Report which will be published after the project's completion in May 2016.

After May 2016, all exercises will be freely available on the Internet at www.smcexamples.com.

This research is within the framework of the IAMU 2015 Research Project 20150104 "VTS-Bot: analysis and implementation of a student-centred learning approach by using a ChatBot computer programme to provide for an outcome-based maritime communication training" which is funded by The Nippon Foundation of Japan. The VTS-Bot research partners are the authors of this paper and, in addition, Dr. Benjamin Brooks (Australian Maritime College, University of Tasmania (Australia)) and Sylvia Beshar Fakhry Beshar Farag (Jade University of Applied Sciences (Germany)).

References

- [1] Noble, A. (2007). "Ports of CALL: computer-assisted language learning (CALL) as a means of focussing language goals within the maritime sector. The MarEng Project ." In Proceedings of International Maritime English Conference (IMEC19), Shipping & Transport College, Rotterdam, the Netherlands. 9-12 October 2007. 52-63. Available at http://www.pfri.uniri.hr/%7Ebopri/IMEC_Proceedings/index.html
- [2] Ferreira, A. (2014). "The Maritime English MOOC: Using MOOC Technology to flip the Classroom". In Proceedings of International Maritime English Conference (IMEC26), Maritime Institute Willem Barentsz, Terchelling, the Netherlands. 7-10 July 2014. 85-101. Available at http://www.pfri.uniri.hr/%7Ebopri/IMEC_Proceedings/index.html
- [3] de Wet, M. (2013). "Implementing a blended learning approach to Maritime English". In Proceedings of International Maritime English Conference (IMEC25), Piri Reis University, Istanbul, Turkey. 23-26 September 2013. 108-117. Available at http://www.pfri.uniri.hr/%7Ebopri/IMEC_Proceedings/index.html
- [4] Garcia de la Maza, C. (2009) "Multimedia Maritime English learning tools: an experience in the classroom". In Proceedings of International Maritime English Conference (IMEC21), Szczecin Maritime University, Szczecin, Poland. 6-9 October 2009. 129-138.
- [5] Eliasson, J. and Gabrielli, A. (2011). "Language taught as language used, integrating Maritime English in the teaching of Mechanical Engineering". In Proceedings of International Maritime English Conference (IMEC23), Constanta Maritime University, Constanta, Romania. 10-14 October 2011. 114-119.
- [6] Sihmantepe, A., Sernikli, S. and Ziarati, Z. (2011). " Building Maritime English by event simulation". In Proceedings of International Maritime English Conference (IMEC23), Constanta Maritime University, Constanta, Romania. 10-14 October 2011. 102-113. Available at http://www.pfri.uniri.hr/%7Ebopri/IMEC_Proceedings/index.html

- [7] John, P., Noble, A. and Björkroth, P. (2013). “Making SMCP count!” In Proceedings of International Maritime English Conference (IMEC25), Piri Reis University, Istanbul, Turkey. 23-26 September 2013. 40-49. Available
http://www.pfri.uniri.hr/%7Ebopri/IMEC_Proceedings/index.html
- [8] Noble, A., Björkroth, P. and John, P. (2014). “Exploiting the didactic possibilities of low-fi simulation in virtual bridge-team communication exercises”. In Proceedings of International Maritime English Conference (IMEC26), Maritime Institute Willem Barentsz, Terchelling, the Netherlands. 7-10 July 2014. 159-174. Available at
http://www.pfri.uniri.hr/%7Ebopri/IMEC_Proceedings/index.html

Appendix 4: Survey questionnaire

IAMU VTS-Bot workshop: participants' feedback questionnaire

We would be grateful if you would take a few minutes to answer the following questions about the ChatBot.

Give the name of the MET institution/maritime organisation to which you are affiliated.

Do you give classroom instruction in IMO SMCP?

yes – no

Do you consider yourself a technologically ‘savvy’ individual?

yes – quite – not really – no

Did you enjoy using the ChatBot?

yes – very much – yes, quite – no, not very much – no, not at all

If ‘no’, why not?

Did you find the ChatBot reliable (i.e. correct application/testing of IMO SMCP)?

yes, very – yes, quite – no, not very – no, not at all

Should additional exercises be created for specific sections of the IMO SMCP (i.e. is there anything missing)?

yes – no

Which? Please state

Would it help if the CB were divided into different sections according to the IMO SMCP?

yes – no – no difference

Did you find the CB easy to use?

yes, very – yes, quite – no, not very – no, not at all

Do you have any suggestions to make the ChatBot easier to use?

Do you think there should be more instruction for teachers to assist with the use of the CB?

yes – no

If no, please note your ideas.

Will your students have access to the appropriate technology to use the CB?

yes – no

Will you encourage your students to use the CB as a learning tool?

yes – no

If ‘no’, why not?

In general, do you think that the CB will enhance usage of the IMO SMCP and Maritime English in general at sea?

yes – no

Which other areas of maritime communication could be covered by ChatBot exercises?

Appendix 5: Tokyo Bay Approach Scenario and Communication Samples

Vessel Name	Josco Lily
Call Sign	VRBZ7
Flag Sate	Hong Kong
Gross Tonnage	9890 grt
LOA	142.7 m
Beam	22.6 m
Draft Forward	7.3 m
Draft Aft	7.4 m
Destination	Yokohama
Anchorage	Y2
Berth	Honmoku C7
ETA at Uraga Pilot Station	1730 (reported to Tokyo Martis and Uraga Channel Pilot)
ETA at Uraga Center #1 buoy	1745 (reported to Tokyo Martis)
Pilot boarding time the morning	After 0830
ETA at Yokohama Passage	0900

Overview:

Josco Lily enters Uraga Traffic Route with a pilot onboard and proceeds to her anchorage.

In reality, external communications will be done by the pilot in Japanese, but for communication practice purposes, students will do all external communications in English, as if there was no pilot onboard. Josco Lily will approach her Y2 anchorage without using Nakanose Traffic Route. Her berth, anchorage and pilots have been arranged through her agent.

Three communications take place:

Communication #1 (with Uruga Channel Pilot)

Position: 11 miles south of the US line, before calling Tokyo Martis

Report ETA at Uruga Pilot Station

Communication #2 (with Tokyo Martis)

Position: 10 miles south of the US line (reporting line)

Report position (i.e 10 miles from the US line) and ETA at Uruga Pilot Station

Communication #3 (with Yokohama Port Radio)

Position: at Uruga Center #1 buoy (Traffic Route Entrance)

Report ETA at the anchorage

Communication Samples

JL: Josco Lily; TM: Tokyo Martis; UP: Uruga Channel Pilot; PR: Yokohama Port Radio

Communication #1 (with Uruga Channel Pilot)

- JL Uruga Channel Pilot, Uruga Channel Pilot. This is Josco Lily, Josco Lily, Call Sign VRBZ7, VRBZ7. How do you read me? Over.
- UP Josco Lily, Josco Lily. This is Uruga Channel Pilot. I read you loud and clear. Change to channel six four, sixty four, please. Over.
- JL Uruga Channel Pilot, Uruga Channel Pilot. This is Josco Lily. Changing to channel six four. Over.
- JL Uruga Channel Pilot. This is Josco Lily calling on channel six four. How do you read me? Over.
- UR Josco Lily. This is Uruga Channel Pilot. I read you loud and clear. Go ahead. Over.
- JL Uruga Channel Pilot, this is Josco Lily. My position is 11 miles south of the US line. My ETA at Uruga Pilot Station is 1730. Repeat. 1730. Over.
- UP Josco Lily, Uruga Channel Pilot. Your ETA at Uruga Pilot Station is 1730, 1730. Is that correct? Over.
- JL Uruga Channel Pilot, this is Josco Lily. Yes, that is correct. Over.
- UP Josco Lily, Uruga Pilot. Copy. Our pilot will come onboard upon your arrival. Please rig your pilot ladder on your port side, 3 meters above water. Port side, three meters above water. Over.
- JL Uruga Channel Pilot, Josco Lily. Pilot ladder port side, three meters above water. I understand. Over.
- UP Josco Lily, Uruga Channel Pilot. Please make a boarding speed of six or seven knots. Boarding speed, six or seven knots. Over.
- JL Uruga Channel Pilot, Josco Lily. Boarding speed six or seven knots. Copy that. Over.
- UP Josco Lily, this is Uruga Channel Pilot. Thank you for your cooperation. Out.
- JL Uruga Channel Pilot. Josco Lily out.

Communication #2 (with Tokyo Martis)

- JL Tokyo Martis, Tokyo Martis. This is Josco Lily, Josco Lily, Call Sign VRBZ7, VRBZ7. How do you read me? Over.
- TM Josco Lily, Josco Lily. This is Tokyo Martis. I read you loud and clear. Change to channel two two, twenty two, please. Over.
- JL Tokyo Martis, Tokyo Martis. This is Josco Lily. Changing to channel two two, twenty. Over.
- JL Tokyo Martis. Tokyo Martis. This is Josco Lily calling on channel two two. How do you read me? Over.
- TM Josco Lily. This is Tokyo Martis. I read you loud and clear. Go ahead. Over.
- JL Tokyo Martis, this is Josco Lily. My position is 10 miles south of the US line. My ETA at Uraga Pilot Station is 1730. Repeat. 1730. Over.
- TM Josco Lily, Tokyo Martis. Your ETA at Uraga Pilot Station is 1730, 1730. Copy. Information. PCC Cougar Ace will enter Uraga Traffic Route at 1740. Cougar Ace is #1 and you are #2. Please follow Cougar Ace when entering Uraga Traffic Route. Over.
- JL Tokyo Martis, Josco Lily. I will follow Cougar Ace. Over.
- TM Josco Lily, Tokyo Martis. You will follow Cougar Ace. Thank you. Question. How will you approach Yokohoma? Will you use both Uraga Traffic Route and Nakanose Traffic Route? Over.
- JL Tokyo Martis, Josco Lily. Answer. I will not use Nakanose Traffic Route. After leaving Uraga Traffic Route, I will steer north and proceed to Yokohama. Over.
- TM Josco Lily, Tokyo Martis. I understand. You will not use Nakanose Traffic Route. Then please fly 2nd repeater and Papa before entering the traffic route. Over.
- JL Tokyo Martis, Josco Lily. Copy. I will fly 2nd repeater and Papa. Thank you for your information. Over.
- TM Josco Lily, Tokyo Martis. Question. Will you anchor first or proceed directly to your berth? Over.
- JL Tokyo Martis, Josco Lily. Answer. I will anchor first. My anchorage is Y2. Over.
- TM Josco Lily, Tokyo Martis. You will anchor at Y2. Copy. No further information. Stand by on Channel 16. Tokyo Martis, Out.
- JL Tokyo Martis, Josco Lily Out.

Communication #3 (Yokohama Port Radio)

JL Yokohama Port Radio, Yokohama Port Radio, this is Josco Lily, Josco Lily. Call sign, VRBZ7, VRBZ7. How do you read me? Over.

PR Josco Lily, this is Yokohama Port Radio. I read you loud and clear. Change to channel two zero, twenty please. Over.

JL Yokohama Port Radio, this is Josco Lily. Changing to channel two zero. Over.

JL Yokohama Port Radio, this is Josco Lily calling on channel two zero. How do you read me? Over.

PR Josco Lily, this is Yokohama Port Radio. I read you loud and clear. Your message please.

JL Yokohama Port Radio, Josco Lily. I have just passed Uraga Center #6 buoy. My ETA at Yankee 2 anchorage is two zero zero zero hours local time. Over.

PR Josco Lily, Yokohama Port Radio. Copy. Your ETA at Yankee 2 is two zero zero zero hours. Questions. Your arrival drafts, forward and aft please. Over.

JL Yokohama Port Radio, Josco Lily. My forward draft, 7.3 meters, aft draft, 7.4 meters.

PR Josco Lily, Yokohama Port Radio. Forward draft 7.3 meters, aft draft 7.4 meters. Copy. Your berth tomorrow is Charlie 7, and your ETA at Yokohama Passage should be 0900. Over.

JL Yokohama Port Radio, Josco Lily. My berth is Honmoku Charlie 7 and I must enter Yokohama Passage at 0900. Copy. Over.

PR Josco Lily, Yokohama Port Radio. Pilot boarding time is 0830, 0830, and one tug has been arranged. I will contact you tomorrow for boarding arrangement. Over.

JL Yokohama Port Radio, Josco Lily. Pilot boarding time 0830 and one tug arranged. You will contact us tomorrow for boarding arrangement. Thank you. Over.

PR Josco Lily, Yokohama Port Radio. I have a request from the pilot. Have your anchor at short stay when your pilot arrives tomorrow morning. Over.

JL Yokohama Port Radio, Josco Lily. Copy. Anchor at short stay when our pilot arrives.

PR Josco Lily, Yokohama Port Radio. Container vessel Morning Glory, already at Y2, is entering the passage before you. Her berth is Honmoku Charlie 9. She is going deeper into the slip. Please follow Morning Glory. Over.

JL Yokohama Port Radio, Josco Lily. Copy. I will follow Morning Glory. Over.

PR Josco Lily, Yokohama Port Radio. Thank you for your cooperation. Call us again before you let go anchor. I will check your anchor position. Over.

JL Yokohama Port Radio, Josco Lily. Copy. I will call you before letting go anchor. Over.

PR Josco Lily, Yokohama Port Radio. Thank you. Out.

JL Yokohama Port Radio, Josco Lily. Out.

Appendix 6: MediBot Communication Samples

Case 1

DK: Deck; BR: Bridge; PR: Port Radio

DK Bridge, This is Chief Mate. The life boat fell about 2 meters and Bosun is badly hurt.

BR Life boat had a big fall and Bosun is hurt. Copy. What happened?

DK We were testing the onload release mechanism, and the boat was too high when it was released.

BR You released the boat up in the air. Copy. What is Bosun's condition?

DK He has a lot of pain in his back. He may have fractured his backbone. He cannot even stand up.

BR Is he conscious?

DK Yes, he is conscious.

BR He is conscious. Is he bleeding?

DK He has several cuts, but he is not bleeding much.

BR OK. He has several cuts, but bleeding is not serious. I will request a boat for hospital transfer.

BR Port Radio, This is Vessel Name, Call sign (x3) calling. Do you read me?

PR Vessel Name, this is Port Radio. Change to channel 14. Over. Go ahead.

BR Port Radio, Vessel Name. Changing to channel 14.

BR Port Radio, this is Vessel Name calling on channel 14. How do you read me? Over.

PR Vessel Name, Port Radio. I read you loud and clear. Go ahead.

BR Port Radio, Vessel Name. We require a boat for hospital transfer. Bosun seems to have fractured his backbone. Over.

PR Vessel Name, Port Radio. You need a boat. Understood. What happened to Bosun? Over.

BR Bosun fractured his backbone. Over.

PR Fractured? What do you mean?

BR Bosun has broken his back. His backbone is broken.

PR Vessel Name, Port Radio. Your bosun has a broken back and you require a boat for hospital transfer. Is that right?

BR Port Radio, Vessel name. Yes, that is correct. Over.

PR Vessel name, Port Radio. Copy. Bosun has broken his back. I will arrange a boat. Stand by on this channel. Over.

BR Port Radio, Vessel name. Standing by.

PR Vessel Name, Port Radio. How do you read me? Over.

BR Port Radio, Vessel Name. I read you loud and clear. Over.

PR Vessel Name, Port Radio. We have arranged a boat. ETA 1400 hours local time. Over.

BR Port Radio, Vessel Name. I understand. ETA 1400. Over.

PR Vessel Name, Port Radio. What is the condition of the injured crew member? Is he conscious?

BR Port Radio, Vessel Name. Yes, he is conscious, but has a lot of pain in his back. He is not

bleeding, either.

PR Vessel Name, Port Radio. Understood. Patient is conscious and he is not bleeding. I will advise the hospital accordingly. Out.

BR Port Radio, Vessel Name. Thank you. Out.

PR Vessel Name, Vessel Name, this is Port Radio. How do you read me? Over.

BR Port Radio, this is Vessel Name. I read you loud and clear. Over.

PR Vessel Name, Port Radio, Change to channel 20. Over.

BR Port Radio, this is Vessel Name. Channel 20. Copy.

PR Vessel Name, this is Port Radio calling on channel 20. How do you read me? Over.

BR Port Radio, Vessel Name. I read you loud and clear. Go ahead.

PR Vessel Name, Port Radio. Good news for you. Japan Coast Guard boat Kurinami, Kurinami is on her way. New ETA 1330. I repeat. New ETA 1330 local time. Over.

BR Port Radio, Vessel Name. New ETA 1330. Thank you. What is the vessel name again?

PR Vessel Name, Port Radio. The vessel name is Kurinami, Kilo, Uniform, Romeo, India, November, Alpha, Mike, India. She is approaching you from West. Over.

BR Port Radio. Vessel name. Kurinami is approaching from West. Thank you. Over.

PR Vessel Name, Port Radio. Going back to channel 16. Out.

BR Port Radio, Vessel Name. Out.

Case 2

FC: Forecastle; BR: Bridge; PR: Port Radio

FC Bridge, This is forecastle deck, Chief Mate speaking. Emergency. Third engineer was hit by a wave and unconscious.

BR Third engineer is unconscious. Understood. What happened?

FC Third engineer was hit by a huge wave and hit his head against the windlass.

BR Can't you wake him up?

FC I tried, but I couldn't. He is also bleeding from his left thigh.

BR Is the wound deep?

FC Yes, it is deep.

BR Is he breathing?

FC Yes, but it is very weak.

BR I will request a boat for hospital transfer.

BR Port Radio, This is Vessel Name, Call sign (x3). Come in please.

PR Vessel Name, this is Port Radio. Change to channel 14. Over.

BR Port Radio, Vessel Name. Changing to channel 14.

BR Port Radio, Vessel Name. How do you read me? Over.

PR Vessel Name, Port Radio. I read you loud and clear. Go ahead with your message.

BR Port Radio, Vessel Name. We have a medical emergency. We require a boat for hospital transfer. Over.

PR Vessel Name, Port Radio. Medical emergency. You are requesting a boat for hospital transfer. What is the condition of the patient?

BR Port Radio, Vessel Name. Third engineer was hit by a wave and hit his head against the windlass hard. He is unconscious.

PR Vessel Name, Port Radio. Third engineer hit his head and unconscious. Is that correct?

BR Port Radio, Vessel Name. Yes, that is correct. Over.

PR Vessel Name, Port Radio. Any other conditions I should report to the hospital? Over.

BR Port Radio, Vessel Name. He has a deep cut in his left thigh, and bleeding. His breathing is weak. Over.

PR Vessel Name, Port Radio. His breathing is weak. Understood. Where is the cut? Sigh?

BR Port Radio, Vessel Name. He has a cut in his left thigh. Over.

PR Vessel Name, Port Radio. Please spell the last word. Sierra, India, Golf, Hotel?

BR Port Radio, Vessel Name. Thigh. Tango, Hotel, India, Golf, Hotel. Over

PR Vessel Name, Port Radio. Copy. Deep cut in his right thigh and bleeding. Patient's breathing is weak. I will arrange a boat immediately. Stand by on this channel.

BR Port Radio, Vessel Name. No. His cut is in his left thigh. Over.

PR Vessel Name, Port Radio. His cut is in his left thigh. Understood. Over.

BR Port Radio, Vessel Name. I will be standing by on this channel. Out.

PR Vessel Name, Port Radio calling on channel 14. Do you read me? Over.

BR Port Radio, Vessel Name. I read you clear. Go ahead. Over.

PR Vessel Name, Port Radio. The swell is too high and we cannot dispatch a boat. Sorry. Over.

BR Port Radio, Vessel Name. Swell too high and cannot dispatch a boat. Understood. Over.

PR Vessel Name, Port Radio. The swell is expected to decrease in 2 hours. We will call you once the swell subsides.

BR Port Radio, Vessel Name. Thank you for your cooperation. We will be waiting for your call. Over.

PR Vessel Name, Port Radio. Yes, stand by on channel 16. Out.

BR Port Radio, Vessel Name. Back to channel 16. Out.

Case 3

ER: Engine Room; BR: Bridge; PR: Port Radio

ER Bridge. This is engine room. Explosion! Explosion!

BR Calm down. Calm down. What exploded?

ER Auxiliary boiler exploded. Flashback when igniting.

BR Flashback from the auxiliary boiler. Understood. Is anybody injured?

ER Third engineer was igniting the auxiliary boiler burner and BANG. He was in big flame.

BR OK, third engineer is burned. Is that right?

ER Yes, that is right. He is burned. Very serious.

BR Is he conscious?

ER No, he is not conscious.

BR No bleeding?

ER No bleeding.

BR Is he breathing?

ER Yes, he is breathing, but very weak.

BR What part of his body is affected?

ER All over his upper body, front part, Sir. His face is also burned. Very very bad.

BR OK, I will request a boat for hospital transfer.

BR Port Radio, This is Vessel Name, Call sign. Come in please.

PR Vessel Name, this is Port Radio. Change to channel 14. Over.

BR Port Radio, Vessel Name. Changing to channel 14.

BR Port Radio, Vessel Name. How do you read me? Over.

PR Vessel Name, Port Radio. I read you loud and clear. Message please.

BR Port Radio, Vessel Name. Third engineer is seriously burned. We request a boat for hospital transfer. Over.

PR Vessel Name, Port Radio. Third engineer is barn? What happened to him? Over.

BR Port Radio, Vessel Name. We had a boiler explosion. Big [flame/fire] burned third engineer. He is burned. Bravo Uniform Romeo November, Echo, Delta. Burned. Damaged by heat. Over.

PR Vessel Name, Port Radio. Boiler exploded and third engineer is burned. Understood. What is his condition?

BR Port Radio, Vessel Name. Front side of his upper body, including his face, is seriously affected.

PR Vessel Name, Port Radio. His face and front side of upper body are affected. Understood. Is he conscious?

BR Port Radio, Vessel Name. No, he is not conscious. Over.

PR Vessel Name, Port Radio. Is he breathing? Over.

BR Port Radio, Vessel Name. Yes, he is breathing, but very weak.

PR Vessel name, Port Radio. His breathing is very weak. I will arrange a boat immediately and get

back to you. Stand by on this channel. Over.

BR Port Radio, Vessel name. Thank you very much for your assistance. standing by on channel 14. Out.

PR Vessel Name, This is Port Radio calling on channel 14. Do you read me? Over.

BR Port Radio, Vessel Name. I read you loud and clear. Go ahead.

PR Vessel Name, Port Radio. We have arranged a boat to pick up your patient. ETA 1730 hours local time. Over.

BR Port Radio, Vessel Name. I understand. ETA 1730. Over.

PR Vessel Name, Port Radio. The Japan Coast Guard boat name is ASAGIRI, ASAGIRI, Alpha, Sierra, Alpha, Golf, India, Romeo, India. She will contact you for boarding arrangement. Over.

BR Port Radio, Vessel Name. Asagiri will contact us for boarding arrangement. Over.

PR Vessel Name, Port Radio. By the time the boat arrives it will be dark. Make sure the boarding area is well lighted. Over.

BR Port Radio, Vessel Name. I will make sure the boarding area is well lighted. Thank you. Over.

PR Vessel Name, Port Radio. If you need any further assistance, please let us know. Port Radio, Out.

BR Port Radio, Vessel Name. Thank you very much for your kind assistance. Out.



International Association of Maritime Universities

Meiwa Building 8F, 1-15-10 Toranomom, Minato-ku, Tokyo 105-0001, Japan

Tel : 81-3-6257-1812 E-mail : info@iamu-edu.org URL : <http://www.iamu-edu.org>

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