DEVELOPMENT OF EBDIG-WFSV CURRICULUM IN LINE WITH ECVET AND RINA'S CPD REQUIREMENTS

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SUMMARY

This paper reports on the development of EBDIG-WFSV design courses curriculum and to establish the ground work to ensure its compliance with the requirements of the European Credit system for Vocational Education and Training framework (ECVET). It is also expected that the curriculum would also satisfy the requirements of the Royal Institution of Naval Architects' Initial and/or Continuing Professional Development (RINA's IPD/CPD).

The paper includes an investigation into the ECVET framework to ensure that the EBDIG-WFSV courses are developed in line with this system's requirements and at the same time the courses also satisfies the requirements of the Royal Institution of Naval Architects' IPD and/or CPD.

In this paper the ECVET framework is described and RINA's requirements for accreditation are identified. A cross-referencing technique is used to ensure all requirements are met and EBDIG-WFSV courses will be compliant with ECVET and ready for accreditation by RINA.

Keywords: European Boat Design Innovation Group-Wind Farm Support Vessel (EBDIG-WFSV), European Credit system for Vocational Education and Training framework (ECVET), Initial and/or Continuing Professional Development (RINA's IPD/CPD),

1. INTRODUCTION

The European Credit system for Vocational Education and Training (ECVETS) is the new European instrument to promote mutual trust and mobility in vocational education and training. ECVET is a European system of accumulation and transfer of credits and has been designed to enable the recognition of the learning outcomes by an individual in a learning pathway to a qualification. The system favours the documentation, validation and recognition of achieved learning outcomes acquired, in particular in the framework of transnational mobility, in both formal Vocational Education and Training (VET) and in non-formal context.

The process of professional development whilst being continuous during a career, it is often considered as two stages: Initial Professional Development (IPD) and Continuing Professional Development (CPD) [1]. The intention is to seek accreditation for EBDIG-WFSV from the Royal Institution of Naval Architects (RINA). Given the equal level of intended professional engagement in the design process between naval architects and marine designers, the EBDIG IPD/CPD training courses learning outcomes will be mapped against RINA IPD development objectives for naval architects. In addition to the Accreditation of EBDIG-WFSV IPD/CPD courses by an international chartered professional body such RINA, the opportunity for EBDIG-WFSV to support vertical and horizontal mobility of higher education and VET in the long run necessitates the implementation of ECVETS into this mapping process so that both RINA and ECVET requirements are met. It is also very important that a formal assessment of the EBDIG-WFSV courses are implemented through the academic partners of EBDIG-WFSV and to ensure that the assessment meets the ECVET requirements.

For a successful project outcome, it is very important that during the curriculum development process, both objectives are to be addressed carefully and in some depth.

This paper reports on the development of the process of accreditation of EBDIG-WFSV training courses applying a cross-referencing technique ensuring a right balance between marine engineering design and naval architecture.

2. ECVET AND LEARNING TIME

The European Credit system for Vocational Education and Training (ECVET) is centred on the individual and based on the learning outcomes approach, defined in terms of knowledge, skills and competences necessary for achieving a qualification. This enable a more accurate design of training courses which answers to the training needs of employees. ECVET is based on concepts and process which are used in a systematic way to establish a user-friendly language for transparency, transfer and recognition of learning outcomes. Some of these concepts and processes are already embedded in many qualifications systems across Europe[2].

ECVET has a formal structure which includes the following:

- **Learning outcomes,** which are statements of knowledge, skills, and competence that can be achieved in a variety of contexts.
- **Units of learning outcomes** that are components of qualifications. Units can be assessed, validated and recognized.
- **EVCET points,** which provide additional information about units and qualifications in a numerical form.
- **Credit** that is given for assessed and documented learning of a learning outcome of a learner. Credit can be transferred to other contexts and accumulated to achieve a qualification on the basis of the qualification standards and regulations existing in the participating countries.
- **Mutual Trust and partnership among participating organisations**. These are expressed in Memoranda of Understanding and Learning Agreements.

A **Memorandum of Understanding (**MoU) forms the framework for cooperation between the competent institutions. It aims to establish mutual trust between the partners involved. In this MoU partner organisations mutually accept their respective criteria and procedures for quality assurance, validation and recognition of knowledge, skill and competence for the purpose of transferring **Credit**.

There is also a provision for Agreements (within an MoU or as an attachment) set up by sector based organisations (e. g. by Chambers, regional and national authorities). This should include a list of organisations such as VET providers, companies, etc., who are able to operate in the framework set up by the MoU.

In order to recognise **Credit**, the competent institution in charge needs to be confident that the required learning outcomes have been assessed in a reliable and valid manner. It also needs to trust that the learner's credit does concern the learning outcomes expected and these are at the appropriate level.

On the basis of the assessed outcomes, the credit can be validated and recognised by another competent institution. The transfer process includes three distinct stages:

1. The hosting institution assesses the learning outcomes achieved and awards credit to the learner. The learning outcomes achieved and corresponding ECVET points are recorded in a learner's personal transcript.

2. The sending institution then recognises learning outcomes that have been acquired; this recognition gives rise to the award of the

units and their corresponding ECVET points, according to the rules of the home system.

3. Credit accumulation is a process through which learners can acquire qualifications progressively by successive assessment and validation of learning outcomes. Accumulation of credit is decided by the competent institution responsible for the award of the qualification. When the learner has accumulated the credit required and when all conditions for the award of the qualification are fulfilled, the learner is awarded the qualification[2].

3. RINA'S PROFESSIONAL DEVELOPMENT REQUIREMENTS

As a graduate, a marine designer is only at the beginning of their professional career. The achievement and maintenance of professional competence, especially where it cannot be acquired solely by formal study, necessitates lifelong professional development. Professional development is acquisition, maintenance, improvement and broadening of knowledge, understanding and skills, and the development of personal qualities necessary to carry out their professional duties throughout a member's working life**. It is important to consider the difference between the role of a marine designer (industrial designer) and a naval architect**. Whilst both are of equal professional standing, within the industry, and work together in team, the marine designer has a primary focus on aesthetics design underpinned by technical knowledge of ergonomics and engineering technology, which facilitates an informed design process. Whereas, the naval architect has a detailed technical knowledge and engineering analysis capability, can complete the detailed realisation of design concepts, proposed by a marine designer.

The process of professional development whilst being continuous during a career, it is often consider as two stages: Initial professional Development (as an Associate Member) prior to achieving Corporate membership of the Institution (as a Member), and Continuing Professional Development (as a Member or Fellow) thereafter.

EBDIG-WFSV like its predecessor project EBDIG (The European Boat Design Innovation Group) is a Leonardo Transfer of Innovation (TOI) project which aims to provide innovative professional development training and networking to commercial marine industry employees (Naval Architects, project managers) by transferring embedded practices within automotive design, interior design and the leisure marine industry (Super yachts) which will enable the European commercial marine sector to understand and exploit growing design opportunities in the wind farm support vessel sector to produce more appealing working conditions for this new and growing sector to help recruit new staff and reduce the risk of human error.

This EU funded Leonardo project will create innovative learning materials for employees working within the marine industry and a networking framework for professionals. This will be achieved by transferring embedded practices within the automotive industry through courses in: Marine Design; Wind Farm Support Vessel design; WFSV Mother-Ship Design; Human Factors Integration (HFI). The courses will be delivered by an interactive web based called "Digital Innovation Studio".

4. AIMS AND OBJECTIVES OF EBDIG-WFSV MARINE DESIGN IPD/CPD MODULES

The aims of the EBDIG-WFSV IPD/CPD modules are:

a) To enable a Marine Designer to achieve a sound understanding of the design principles of the types of vessels in which they are currently involved (IPD)or a new type of vessel that they have no experience of designing (CPD)

b) To develop academic abilities appropriate to an honours graduate in order to analyse marine design problems and identify innovative and practical solutions.
c) To develop a range of personal, professional and transferrable skills to assist the professional/graduate to gain/enhance employment opportunities
d) To promote in the professional/graduate the aptitude and professional development and further study

The curriculum of the courses is given in **Appendix 1**.

Given the equal level of professional engagement in the design process between naval architects and marine designers (industrial design) and in order to achieve these aims and RINA accreditation the objectives the EBDIG IPD/CPD training courses learning outcomes are mapped against the RINA IPD development objectives for Naval Architects. (**Appendix 2**)

The objectives of the EBDIG IPD/CPD awards are:

(a) to achieve an appropriate appreciation of marine design and marine technology skills

(b) to perform practical analysis of design workflow excercises in marine design

(c) to demonstrate communication skills to explain and demonstrate such workflow and related technology systems.

d) to investigate and analyse innovative technologies relating to the marine industry, specifically the implementation of telematics.

e) to appreciate the regulatory considerations of thr design process in the marine industry

(f) to evaluate an individual and creative design project based on contemporary technology and needs within the marine industry.

(g) to excercise and enhance the range of personal/transferable skills as part of the learning process within the course

The implementation of the IPD/CPD modules relies upon the industry professional to engage in self- directed learning and record access time to the e-learning material, in accordance with RINA IPD/CPD logbook recommendations. Accreditation by an international body such as RINA overcomes the issue of transnational mobility, due to its engagement with the global marine industry. However, the opportunity for EBDIG to support vertical and horizontal mobility between higher education and VET in the long term, will inform the curriculum development. The vessel specific modules will have their learning time calculated in ECVET credit units (1 unit defined as 25-30 hours of learning time). These IPD/CPD units would need to have a formal assessment implemented through the academic partners of EBDIG WFSV to meet the ECVETS requirements. The potential Master level qualification would need to be examined[3].

5. CONCLUSION

In this paper the ECVET framework has been described and RINA's requirements for accreditation are identified.

This paper reported on the work of Piri Reis University in Turkey, as a partner in the EBDIG-WFSV and the previous EU funded EBDIG project, in supporting the development of EBDIG-WFSV curriculum and has established the ground work for ensuring that it is compliant with the requirements of ECVET. It is also now feasible to continue developing the curriculum so that is in line with the requirements of the RINA's IPD/CPD now that these requirements are identified.

A cross-referencing technique developed as part of the EU's EURITECNET project tested in several EU funded project has been used to ensure all requirements are met and EBDIG-

WFSV will be compliant with ECVET and ready for accreditation by RINA.

The paper included the outcome of the investigation into the ECVET framework to ensure that the EBDIG-WFSV courses are developed in line with this system's requirements and at the same time the course is on track to satisfy the requirements of the RINA' IPD and/or CPD.

With regard to the content of the course, given the equal level of intended professional engagement in the design process between naval architects and marine designers, the EBDIG IPD/CPD training course learning outcomes are mapped against RINA IPD development objectives for naval architects. In addition to the accreditation of EBDIG-WFSV IPD/CPD courses by an international chartered professional body such RINA, the opportunity for EBDIG-WFSV to support vertical and horizontal mobility of higher education and VET in the long run necessitates the implementation of ECVETs into this mapping process so that both RINA and ECVET requirements are met. It is also very important that a formal assessment of the EBDIG-WFSV course is implemented through the academic partners of EBDIG-WFSV and ensure that the assessment meets the ECVET requirements.

For a successful project outcome, it is very important that during the curriculum development process, the need to transform the curriculum as summarised in Appendix 1 below is addressed carefully and in some depth.

8. REFERENCES

1. [RINA CPD MANUAL], *[www.rina.org]*

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3. [EUROPEAN COMMISSION Education and Culture], "[The ECTS Users Guide]", *[European Commission],* [2009]

4. [CERTIPILOT], "[Maritime Pilots Qualification Under the ECVET and EQF]", *[CERTIPILOT European Project*], [2013]

7. AUTHERS BIOGRAPHY

Sezai IŞIK (MSE NA&ME) served in the Turkish Navy as Project Officer, Superintendent, Chief Engineer, Head of Ship Construction Department, and Turkish Navy Project Coordinator. After retirement from the Turkish Navy, he joined the TÜDEV teaching team and currently is a lecturer at Piri Reis University**.**

Professor Dr Reza Ziarati (BSc(Eng) PhD(Eng) CertEd FIEE FIMechE FIMarEST Ceng) holds the Chair of Marine Engineering at Piri Reis University and is the Vice Rector. He is also the Chairman of the Centre for Factories of the Future, UK, and currently supervises several PhD Programmes in the UK universities. He was a Teaching Quality Assessor for the UK Government Higher Education Funding Council as well as serving as the Examiner/Chief Examiner for major awarding bodies. He was an accreditor for IET and servided on the Engineering Council as the elected representative of West Midliand. He has initiated many UK and EU funded projects and was involved in the first EBDIG project.

Appendix 1: EBDIG-WFSV Curriculum

Module 1 - Maritime Human Factors

The aim of this module is to comprehend commercial marine vessel types, functions, limitations and solutions.

Intended Module Learning Outcomes

On completion of this module the student should be able to:

1. Carry out a comparative analysis of characteristics of the following vessel platform types: displacement monohull; planing monohull; SWATH; catamaran; Surface Effect Ship; hydrofoil
2. Identify the relationship between commercial vessel function and platform type
3. appreciate functional vessel limitations and solutions of : accommodations; access; safety; life at sea
4. Define the following symptomatic areas of concern relevant to the design and operation of marine vessels: Motion Sickness; Fatigue; Sleep loss; Injury; Human Error
5. Appreciate the influence of following Human stressors: Mental workload; airborne noise; whole body vibration; motion; impact; lighting issues; temperature extremes; lack of ventilation
6. Appreciate the significance of the following aspects of Human-Machine Interface: automation; controls; instrumentation; seating; General Arrangement (GA); crew size; HVAC; lighting; anthropometrics
7. understand the Ship as a Socio-Technical System and the potential of Human Systems Integration
8. Identify the details of the following approaches to Human Factors research and design: simulator testing and field research; computer modelling; questionnaires.

Indicative Content

- Peer-to-peer learning using blogs and VOIP (10%)
- Self-directed online learning and other self-directed learning (90%)

Module 2 - Marine Design

The aims of this module are:

- To introduce the skills, knowledge and understanding involved in Marine Design, as an Industrial Design approach
- To demonstrate the relevance of, and application of the Marine Design (Industrial Design) processes for a range of commercial marine vessels.
- To develop the ability to analyse and evaluate vessel design and enhance design decisions

Intended Module Learning Outcomes

On completion of this module the student should be able to:

1. Define Marine Design as an Industrial Design approach, its purpose and processes
2. Appreciate creative and lateral thinking methods
3. Identify the key stages of a number of Industrial Design processes
4. define innovation as a process in the context of Marine Design
5. have familiarity with the User-Centred Design process and emotional design
6. Appreciate the relevance and potential of Design-Driven Innovation
7. appreciate basic aesthetic principles and the principles of interior design
8. appreciate the impact of design upon the environment

Indicative Content

- Peer-to-peer learning using blogs and VOIP (10%)
- Self-directed online learning and other self-directed learning (90%)

Module 3 - Marine Design of Wind Farm Support Vessels (WFSV)

The aims of this module is to demonstrate the relevance of, and application of Marine Design in the design process of a Wind Farm Support Vessel

Intended Module Learning Outcomes

On completion of this module the student should be able to:

1. Identify the key stages of the User Centred Design process to determine mission requirements and platform design, including task analysis and the consideration of symptomatic areas of concern
2. Appreciate the application and potential of Emotional Design methodologies
3. Identify the key stages in Design-Driven Innovation scenario development
4. Appreciate the application of exterior form development
5. Appreciate the application of the principles of interior design and UCD analysis in the development of vessel General Arrangement (GA) and interior development
6. Identify the key considerations of the domains of Human Systems Integration for Wind Farm Support Vessels
7. Appreciate the application of Digital Human Modelling (DHM) to resolve both anthropometric and cognitive aspects of command and control
8. Appreciate the implications and challenges of design regulations for Wind Farm Support Vessels

Indicative Content

- Peer-to-peer learning using blogs and VOIP (10%)
- Self-directed online learning and other self-directed learning (90%)

Module 4 - Marine Design of Wind Farm Support Vessel Mothership

The aims of this module is to demonstrate the relevance of, and application of Marine Design in the design process of a Wind Farm Support Vessel mothership.

Intended Module Learning Outcomes

On completion of this module the student should be able to:

1. Identify the key stages of the User Centred Design process to determine mission requirements and platform design, including task analysis and the consideration of symptomatic areas of concern
2. Appreciate the application and potential of Emotional Design methodologies
3. Identify the key stages in Design-Driven Innovation scenario development
4. Appreciate the application of exterior form development
5. Appreciate the application of the principles of interior design and UCD analysis in the development of vessel General Arrangement (GA) and interior development
6. Identify the key considerations of the domains of Human Systems Integration for Wind Farm Support Vessel motherships
7. Appreciate the application of Digital Human Modeling (DHM) to resolve anthropometric aspects of key tasks
8. Appreciate the implications and challenges of design regulations for Wind Farm Support Vessels

Indicative Content

- Peer-to-peer learning using blogs and VOIP (10%)
- Self-directed online learning and other self-directed learning (90%)

Appendix 2 :
Mapping of EBDIG IPD/CPD course learning outcomes to RINA Associates professional developement objectives

EBDIG IPD/CPD course learning outcomes (Maritime Human Factors)	**RINA Associate Professional Developement Objectives**						
	(a) To achieve an appropriate appreciation of marine design and marine technology skills	(b) to perform practical analysis of design workflow excercises in marine design	(c) to demonstrate communication skills to explain and demonstrate such workflow and related technology systems	(d) to investigate and analyse innovative technologies relating to the marine industry, specifically the implementation of telematics	(e) to appreciate the regulatory considerations of the design process in the marine industry	(f) to evaluate an individual and creative design project based on contemporary technology and needs within the marine industry	(g) to excercise and enhance the range of personal/transferable skills as part of the learning process within the course
1.1 Carry out a comparative analysis of characteristics of the following vessel platform types: displacement monohull; planing monohull; SWATH; catamaran; Surface Effect Ship; hydrofoil	1						
1.2 Identify the relationship between commercial vessel function and platform type		1					
1.3 appreciate functional vessel limitations and solutions of : accommodations; access; safety; life at sea	1						

1.4 Define the following symptomatic areas of concern relevant to the design and operation of marine vessels: Motion Sickness; Fatigue; Sleep loss; Injury; Human Error	1						
1.5 Appreciate the influence of following Human stressors: Mental workload; airborne noise; whole body vibration; motion; impact; lighting issues; temperature extremes; lack of ventilation		1					
1.6 Appreciate the significance of the following aspects of Human-Machine Interface: automation; controls; instrumentation; seating; General Arrangement (GA); crew size; HVAC; lighting; anthropometrics		1					
1.7 understand the Ship as a Socio-Technical System and the potential of Human Systems Integration		1					

1.8 Identify the details of the following approaches to Human Factors research and design: simulator testing and field research; computer modelling; questionnaires.		1					

Mapping of EBDIG IPD/CPD course learning outcomes to RINA Associates professional developement objectives

EBDIG IPD/CPD course learning outcomes (Marine Design)	**RINA Associate Professional Developement Objectives**						
	(a) To achieve an appropriate appreciation of marine design and marine technology skills	(b) to perform practical analysis of design workflow excercises in marine design	(c) to demonstrate communication skills to explain and demonstrate such workflow and related technology systems	(d) to investigate and analyse innovative technologies relating to the marine industry, specifically the implementation of telematics	(e) to appreciate the regulatory considerations of the design process in the marine industry	(f) to evaluate an individual and creative design project based on contemporary technology and needs within the marine industry	(g) to excercise and enhance the range of personal/transferable skills as part of the learning process within the course
2.1 Define Marine Design as an Industrial Design approach, its purpose and processes	1						
2.2 Appreciate creative and lateral thinking methods		1	1				
2.3 Identify the key stages of a number of Industrial Design processes		1					
2.4 define innovation as a process in the context of Marine Design				1			
2.5 have familiarity with the User-Centred Design process and emotional design	1						

2.6 Appreciate the relevance and potential of Design-Driven Innovation				1			
2.7 appreciate basic aesthetic principles and the principles of interior design	1						
2.8 appreciate the impact of design upon the environment					1		

Mapping of EBDIG IPD/CPD course learning outcomes to RINA Associates professional developement objectives

EBDIG IPD/CPD course learning outcomes (Marine Design of Wind Farm Support Vessel/Mothership)	**RINA Associate Professional Developement Objectives**						
	(a) To achieve an appropriate appreciation of marine design and marine technology skills	(b) to perform practical analysis of design workflow excercises in marine design	(c) to demonstrate communication skills to explain and demonstrate such workflow and related technology systems	(d) to investigate and analyse innovative technologies relating to the marine industry, specifically the implementation of telematics	(e) to appreciate the regulatory considerations of the design process in the marine industry	(f) to evaluate an individual and creative design project based on contemporary technology and needs within the marine industry	(g) to excercise and enhance the range of personal/transferable skills as part of the learning process within the course
3.1 Identify the key stages of the User Centred Design process to determine mission requirements and platform design, including task analysis and the consideration of symptomatic areas of concern	1		1				
3.2 Appreciate the application and potential of Emotional Design methodologies	1		1				

3.3 Identify the key stages in Design-Driven Innovation scenario development							1
3.4Appreciate the application of exterior form development							1
3.5 Appreciate the application of the principles of interior design and UCD analysis in the development of vessel General Arrangement (GA) and interior development							1
3.6 Identify the key considerations of the domains of Human Systems Integration for Wind Farm Support Vessels		1					
3.7 Appreciate the application of Digital Human Modelling (DHM) to resolve both anthropometric and cognitive aspects of command and control						1	

3.8 Appreciate the implications and challenges of design regulations for Wind Farm Support Vessels					1		