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Maritime sector has always been influencing the global economy. Shipping facilitates the bulk transportation of raw material, oil and gas products, food and manufactured goods across international borders. Shipping is truly global in nature and it can easily be said that without shipping, the intercontinental trade of commodities would come to a standstill.

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DIGITALIZATION OF MARITIME EDUCATION AND TRAINING

Dr (Capt) Suresh Bhardwaj

Abstract
The digitalization push in the maritime operations and education and training in general is invariably influencing the field of Maritime Education and Training as well. However, the excitement with all the buzz and potentials of technology needs to be carefully weighed against its application in safety-critical, skills and competency based domain of shipping operations.

Key words: Digitization, Maritime Education and Training, Competency Based Assessments

1. THE DIGITALIZATION PUSH:

Digitalization in education refers to the use of desktop computers, mobile devices, the Internet, software applications, and other types of digital technology to teach students of all ages. Test-taking using a computer, online universities, e-books, and edutainment are just a few examples of digitalization in education today. The term “digital training solutions” encompasses a much wider choice of training techniques than just self-paced e-learning.

Today, due to accelerating processing speeds, increased memory capacity and the decreasing cost of hardware, computer based training and assessment has made much inroads. The power of hardware and sophistication of software design now allow desktop-based multi-media presentations, simulation exercises and virtual reality solutions to work effectively in individual, local, wide-area and Internet environments. Computers are popular for their ability to rapidly store and recover data, respond to a user interaction, and integrate multi-media applications which can incorporate visual, audio and physical stimulus.

Simulations mimic the real world in computer models. In the context of training, simulations denote any application where the user changes some interactive control and sees the outcome. Often, gamification of training is connected to simulations in digital solutions. There are various maritime applications in simulation-based training, example, computer simulations with suitable graphics can help trainees to learn and retain qualitative relations, e.g., between ship form parameters and stability (Baldauf et al. 2018).
Virtual Reality (VR) for us means a computer-generated 3-D space to navigate through, with control devices allowing manipulation, operation, and possibly control of items in this 3-D space.

Augmented Reality (AR) combines real world with overlaid computer-generated images. A typical application is a nautical simulator which combines a real bridge with a simulated outside world. The approach is ideal with scenario-based learning, where a given task in a scenario has to be solved, e.g., handling a rudder failure without causing an accident (Lukas, 2010).

So, here we have new training tools, and the demos from vendors are impressive. There is a new-found optimism, a spirit of a new beginning, where we will leave the drab, underfunded old world of classroom training in dull engineering/regulatory topics behind us, and enter a new world of exciting training options, with videos, Virtual Reality, and gaming to make training memorable and fun.

2. THE CAVEAT:

Some educators and technology evangelists amongst us believe that eventually Maritime Education and Training (MET) will be an entirely digital pursuit, fortified by artificial intelligence and virtual reality.

There is a caveat though:

Seafaring is a practical and demanding profession, requiring fast and accurate analysis of situations; and swift, decisive action. Candidates for seafaring jobs are therefore, expected to exhibit a balance of cognitive, affective and psychomotor skills. In addition, in an increasingly complex workplace that ships are getting, seafarers require a high level of teamwork and interpersonal skills in order to function effectively.

If the intention is to replace a well-designed training and exercise session supported by a good trainer with Computer Based Training (CBT) material alone, it should be realised that it is possible to impart a lot of knowledge, but individuals may not be able to put it into practice,
due to the lack of tangible and physical environment, the lack of team support, and the lack of
the necessary human interaction.

In safety critical industries such as shipping characterised by high-risk workplaces, any changes
to training and assessment methodologies must be aimed at enhancing critical skills as opposed
to commercial expedience or just fad.

The findings of some early measures suggest that many people might be entering the
occupation with questionable qualifications owing to the unreliability of the new assessment
methods. Not only is the safety of shipping put at risk, including the safety of individual
workers, the cost for ship owners is increased by the need to introduce separate assessment and
basic re-training procedures and recruitment level.

Therefore, whilst digitalization has many potential advantages, its design and application,
particularly in safety-critical areas like seafaring can be problematic and must be considered
carefully (IMO, 2002).

In shipping, the haphazard ways in which digitalization is currently being implemented pose
possible dangers to workers’ lives and to the environment.

3. DIGITALIZED ASSESSMENTS AND E-EXAMINATIONS:

There is a study commissioned by EMSA (European Maritime Safety Agency) and conducted
by SIRC (Seafarers International Research Centre, Cardiff University) in 2009-10 titled CBA
in MET (Gekara et al, 2011). It revealed that CBA in seafarer’s licensing examinations has
been mainly driven by three factors; increasing examiner workload, the need for objectivity
and consistency and the need to meet growing international demand for officers. It might seem
therefore that Maritime Administrations are primarily motivated by cost and practicality as
opposed to the pedagogic issues of validity (the ability of an assessment to effectively test that
which it is intended to), and reliability (consistency of testing across a range of instruments,
environments, assessors, and time).

There are different aspects of validity in assessment, including content validity, construct
validity, criterion validity, and predictive validity, all of which describe ways in which various
Assessment instruments may be employed to achieve robust and meaningful assessment outcomes.

*Construct validity* refers to the ‘degree to which elements of an assessment instrument are relevant to and representative of the targeted construct for a particular assessment purpose’. *Content validity* is how the assessment material relates to the core objectives of the training. *Criterion validity* is the correlation between test results to the expected external behaviour based on predetermined criteria.

An important part of the discussion of validity in competency-based training such as MET relates to *authentic assessment* and *predictive validity*. The proponents of *authentic assessment* have argued that for an assessment to be robust, it must closely simulate the real-life work environment in which candidates are expected to apply their acquired knowledge, skills and competencies. The results of one’s test should, therefore be closely *predictive* of candidates’ performance in real-life employment situations.

This involves fulfilling all the aspects of *validity*.

So CBA (Computer based Assessment) like MCQ (Multiple Choice Questions) within the safety-critical field of maritime education and training (MET), particularly, in relation to the *summative assessment* (outcomes) of seafarers for licensing purposes is highly inadequate. CBA may be useful in testing basic knowledge recall (which may be promoted by rote learning), but can CBA be usefully applied in relation to the assessment of higher cognitive skills such as *comprehension, application, analysis, synthesis, and evaluation*, is highly questionable. And then there are issues like Security and Corruption as well.

Vocational Education and Training assessment is designed to determine the extent to which a trainee has effectively acquired the skills and competencies along with knowledge that is required by the employers. Across a range of occupations, such testing has traditionally comprised a portfolio of practical on-the-job assessments. MET has already in place some good systems prescribed under the STCW (Standards of Training, Certification and Watch-keeping), like the structured training record book that accompanies the mandatory on-board apprenticeship, and laboratory / simulator based courses.
The tests typically based on simulator scenarios are developed by instructors and tested and approved by Maritime Administration examiners. The selection of test scenarios is undertaken by a designated external examiner/invigilator, normally assigned from the Maritime Administration.

On the engine side candidates are tested using simulation scenarios based on any one of the essential engine systems. The engine systems on which training and test scenarios are commonly based include the boiler system, the fresh water generator system, the lubrication oil system, heavy fuel separator and the diesel generator. The assessment essentially requires candidates to ‘line-up’ (prepare) the system, start it and ‘watch-keep’ (monitor) its operation throughout the session. Test time typically is about 30 minutes with an equal allocation for preparation. Two engine problems are programmed to occur during the simulation exercise, which candidates have to resolve. Problem resolution is allocated about seven minutes. Candidates lose marks if they delay or fail to solve the assigned problems. Problems are signalled by alarm indicating the location of the problem but not its nature. The task, therefore, includes analysing and determining the cause of the problem and affecting a solution. Scoring utilises a built-in automatic point-deduction programme whereby candidates’ marks reduce as the exercise proceeds depending on the speed with which they started the engine, maintained it and problem solved. In instances where the problem set was not critical to the operation of the system, the candidate could move on to the next stage of the test without solving it. In such cases candidates lose 20 points. Where a problem is critical candidates automatically get failed if they are unable to resolve it. The test pass mark is 70%.

Practical assessment for deck officers similarly lasts 30 minutes and covers navigation, manoeuvring, docking, and collision avoidance. Using simulations candidates are required to manoeuvre a vessel under predetermined traffic and weather conditions. They are for instance, required to make sure that the vessel maintains course and speed, stays a certain safe distance from other vessels and the shore and maintains the required safe draft (minimum depth of water).

Like the engine tests, performance is automatically scored on a point-deduction basis: candidates are penalised for mistakes and lost time. Particular errors result in automatic failure, for example, grounding, collision or a failure to complete the ‘voyage’ within the set time. In order to effectively test candidates’ skills a number of traffic distractions are incorporated into
test scenarios, for example other vessels approaching and manoeuvring. After 30 minutes the test gets terminated automatically and the test results, including a detailed graphic representation of the route taken by the candidate is printed off and signed by the examiner. The pass mark is 70%.

4. CONCLUSION:

Digital training solutions are more than the (in)famous e-learning. Matter of fact there is a newfound optimism and excitement. But the excitement sooner wanes as we find funding not meeting up to expectations, as some of the technology enabled learning resources can be prohibitively expensive. So also, there is very limited area rendering suitable application. This kind of disappointment is common in technology hype. Many initiatives start by attempting to boil the ocean and not by focusing on something smaller and attainable (Bertram and Plowman, 2019).

There is of course no doubt that we will see digital training solutions on the rise. But we will see classroom training possibly improved by adapting some of the brain-friendly training techniques that come with the new wave of digital training, and thus a lot of blended learning, in various ranges as they address different training needs.

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