Maritime training: Past, Present and the Future – VR, AR and Machine learning…….

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Abstract:

All kinds of industries are taking baby steps towards VR, AI & AR technologies. It looks like the VR& AI technology will mature in future to set a trend. Maritime industry has taken initiatives to bring up safe working practice, blue revolution, safety of seafarers and machine intelligent training for operating of the new technology in industry. The paper briefly discusses about the traditional training followed from past to e-learning at present. In this kind of conventional training the grasping power of trainees differs from student to student. So, the world is developing its technology rapidly and the youth of today are very much interested in handling electronic gadgets. If this point is taken into consideration, by training the students with AI & VR equipment, comparatively the knowledge gained by the students will be more to conventional training. So, below we have discussed how the new technology growing up in other industries could impact the shipping industry as well as – Maritime training institutes (MTI's).

Keywords: Traditional training, e-learning, artificial intelligence, virtual reality augmented reality.

Conventional training:

Traditionally, the primary educational technique of traditional education was simple oral recitation, in a typical approach, students sat quietly at their places and listened to one student after another recite his or her lesson, until each had been called upon. The teacher's primary activity was assigning and listening to these recitations; students studied and memorized the assignments at home. It was also an extremely inefficient use of students and teachers time. This traditional approach also insisted that all students been taught the same materials at the same point; students those did not learn quickly enough failed. The conventional educator, on the other hand, regards truth not as something that the soul can perceive but as something relative and subjective. You have your truth; I have mine. That is synonymous for, "There is no truth." In addition, it lays the foundation for a teaching approach and a curriculum that is ordered to the emptiness that I claimed above was the ultimate goal of conventional education. Education should be a right for all, irrespective of their socio-economic standing. In addition, in some ways, the conventional mode is not able to take in everyone, as it is not prepared for the diversity of situations.

In a conventional set up, the teacher or faculty delivers a lecture, students take notes and in between there is interaction on a given topic or subject. The format is clear-cut and often faculty driven. Interaction or lack of it depends on the faculty. The amount of time invested is often critical, not just for students' but also for faculty.

Challenges with lecture-based learning:

The teacher has a dominant role in most classroom activities. The student becomes a passive participant in learning as lessons are pre-planned and designed for the needs of the group. Goals are set for the group with no opportunity for individual planning. The responsibility for identifying problem behaviours and resolving problems is placed on the teacher. Poor behaviour is often tolerated until it becomes extreme. Punishment is the primary outcome and conflict resolution training is often ignored.

Subjects are often taught without the meaningful context of relating them to other subjects to engage the student's interest. Reinforcement of learning comes through the external evaluation of the teacher and comparisons with others through grade assignments. Students may become discouraged from learning as they compare themselves to others. Homework may take several hours a night. This is a result of group goal setting with limited class time for student comprehension. Concepts are quickly introduced in the class and mastered/memorized at home.

1. **Its passive**: Probably the main argument levied against lecture-based classroom styles involves how little it truly engages students. Breaking up the monotony with activities like quick papers,

merely punctuating lectures with something more interactive might be all a teacher really needs to get students learning and retaining knowledge.

2. **It does not engage every learning style:** Only visual/verbal and auditory/verbal learners get anything out of lectures, so tactile/kinaesthetic and visual/nonverbal students end up falling behind. Educators who fear their courses might not completely reach all styles might want to explore different ways to infuse other activities and projects into the syllabus so everyone gets a chance to see lessons in a way that makes sense.

3. **It facilitates rote learning above all else:** Listening to lessons on repeat only works best for some subjects, not all, and its main drawback involves compromising critical thinking skills.

4. **It's biased:** The most effective education allows students to consider content from multiple angles and form opinions accordingly, not just perpetually parrot back what teachers spoon-feed into their cranial meats.

5. **It precludes discussion:** Only allowing the teacher a forum to express his or her personal views shuts out all other insights, which leaves students feeling excluded from their own educations.

6. **It's not the right fit for every subject:** The arts, math's, and sciences especially benefit from more interactive, hands-on approaches, three subjects one would expect more talk-based approaches — might not completely rock the lecture-based structure, either.

7. **Minimal student feedback:** If a teacher just stands there talking to the class, there is no real way to fully grasp whether students understand the subject until assignment or test time rolls around, different learners absorb lessons in a more comfortable way, but it also allows them to inquire about anything particularly confusing as well.

8. **Not every teacher excels at public speaking:** Poor communicators can seriously screw over different learners, even if they typically benefit from traditional lecture structures.

9. **Not every attention span lasts that long:** The average attention span is 10 minutes in university students; say some disconcerting studies, which is not exactly conducive to most classes. Others posit the number might hover between 15 and 25. They provide all the education of a traditional lecture — if not more — without wasting money on slashing periods down.

10. **It only nurtures a limited range of skill sets:** As a passive format, creativity, critical thinking, analysis, and other more active ingredients in a valuable education receive little attention. Lectures certainly fortify memorization and note taking, but they are not the only abilities students need to succeed.

Common Problems Faced by Students In eLearning:

1. Adaptability Struggle
2. Technical Issues
3. Computer Literacy
4. Time Management
5. Self-Motivation

Human brain: According to Zabisco, the average person responds far better to visual information compared to just plain text. Whether you are buying a product or revising for an exam, visual stimulation over text translation allows the brain to consume the material with more consummate ease.

Well first off, it could be something to do with the fact that 90% of information transmitted to the brain is visual, and visuals are processed in the brain at 60,000 times the speed of text. In other words, we look at pictures and videos regularly and we consume them more quickly than we do text.

Virtual reality: A computer technology uses virtual reality headsets, sometimes in combination with physical spaces or multi-projected environment to generate realistic images, sounds and other sensations that stimulate a user's physical presence in a virtual world or imaginary environment. On a computer VR is primarily experienced through two of the five senses: sight and sound.

How it works? VR tricks our brain into believing we are in a 3D world. The first way VR does this is with the stereoscopic display. This works by displaying two slightly different angles of the scene to each eye, simulating depth. This along with other ways to stimulate depth like the one parallax (slower movement of objects when seen from far), shading and techniques create an almost life like experience. An example of stereoscopic display is below.

Fig 1. Different angles of scene to each eye(target point)

MILITARY: VR useful for training soldiers for combat situations or other dangerous settings where they have to learn how to react in an appropriate manner. Virtual reality simulation enables them to do so but without the risk of death or a serious injury. They can re-enact a particular scenario, for example engagement with an enemy in an environment in which they experience this but without the real world risks. This has proven to be safer and less costly than traditional training methods.

HEALTH CARE: Healthcare is one of the biggest adopters of VR, which encompasses surgery simulation, phobia treatment, robotic surgery, and skills training. One of the advantages of this technology is that it allows healthcare professionals to learn new skills as well as refreshing existing ones in a safe environment. In addition, it allows this without causing any danger to the patients.

BUSINESS: Virtual reality is being used in a number of ways by the business community, which include:
- Virtual tours of a business environment
- Training of new employees
- A 360 view of a product

Many businesses have embraced virtual reality as a cost-effective way of developing a product or service. For example, it enables them to test a prototype without having to develop several versions of this which can be time consuming and expensive. In addition, it is a good way of detecting design

SPORTS: VR is used as a training aid in many sports such as golf, athletics, skiing, cycling etc. It is used as an aid to measuring athletic performance as well as analysing technique and is designed to help

with both of these. It also used in clothing/equipment design and as part of the drive to improve the audience's experience.

EDUCATION: Education is another area, which has adopted VR for teaching and learning situations. The advantage of this is that it enables large groups of students to interact with each other as well as within a three-dimensional environment. It is able to present complex data in an accessible way to students, which is both fun and easy to learn. In addition, these students can interact with the objects in that environment in order to discover more about them.

So, it makes sense to implement virtual reality as one of several forms of technology in order to educate tomorrow 's technological elite. Education has moved on from books, pencils and pens to the use of interactive technologies to help impart knowledge and understanding.

Artificial intelligence:

It is a way of making a computer, a computer-controlled robot, or a software think intelligently, in the similar manner the intelligent humans think.AI is accomplished by studying how human brain thinks, and how humans learn, decide, and work while trying to solve a problem, and then using the outcomes of this study as a basis of developing intelligent software and systems.

How it works?

There is no single way in which artificial intelligence works. One definition of AI is when a computer can solve a problem that normally requires a level of intelligence. Over the past 60 or so years, many different approaches to solving a wide variety of problems have been discovered by AI researchers. For example, chess can now be played by computers such as Deep Blue at a Grand Master level. It works by examining many thousands of chessboard configurations, to see the future result of making particular moves. Another example is expert systems, which solve problems in areas such as medicine and engineering by duplicating the problem solving performed by real human experts. Other problems are more difficult. For example, making computers read and communicate in English is very challenging, and is far from solved.

Goals of Artificial Intelligence:

- **To Create Expert Systems** − The systems which exhibit intelligent behaviour, learn, demonstrate, explain, and advice its users.
- **To Implement Human Intelligence in Machines** − Creating systems that understand, think, learn, and behave like humans.

Applications of AI:

1. **Gaming:** AI plays crucial role in strategic games such as chess, poker, tic-tac-toe, etc., where machine can think of large number of possible positions based on heuristic knowledge.

2. **Natural Language Processing:** It is possible to interact with the computer that understands natural language spoken by humans.

3. **Expert Systems**: There are some applications which integrate machine, software, and special information to impart reasoning and advising. They provide explanation and advice to the users.

4. **Vision Systems:** These systems understand, interpret, and comprehend visual input on the computer. For example;

➤ A spying aeroplane takes photographs, which are used to figure out spatial information or map of the areas.
➤ Doctors use clinical expert system to diagnose the patient.
➤ Police use computer software that can recognize the face of criminal with the stored portrait made by forensic artist.

5. **Speech Recognition:** Some intelligent systems are capable of hearing and comprehending the language in terms of sentences and their meanings while a human talk to it. It can handle different accents, slang words, noise in the background, change in human's noise due to cold, etc.

6. **Handwriting Recognition:** The handwriting recognition software reads the text written on paper by a pen or on screen by a stylus. It can recognize the shapes of the letters and convert it into editable text.

Implementation of VR and AI in shipping industry:

The next five to ten years will be decisive for virtual reality. While consumers today feel a bit intimidated by the price of VR technology, the interest in the industry is far from going flat. Virtual realities are steadily finding its niche in the market and begin to make an impact on the business world.

Robert Bryan and Adam Bullas from Opace, a Birmingham-based digital marketing agency, have recently published detailed research on the possible intersections of VR and the business like:

1. One stop engineering knowledge shopping
2. Addressing the needs of industry
3. Experience the design functionality

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Benefits of VR and AI:
• Teach more with less as the cost of equipment.
• Ensures safe working environment to eliminate serious risks.
• Trainee can work on an oil rig as real time experience.
• Access to perform important safety operations simulating real life scenarios in various weather conditions.
• Equipment can be updated in the field without huge new capital outlays for equipment.
• Learn by doing – engaging situations that mirror real life scenarios by trainees.
• No requirement of physical infrastructure by spending huge amount to install labs.

Advantages of using VR and AI In the maritime training:

1. **Students as Creators:** While research centres will continue to build advanced immersive labs, the developments in standalone VR headsets and software platforms like Unity and Unreal engine are driving a democratization of immersive experiences. New VR native applications like Tilt Brush will enable our trainees to become creators in virtual worlds. They will not only have the opportunity to observe unseen phenomena but to prototype solutions to complex problems.

2. **Provides Outstanding Visualizations that are not possible in the Traditional Classroom:** Virtual reality is great because it lets us explore different realities and alternate our experiences. By wearing a VR headset, you are encountering high-quality visualizations that can mark you in a positive way.

3. **Creates Interest:** No matter what age they have, students will always love to sit and watch something instead of reading it. The VR technology is quite interesting, as it can create amazing experiences that could never be "lived" in the real life. Students will definitely feel more motivated to learn with the use of this technology.

4. **Increases Students' Engagement:** Nowadays, teachers find it very hard to create a productive engagement within the class. With the virtual reality technology present in the education, this aspect will forever disappear, as most of the students will feel tempted to talk about their experiences within their virtual reality.

5. **Doesn't Feel Like Work**: Let us face it; placing a headset on your head and watching stuff flash before your eyes, learning new information through videos and amazing visualizations, it does not look like work. If we can make education fun, trainees will love to learn more stuff and be more ambitious. This is a general rule. When we enjoy doing something, we will do it with more interest, we will do it better, and we will not feel like we are doing something painful.

6. **Improves the Quality of Education in Different Fields:** The content writing and editing field. Virtual reality can often help at find mistakes in content and provide awesome editing features.

7. **Eliminates the Language Barrier:** With virtual reality, every possible language can be implemented within the software. Therefore, language will no longer represent a barrier for student's education plans.

8. **Digital Assistants:** Highly advanced organizations use 'avatars 'who can actually interact with the users, thus saving the need of human resources, the robots think logically and take the right program decisions. Emotions are associated with moods that can cloud judgment and affect human efficiency. This is completely ruled out for machine intelligence.

9. **Difficult Exploration:** Artificial intelligence and the science of robotics can be put to use in mining and other fuel exploration processes. Not only that, these complex machines can be used for exploring the ocean floor and hence overcoming the human limitations. Due to the programming of the robots, they can perform more laborious and hard work with greater responsibility. They do not wear out easily.

Advantages of VR and AI in MTI's: The use of virtual reality and cloud-based simulation engines promises to train automatons in real-world scenarios through simulated trial and error without endangering real people and real things.

Challenges of Using VR and AI In maritime training:

1. Deteriorates Human Connections: While virtual reality can be a great asset for most of the existent fields of activity, it can also be a huge disadvantage. The traditional education is based on personal human communication and interpersonal connections.

2. Lack of Flexibility: If in class you can be flexible, ask questions, receive answers, using a virtual reality headset is a different experience. This lack of flexibility can be a disadvantage for most of the students, and that is because education is not a fixed activity. It always fluctuates!

3. Functionality Issues: Like with any programmed software, things can often go wrong. When things go wrong, you students' learning activity is over until the tool is fixed. This can be quite expensive and inconvenient.

4. Addiction to the Virtual World: The possibility of students getting addicted to their virtual world is also big, if what people experience is better than their normal existence, there is quite a big chance of them becoming addicted.

5. Quite Expensive: Advanced technology is often expensive, but it is one-time investment. If we wish to expand this virtual reality trend and reach the masses, we have to spend billions of dollars on these features. More than that, the modern education that takes advantage of the virtual reality environment will only be accessed by the rich ones. The poor will not afford it; therefore, we will create inequality in education.

6. Lack of compute power: AI – specifically the machine learning and deep learning techniques, which show the most promise, require a huge number of calculations to be made very quickly. This means they use a lot of processing power.

Conclusion for challenges of VR and AI in MTI's:

Virtual reality environment is consistently evolving. It brings dozens of benefits to almost any field. A word of caution – it is double edged sword - it can also prove to be harmful. We believe that the modernization of education with virtual reality can be quite a productive accomplishment.

Programming without AI	Programming with AI
A computer program without AI can answer the specific questions it is meant to solve.	A computer program with AI can answer the generic questions it is meant to solve.
Modification in the program leads to change in its structure	AI programs can absorb new modifications by putting highly independent pieces of information together. Hence, you can modify even a minute piece of information of program without affecting its structure.
Modification is not quick and easy .it may lead to affecting the program adversely.	Quick and easy program modification

AR makes it possible to merge the real and the digital world, creating a unique space "Mixed reality."

Augmented reality (AR) system combines the real world with virtual information and provides expanded and information-rich view of the environment to the user. The AR systems have been around for a few decades but their number started to grow significantly only during the past few years.

The following have propelled the rapid development of the AR.
- Recent advances in technology,
- Lower cost of otherwise expensive equipment and
- Development of the smart handheld-device market

It has literally become a part of everyday life.

Two of the main reasons that augmented reality can provide valuable solutions, are the following:

- **Training becomes visual:** the learning process becomes more appealing than in the traditional way. Real-life experiences taken in to the digital world.
- **Learning is safer:** Workers can gain familiarization with complex situations and risky environments and they can practice in real life scenarios until they are near perfect.

Marine AR and VR applications

Many fields already benefit from AR technology. Significant achievements have already been done in agriculture, architecture, art, collaboration, games, exposure therapy, education, medicine, military, sales & e-commerce, tourism and, especially interesting for us, the use of AR at and under the sea. Hence, the marine AR applications are described in more details below.

Ship simulators: Ship simulators are maybe the best known and exploited marine application though they are closer to the virtual than the real. Ship's bridge simulators are commonly used to simulate movements into and out of major ports around the world and train maritime officers to use ship systems in a controlled real time environment. It is also an important training tool that prepares deck personnel for what they could expect once they step onto a vessel. The ship's bridge simulator is usually integrated with the Dynamic Positioning, Engine Room, and Cargo Handling simulators, which allows abroad range of realistic training scenarios.

Shipbuilding: Virtual Reality is used as a tool for design review by some of the leading shipyards in Germany. Participants of various disciplines and stakeholders have an opportunity to test and evaluate present model while design is still in a developmental stage. Virtual models that replace real ones may be used to inform customers and public about new products, i.e. ships and offshore installations.

Electronic Navigational Aids: Electronic Navigational Aids available on-board today's ships provide extensive information to help navigation but often force deck officers to turn their attention away from watch-keeping duty. Fusion of all added information into a one easy-to-perceive display of the ship's navigational and voyage related data would ensure optimal use of all resources available without interrupting ships operational procedures. It improves safety of navigation, collision avoidance, ship security and environmental protection by integrating together a variety of electronic navigational and communications systems, e.g. automatic identification system (AIS), vessel traffic services (VTS) or automatic radar plotting aids (ARPA) with nautical charts, satellite photos or other on-board systems and sensors.

Dynamic positioning: The use of AR technology as aid for Dynamic Positioning Operator is more concept of the future than of the present. Potential is, however, enormous. DPO (dynamic positioning operator) will be wearing AR goggles. In addition to seeing the sea, the ships and structures on it – we could lay on information about the sub-sea environment, the current, the cable route, the fact that the vessel ahead was having problems holding station, etc, etc… all the information that exists, but which we maybe never know or never see visualised suddenly becomes part of our decision-making process.

With the AR system working in tandem with the human element and the DP equipment we can trigger warnings, develop scenario and simulate the outcome of actions.

Underwater Augmented Reality (UWAR): During underwater work, divers are exposed to demanding physiological circumstances such as high pressure, poor visibility, weightless condition, water temperature, hearing limitations and lack of orientation. This can have a significant impact on behaviour and mental processing of divers, causing psychological effects e.g. anxiety, panic or memory disorders. These effects can be mitigated by assisting divers in locating the work site, keeping them informed about their position and orientation, and providing a 3-D virtual guide for the working task. UWAR system provides such visual aids, to divers improving both performance and safety of the underwater work.

Maintenance with AR: Another promising application of AR is the assistance in assembly, maintenance and repair of complex systems. Instructions, drawings, procedures and 3-D virtual guides overlaid in real time on see-through image of the actual equipment can help engineers to complete their job safer, easier and faster. First applications of this type were developed almost 20 years ago at Columbia University and Boeing. A new AR system developed at Columbia University helps marine mechanics carry out repair work. Marine mechanics perform maintenance and repair of complex machinery, very often in a tight space. Instead of carrying laptop and paper documentation with them, mechanics wear a head-worn display while AR system generates virtual layers of text instructions, labels and warnings, 3-D guiding arrows and 3-D models of the appropriate tools. A smart phone with touch screen is attached to the mechanic's wrist and is used for user-AR system interaction. Initial testing of the A application suggests that it can help users to perform their maintenance tasks in almost half the usual time.

Augmented Reality under water

Creating an underwater AR system is still a challenge. It has to fulfil some additional requirements. The system has to be waterproof, has to withstand the high pressure of diving depth and cannot rely on GPS. These requirements result in the AR system which has to use specialized sensors, has to be robust, and is therefore difficult to design and expensive.

Researchers from the Fraunhofer Institute for Applied Information Technology FIT, Germany developed the system which allows people to discover underwater word of corals, fishes or fairy-tale wrecks in a swimming pool in a comfortable and safe way, see Figure (source: Fraunhofer FIT web site, page: Underwater AR).

Augmented Reality techniques visually enhance a regular swimming pool with virtual objects, upgrading it to a virtual coral reef with shoals, mussels and weeds. The system main components are waterproof display and camera integrated into diver's mask, mobile PC in the diver's backpack and inertial and magnetic tracking system. Based on camera image, diver's orientation and pre-programmed scenario, the system generates visual representations of the virtual 3-D scenes.

How can shipping companies use AR for training?

Augmented reality, like any other cutting-edge technology, can help shipping companies accelerate and simplify their processes. It is comparable to switching from pen and paper to a computer and will provide new tools to execute tasks faster and more intelligently.

It will also improve the performance of workers.

- In the aviation industry it was reported that the use of an AR headset to help a GE technician wire a wind turbines control box improved a worker's performance by 34% on first use.

- Instead of looking at a general arrangement drawing (GA) plan on a screen, workers could look at the entire ship in 3D on a table in front of them. They could look at it from all angles, virtually highlight certain areas, or display the main engine, making the interaction feel more natural instead of looking at a screen.

Rather than immersing us in an alternate universe as virtual reality does:

Devices that use augmented reality enhance our actual surroundings by adding holograms into our field of vision to interact with. AR makes it possible to merge the real and the digital world, creating a mixed reality. There are almost unlimited possibilities, especially as the technology progresses

- Using AR devices means screens and monitors could also become obsolete, with employees able to access cloud-based data wherever they are working.
- It will render a lot of hardware redundant. Just as the smart phone included the functionality of a lot of gadgets, such as a camera, telephone, calendar or calculator, AR devices go one step further.
- For ship inspections, inspectors will no longer need to take additional equipment with them, because the questionnaire could be displayed directly in the room and pictures could be taken with the camera within the device.

Communication benefits.

- The industry is already working on projects that make it possible to have virtual meetings.
- Holoportation is a new type of 3D capture technology that allows high-quality 3D models of people to be reconstructed, compressed and transmitted anywhere in the world in real time.
- When combined with mixed reality displays such as HoloLens, this technology allows users to see, hear and interact with remote participants in 3D, as if they are in the room.
- Communicating and interacting with remote users will become as natural as face-to-face communication.

Challenges and limitations of AR

Technological: There are still several technical challenges AR needs to overcome. Geo-tagging is based on accurate positioning of a mobile device. Unfortunately, a GPS used in handheld devices is only accurate to within 3-15 meters. There are more accurate options (DGPS, WASS etc.) available on the market but both size and price are still not capable to satisfy the handheld market. Inability to work indoors or underwater is yet another GPS constraint.

Sociological: What may happen, for instance in tourism, is that people may prefer to use their AR applications rather than an experienced tour guide. People can even prefer to take a virtual tour of interesting destination instead of travelling there and experience it on their own. This phenomenon may lead to some kind of social alienation where people, instead of socializing and travelling, stay in their rooms. On the other hand, the AR experience of the popular destination could make them more eager to travel to the spot.

Privacy: AR applications that support face-tagging, allow users to instantly see information about people around them from their social networks online profile les (Facebook, LinkedIn etc.). People willingly put personal information online but it may be quite shocking to just meet someone who already knows so much about you, your life and family. Further development of face-tagging and similar applications will bring up a lot of privacy issues to the world or AR.

There are many other issues related to AR:
Unauthorized advertising, security and spam are just examples of new, emerging problems whose number will increase together with the number of users and applications.

Can a machine think and behave as humans do?

**Artificial intelligence represents a new way of interfacing with data:**

- With the cost of sensors, data storage, and analytics plunging, nearly every industry can now produce Exabyte's of data concerning its daily operations, from the temperature of a computer processor to the vibration in a bearing.

- Artificial intelligence promises to simplify the analysis of all this data by optimizing the analytic process.

- By shifting data optimization from humans to computer programs, useful insights into patterns, trends, and applications can be rapidly developed and executed. Some of the technologies developed by shipping companies are discussed below.

Used cases:

1. **Mitsui O.S.K. Lines, Ltd. (MOL)** announced that it teamed up with Fujitsu Laboratories Ltd., and Tokyo University of Marine Science and Technology to verify the accuracy of technology to estimate vessel performance at sea by applying **Fujitsu's artificial intelligence (AI) technology**, This project is a part of MOL's initiative to assess the effectiveness of AI technology, and aims to reduce fuel consumption and vessels' environmental impact by verifying the accuracy of the technology, using Fujitsu's AI Technology to estimate vessel performance at sea.

2. **Eco Marine Power** announced that it will begin using the Neural Network Console provided by Sony Network Communications Inc. as part of a strategy to incorporate Artificial Intelligence (AI) into various ongoing ship related technology projects including the further development of the patented Aquarius MRE (Marine Renewable Energy) and Energy Sail. The **Neural Network Console** is an integrated development environment using deep learning for AI creation and has been used in deep learning applied technology development within Sony since 2015.Various functions are included such as recognition technology and a full-fledged GUI (graphical user interface) and these allow deep learning programs to be developed. Deep learning refers to a form of machine learning that uses neural networks modelled after the human brain and is notable for its high versatility with applications in a wide variety of fields including signal processing, and robotics.

3. **Mitsui O.S.K. Lines, Ltd. (MOL)** announced the development of a mariner safety education tool goggle, which uses virtual reality (VR) technology created by Tsumiki Seisaku Co. Ltd. As explained, the tool uses VR technology to re-enact various training scenarios and work operations, offering a new level of realism and immersion. The new VR safety education tool works on easily portable VR goggles, allowing seafarers to train safely in any location, on board or in an office or training centre. This is expected to increase seafarers' safety awareness and contribute to the minimization of on board accidents caused by unsafe behaviour.

4. **K Line LNG Shipping (UK) Ltd** - During the 2017 SAFETY4SEA Conference, Mr.Yuzuro Goto, Managing Director, talked about a 3D simulation tool, developed by Propel that his company uses for training crew on board. In addition, propel has developed a 3D-simulation model, entitled **SAYFR,** in an effort to allow people on board and ashore to interact in different scenarios.

5. **Centre of Excellence in Maritime Safety (CEMS)** developed in collaboration with **Kongsberg Digital** is providing Virtual Reality solutions for enhanced training experiences with the use of mixed reality, virtual reality, augmented reality and augmented virtual reality.

6. **Wärtsilä Seals & Bearings** introduced augmented reality and smart glasses in stern tube seals & bearings services, to improve repair and maintenance operations. With these glasses, the person on site can send and receive visual images, listen to the specialist's advice, and receive written instructions right in front of his eyes on see-through-displays. It is apparent that such a technology can be proven very useful. Augmented reality can stimulate employees' brains, making them learning interactive and easier. In addition, organizations can increase productivity and lower cost by making operations safer and more efficient.

7. **Holoportation** is a new type of 3D capture technology that allows high-quality 3D models of people to be reconstructed, compressed and transmitted anywhere in the world in real time. When combined with mixed reality displays such as **HoloLens**, this technology allows users to see, hear and interact with remote participants in 3D, as if they are in the room. Communicating and interacting with remote users will become as natural as face-to-face communication.

Techno commercial analysis in implementation of AI with VR in maritime industry:
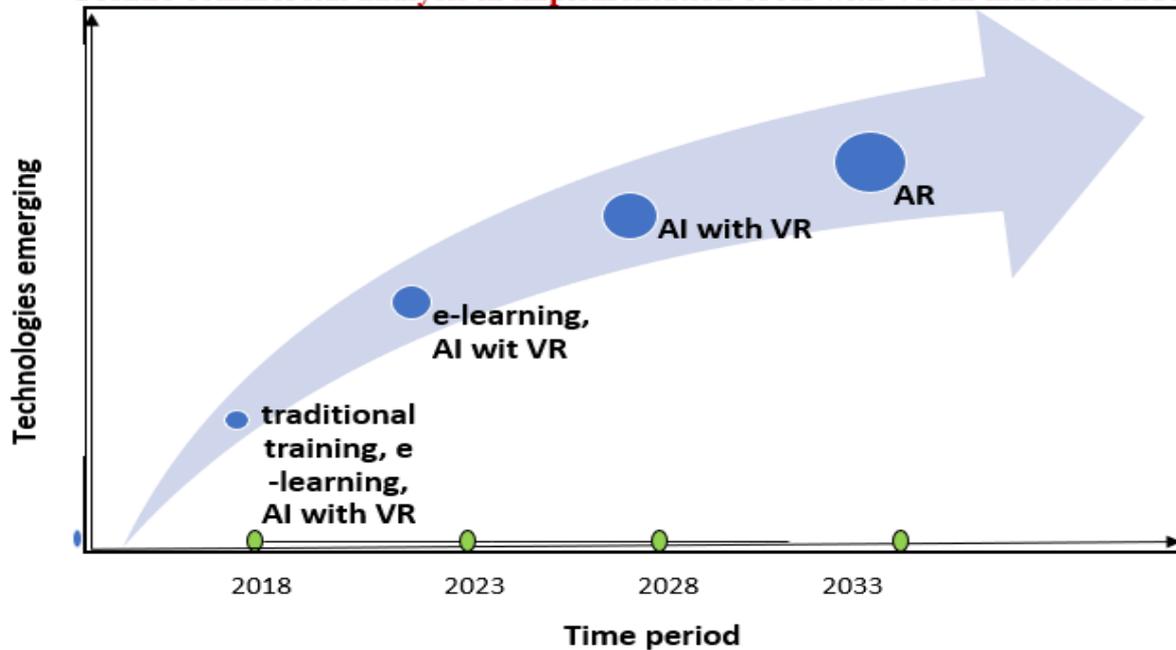
Tab-2 : Effectiveness of augmented reality

Conclusion:

The author's opinion is that all the maritime trainings institutes (MTI's), need to use these tools for preparing themselves to be equipped for the future. However, at present, AI, VR and AR technology equipment are very expensive. So, MTI's from an affordability and economic perspective - need to collaborate with international large companies with deep profits to launch pilot consumer equipment's of AI, VR & AR initiatives for the maritime training.

There is suggestion going around that different MTI's can mutually decide on areas (CoE – centres of excellence) where they specialise and invest wisely their hard to earn income.

If the above discussed technology is adapted in short period of time which will result in the equipment cost to drop down to considerable price so that all the maritime training institutes can afford to adopt and install the AI with VR technology in all MTI's.

"EXPERIENCING REEL WORLD BEFORE ATTEMPTING REAL WORLD"

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