

Training for the Future

Magnetic Compasses in an ECDIS World

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4 Industrial Revolutions

1st Industrial Revolution the age of mechanical production

1760 to 1840 powered by coal and steam

Changed from hand production to
machines, factory system

New transportation methods,
locomotives, steam ships first appear and
start to replace sail

Great change to society led by Great
Britain



2nd Industrial Revolution

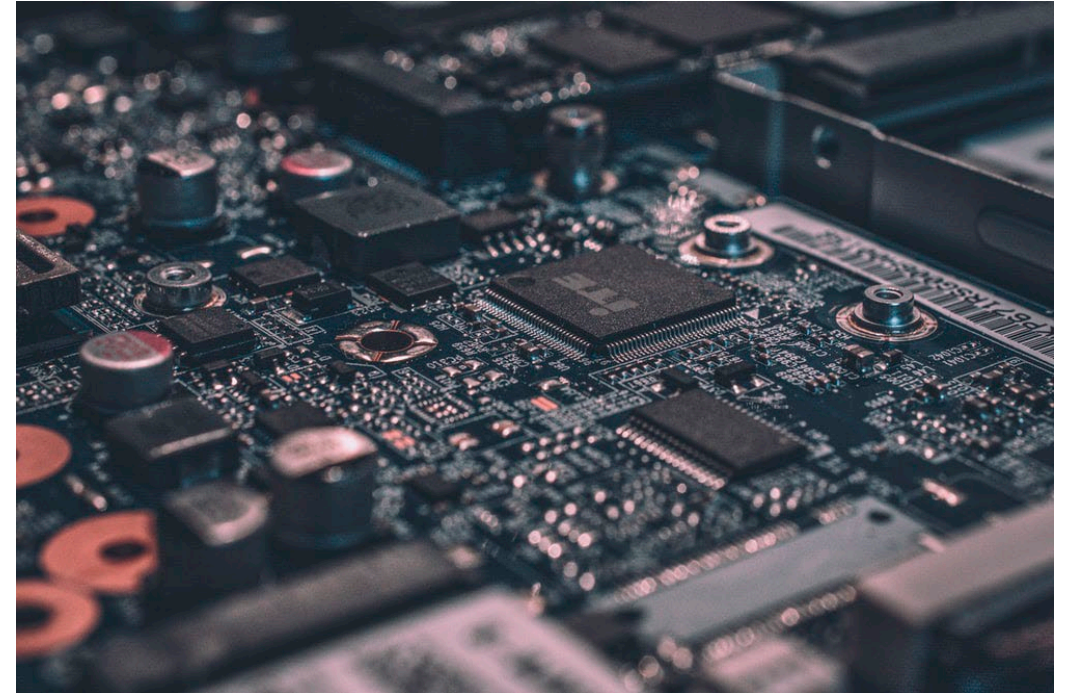
1870 – 1960's powered by gas, oil and electricity age of mass production

- New chemical manufacturing, iron and steel production processes and materials
- Exploiting natural resources, lighter metals, alloys, plastics
- New energy sources i.e. electrification of cities, natural gas, mass urbanization
- Steam gives way to oil in shipping and railroads
- Most industries completely mechanized by mid 19th Century not 'automated' until 2nd half of the 20th Century (distinct from assembly line)
- 1876 Alexander Graham Bell first phone call



3rd Industrial Revolution

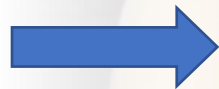
- 1950's – 2000's powered by nuclear energy and electronics, the digital revolution
 - PNP and NPN conductors (Transistors), mainframe and later personal computing
 - Analogue to digital shift dramatically disrupted industries especially global communications
 - From Morse code to sat phones. Sextant to GPS in one generation
 - Electronics and information technology begin to automate production and take supply chains global
 - Miniaturization – Moore's Law
- 3 April 1973 first cellular phone call, cell phone weighed 2.5lbs



4th Industrial Revolution 1980's - present

- Some say 4th is an extension of 3rd Industrial Revolution
- Difference is velocity, scope and systems impact
- Speed of change is exponential and will cross boundaries between physical, digital and biological spheres
- Internet of things, 5G, autonomous vehicles, nanotechnology, biotechnology, materials science, energy storage, 3D printing, quantum computing, robotics, medicine, virtual reality, augmented reality.
- 21 Sept 1983 First commercial cell phone introduced cost \$3995 USD
- Today cell phone size limited by size of human head

Bonus question what is this?





Training what have we learned?

- Current training regime is to load up students with huge amounts of information and hope they retain some of it long enough to pass an exam
- Training is 'front loaded' it may be months or even years before a student actually uses the information we made them learn. SEN O example
- Training needs to be flexible and allow sailors to live a life with a decent work/school/life balance. No more pickup trucks with air mattresses.
- Students learn differently today then they did 40 years ago
- Motivated experienced instructors are a critical component of student learning successes and hard to find
- Students don't learn as well if they are worried about mortgage payments, feeding their families etc.
- Students need time off to upgrade, quit calling them back to work please

Training what have we learned continued?

- Subject matter **must** be relevant and current; students get demoralized when they have to learn things that don't matter anymore
 - Decca eyebrow meter exam questions Decca decommissioned 15 years before
 - PNP NPN conductors MM Electrical syllabus 35 years out of date
 - Loran C was still required until a couple of months ago
 - DGPS is still required to be taught by TC despite CCG issuing shutdown notice for this year

Student Base Knowledge (psssst high school doesn't prepare students)

- Academic skills are generally weak
- Math grade 10 basic, need upgrading
 - Stability requires Pythagorean Theory (SOH CAH TOA)
 - Chartwork and SEN courses vectors (MOT triangle, radar plotting)
 - Engineering courses very math intensive
- English written and comprehension
 - Students cannot write (literally; pun intended!) they have not been taught
 - Many have difficulty learning new marine terminology
 - Expect to be spoon fed i.e. Collision Regulations
- Do not know how to study (never had homework)
- Generally much more tech savvy than previous generations
- 'Wicked Texter'

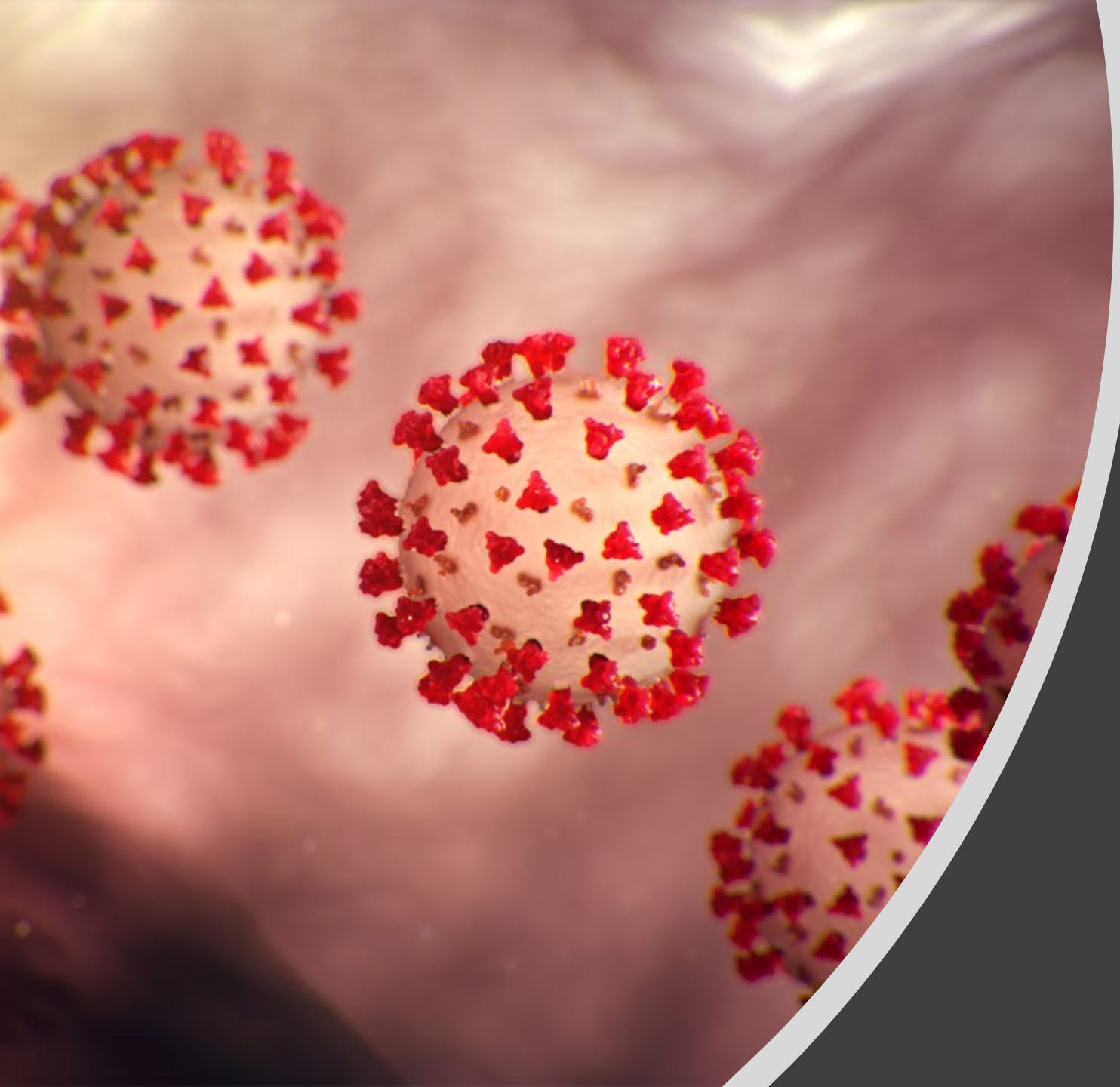


Classrooms

- Synchronous – Instructor onsite with students
- mostly one way communication, lecturer to student
- remember 'death by view graph' now it's Power Point
- Lecture progress based on dealing with most demanding student
- Quicker students bored, increases workload on instructor
- limited time to ask and respond to questions (rabbit holes)
- very difficult to find good experienced instructors
- Expensive for institution to provide classroom space, parking etc.
- Very expensive for student (employer?), travel, accommodation, time away from home, time off work
- 'We have always done it this way' 'It works'
- Hundreds of years of tradition unhindered by progress

The
Classroom
we all
remember

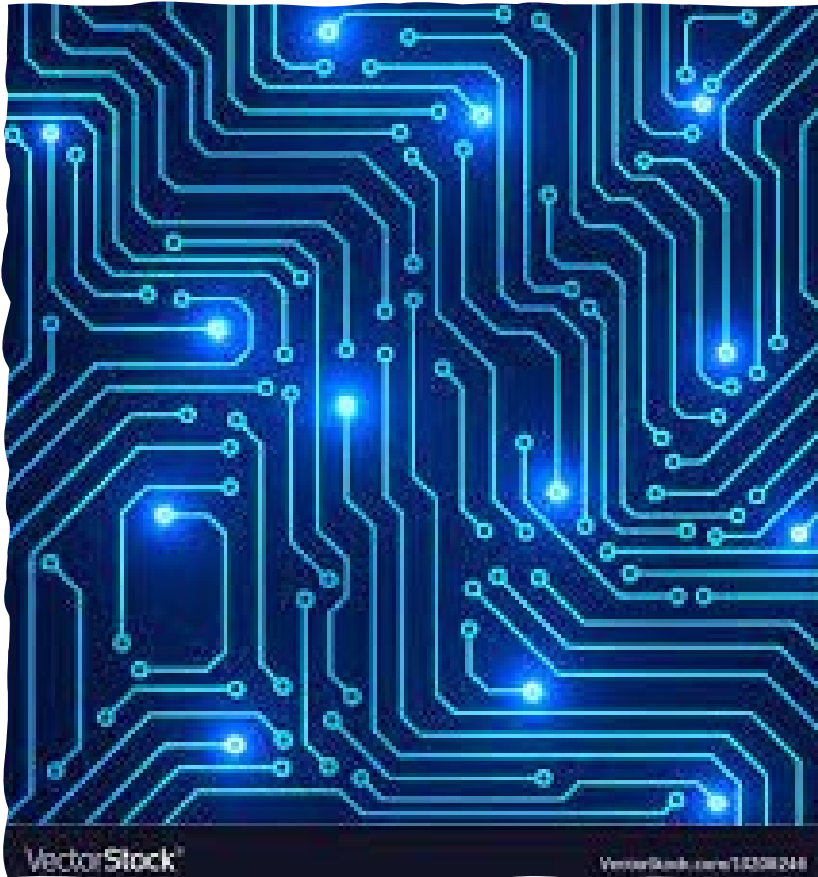




Catalyst for
change in
Maritime
Training

COVID - 19

Online Opportunities due to COVID



- WMI closed 20 March 2020 due to COVID
- Online courses were already being developed, immediately added resources to that project
- TC had to rethink its approval processes they were already looking at O/L delivery; COVID forced acceleration of process
- Initial delivery was via 'Zoom' many lessons learned
- Examinations via "ClassMarker"
- Initially approved by TC for Electronic Positioning Systems
- Approval to complete exams online pulled back
- Once exam proctoring established MRI allowed to deliver exams online
- Student feedback generally positive, however... basically e-Classroom
- Synchronous Training - requires dedicated instructor and mandatory attendance by student at specific times

Types of Training Delivery

Synchronous (online classroom)

- Student signs up for course and conducts learning at specific time as set by Institution
- Can complete course from anywhere the student has good internet access
- Some hardware limitations (Sorry Apple)
- Instructor immediately available s/he conducting course
- Lesson progress determined by students
- Questions require instructor to stop lecture while answering and rest of students just watch; hard to engage class
- Instructor forced to watch 'Brady Bunch' screen to ensure attendance and try to read body language
- Has been called 'death by Zoom'
- Not suitable for all learners

Types of Training Delivery

Asynchronous

- Student signs up for course and conducts learning in their own time, may require internet access during course
- Fully asynchronous training, student downloads entire course and can complete offline (think at sea!)
- only requires periodic internet access to submit assignments and complete quizzes and exams
- Instructor not immediately available but student can arrange meet at mutually convenient time
- Student works at their own speed
- Much more expensive to develop courses
- Much cheaper to deliver courses
- Much less intrusive for student life style; can learn from home, at sea, on vacation
- Not suitable for all learners

Types of Training Delivery

Blended Learning

- Blended Learning (mix of classroom and online)
 - Student signs up for course and conducts initial learning at home either synchronously or asynchronously
 - Great for pre-learning and raising skill fundamentals i.e. math, algebra etc
 - only requires periodic internet access to submit assignments, complete quizzes and exams
 - Instructor not immediately available but student can arrange meet at mutually convenient time
 - Student works at their own speed until practical
 - More expensive to develop courses
 - Less expensive to deliver courses
 - Much less intrusive for student life style; can learn from home, at sea, on vacation
 - Only attendance requirement is for practical components of a course
 - Not suitable for all learners

Simulation



- Student is placed in a simulated environment using displays and consoles i.e. Bridge or ER simulator
- Reasonable facsimile of actual conditions and spaces
- Can simulate faults, traffic, weather, sea state almost anything an instructor can dream up
- Can simulate scenarios for future jobs (like NASA does)
- Pre-learning (Classroom work) conducts initial learning at home.
- In person at institution attendance required for simulations
- Expensive to procure and install simulator. WMI Nautical simulator cost over \$1 million CDN with installation and course development for 3 courses
- Unintended uses BWR, Chartwork courses
- Future uses of simulators qualifying sea time, supervision Engineers?
- WMI in process of getting approval for new to Canada Wartsila Propulsion Plant Simulator including High Voltage Breaker and LNG training 3 year project

Types of Training Delivery

Simulation Continued

- Can accomplish scenarios not possible in classroom or at sea
- Can simulate a 'really bad day' that everyone can learn from and safely go home at night.



A two-team approach to a simulated
fuel manifold fire on deck.
Photo by Mitch Miller

Types of Training Delivery

Virtual Reality

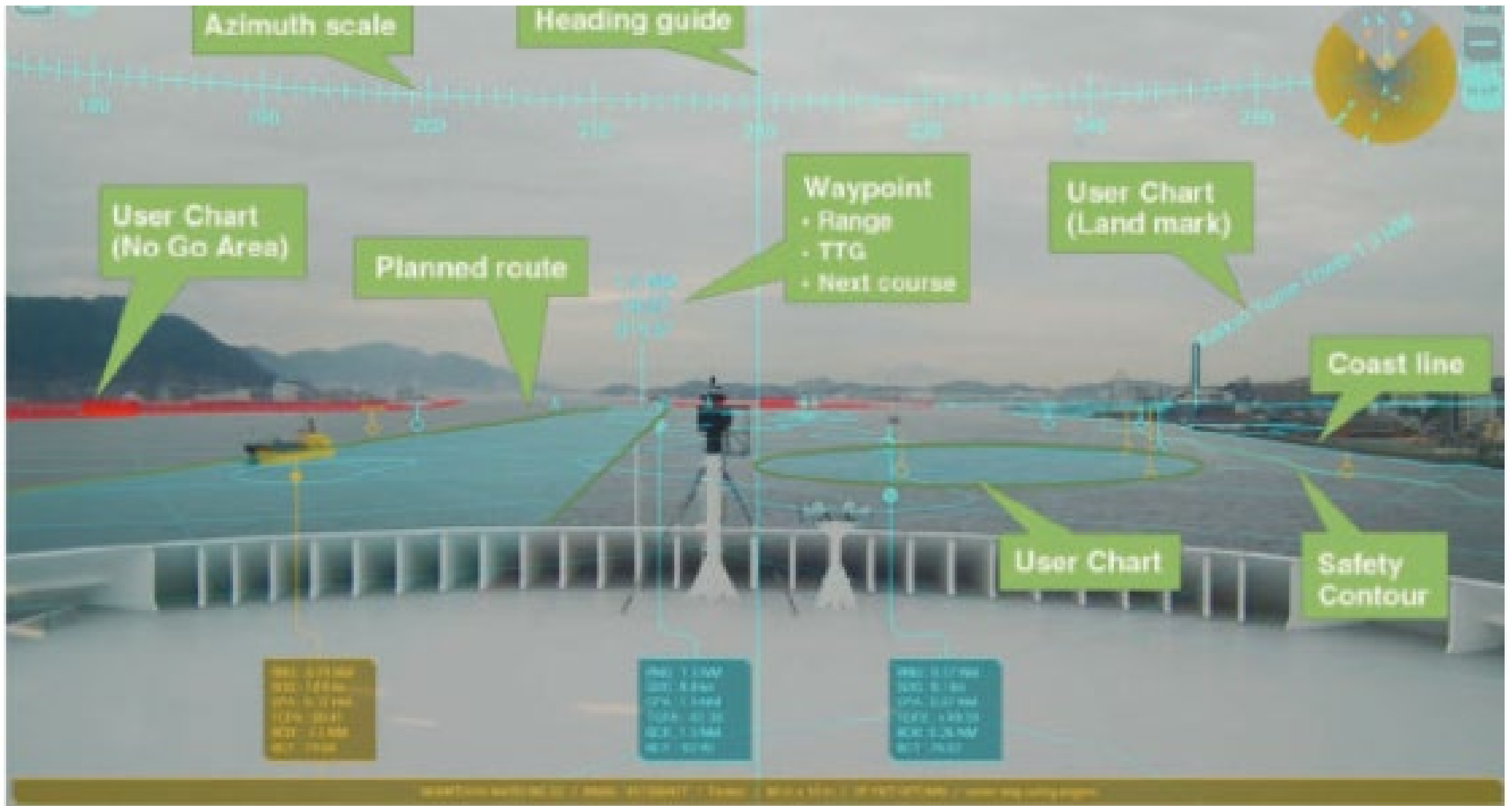
- Students use goggles and joy sticks i.e. Oculus 2. No other equipment required.
- Entire scenario is simulated anything is possible
- Students feel 'immersed'
- Students can interact with equipment detailed 3D simulation
- Very expensive to develop scenarios
- Vertigo an issue with more than 50% of users (Does not work at sea!)



Types of Training Delivery

Augmented Reality

- Students wear goggles and see current environment.
- No issues with vertigo as student can see room/compartment.
- Similar to 'head's up' display in cars, fighter jets.
- Instructor can manipulate scenarios and add in equipment failures, alarms, contacts
- Less expensive (still expensive!) to develop courses
- Coming soon to a vessel near you. Current trials underway on vessels



INS information overlaid on the visual scene. Overlay information indicated in green boxes.

Credit: Furuno

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Types of Training Delivery

Gamification

- Learning is achieved by creating short video games
- Effective for safety related subjects i.e. wearing PPE
- UK P&I Club developed 'Risk Ahoy' for loss prevention
- Multilevel game, pick your platform i.e. Ro-Ro, Container etc
- Complete routine shipboard tasks safely to get 'promoted'
- No extra equipment required, can be done on phone or tablet
- "Micro learning"
- Useful for small items but not STCW practical courses



Types of Training Delivery

Adaptive Learning

- Useful for familiarization training
- Job Shadowing not as effective, subjective based on trainer, some great some not so much
- Data base built by vessel operator specific to each class using standard Learning Management System (LMS)
- Trainee is appointed to a position on a vessel
- LMS automatically creates a company vetted training plan for the trainee to complete based on the platform they are sailing on and position they hold
- Targeted online 'custom' training for the ships crew

Future learning is not about technology it is about inspiring people to be interested in learning continuously.



WMI other initiatives under development:

- **Polar Basic – TC Approved**
- **Wartsila Propulsion Simulator**
- **Domestic Onboard Training Program**
- **High Voltage Breaker Training Basic & Advanced**
- **LNG Basic and Advanced Courses**
- **Domestic 150T Cadet Program**



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