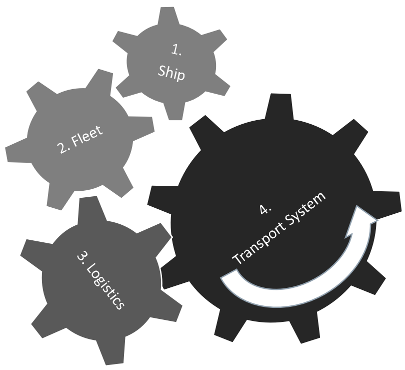
1

Slide 3.1: Agenda: INNOVATIVE DIGITAL SYSTEMS

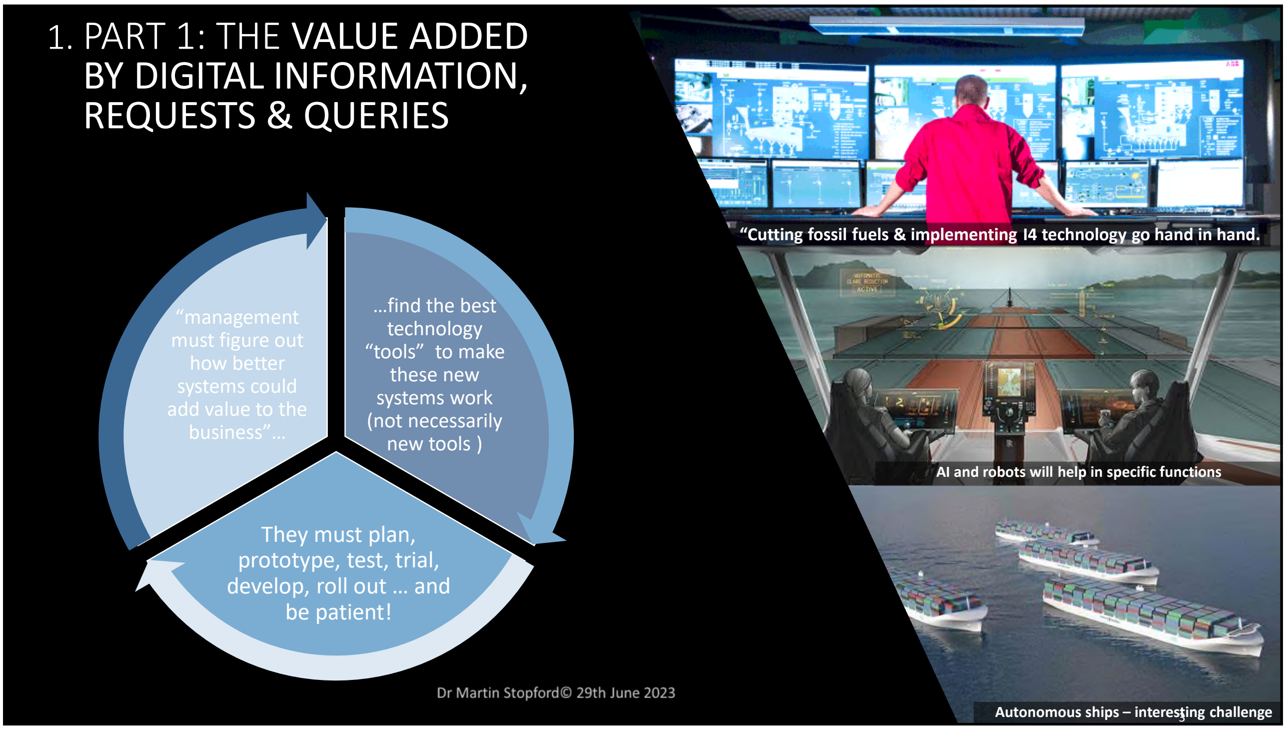
Digital systems are about DETAIL –
They must be: - a) Designed b) Validated c) Applied d) Monitored and updated



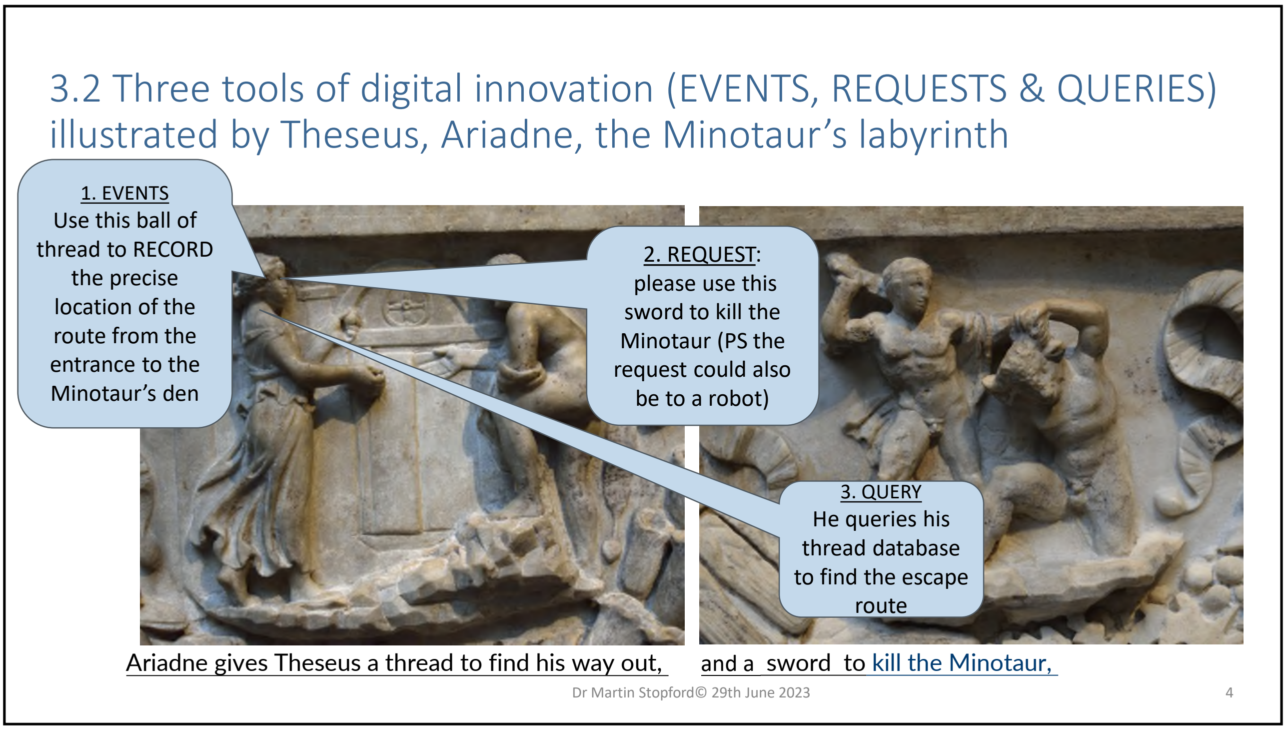
1. The value added by digital EVENTS, REQUESTS & QUERIES
2. Digital systems on the ship
3. Digital systems in the shipping company
4. Integrated global transport systems

Dr Martin Stopford© 29th June 2023 2

2


1. PART 1: THE VALUE ADDED BY DIGITAL INFORMATION, REQUESTS & QUERIES
"management must figure out how better systems could add value to the business"…
…find the best technology "tools" to make these new systems work (not necessarily new tools)
They must plan, prototype, test, trial, develop, roll out … and be patient!
"Cutting fossil fuels & implementing I4 technology go hand in hand.
AI and robots will help in specific functions
Autonomous ships – interesting challenge
Dr Martin Stopford© 29th June 2023

3


3.2 Three tools of digital innovation (EVENTS, REQUESTS & QUERIES) illustrated by Theseus, Ariadne, the Minotaur's labyrinth
1. EVENTS
Use this ball of thread to RECORD the precise location of the route from the entrance to the Minotaur's den
2. REQUEST: please use this sword to kill the Minotaur (PS the request could also be to a robot)
3. QUERY
He queries his thread database to find the escape route
Ariadne gives Theseus a thread to find his way out,
and a sword to kill the Minotaur,
Dr Martin Stopford© 29th June 2023
4

4

3.3 Let's QUERY the tanker fleet performance database – it INFORMS us that deliveries were half the level in 1973.

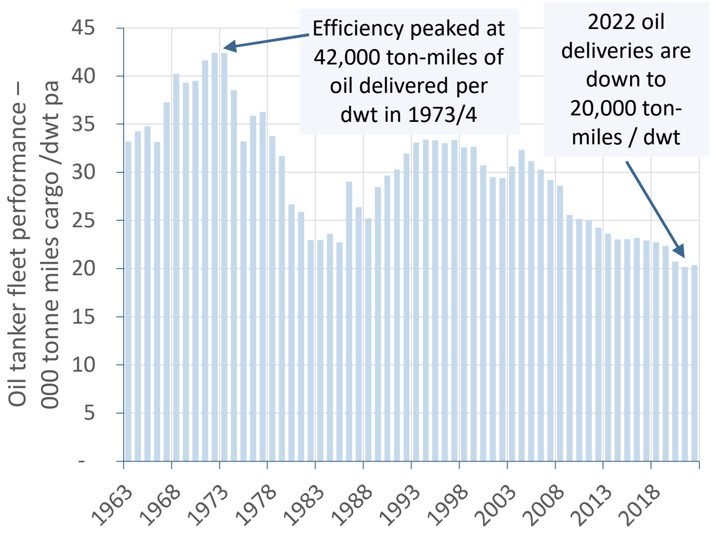


Table A3.2: Analysis of Tanker performance 1963-2023

Variable	1963	2023	Change
Oil cargo carried m tonnes	582	3,022	519%
Average distance n. miles	4,210	4,287	102%
Tonne miles/dwt	33,183	20,350	61%
Tonnes/dwt	8.2	4.7	57%
Active tanker fleet m dwt	71	637	895%
Of which: -			
Shadow Surplus M dwt	0.9	273	Massive
Shadow Surplus % fleet	1%	43%	-

Source: Maritime Economics 3rd Ed Martin Stopford, updated

Tanker fleet transport performance today is about 40% lower than in 1963 and less than half the 1973 peak of 43,000 ton miles/dwt.
The "shadow surplus" is the surplus dwt, if fleet operated at peak performance of 8.3 tonnes/dwt.
Currently "shadow surplus" is about 273 m dwt, 43% of the active fleet.

29-Jun-23 Martin Stopford - Smart Shipping 5

5

3.4 QUERIES need the right EVENTS recorded -

- ✓ Recording events about individua; ship performance allows QUERIES to clarify how to improve transport performance.
- ✓ The pie chart opposite shows the sort of things that might be going on.
- ✓ To be useful databases and systems need to be set up to allow management to submit queries and requests that will add value.
- ✓ The system designer begins with the word statement that describes the function of the digital system.
- ✓ A user must help the "systems-maker" define what the systems should do – the events to record, the queries to answer and a REQUESTS to be dealt with!

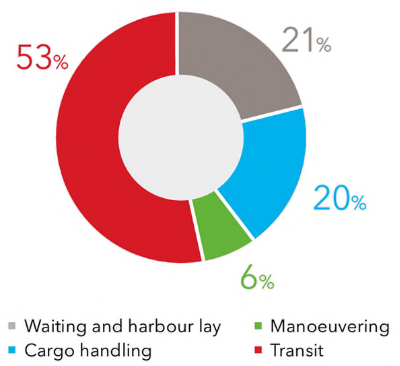


Figure 3: Time spent in different operating modes

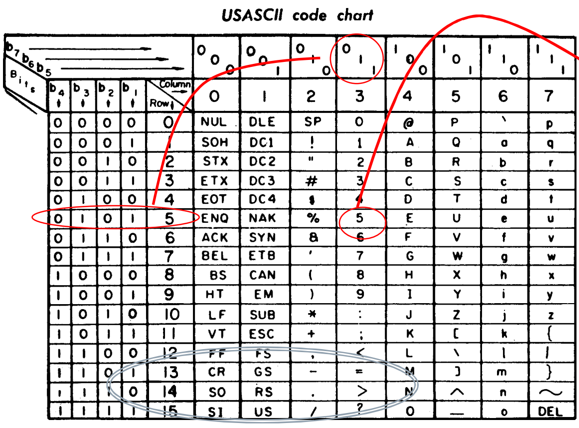
Source: *The Green Ship of the Future* Danish Study 2020

"A TRUTH is generally the first design step. The designer begins with the word statement that describes the function of the digital system. Next, he or she identifies the inputs and outputs of the system draws a truth table. The inputs and outputs may be single bits or a collection of bits. The *truth table* consists of input and output columns, which characterise the function of the digital circuit" *O'Reilly Introduction to Digital Systems: Modelling, & Synthesis, Section 3.7*

6

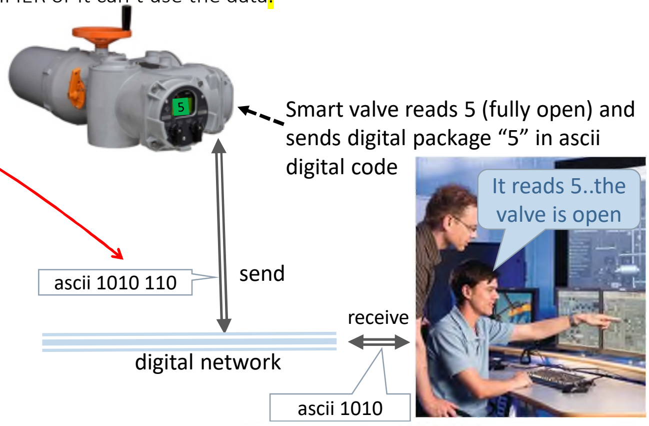
3.5: to record digital events you need the data "frame" identifier

1. Computers communicate with DIGITAL data (binary strings) using bundles of sequential data called "frames".
2. Ships equipment with embedded *computer devices* can send messages.
3. A device receiving a message MUST know its UNIQUE IDENTIFIER or it can't use the data.



USASCII code chart

b_4	b_3	b_2	b_1	Row \ Column ($b_7 b_6 b_5$)	0 (000)	1 (001)	2 (010)	3 (011)	4 (100)	5 (101)	6 (110)	7 (111)
0	0	0	0	0	NUL	DLE	SP	0	@	P	`	p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	10	LF	SUB	*	:	J	Z	j	z
1	0	1	1	11	VT	ESC	+	;	K	[	k	{
1	1	0	0	12	FF	FS	,	<	L	\	l	|
1	1	0	1	13	CR	GS	-	=	M	]	m	}
1	1	1	0	14	SO	RS	.	>	N	^	n	~
1	1	1	1	15	SI	US	/	?	O	—	o	DEL



Format of typical network message

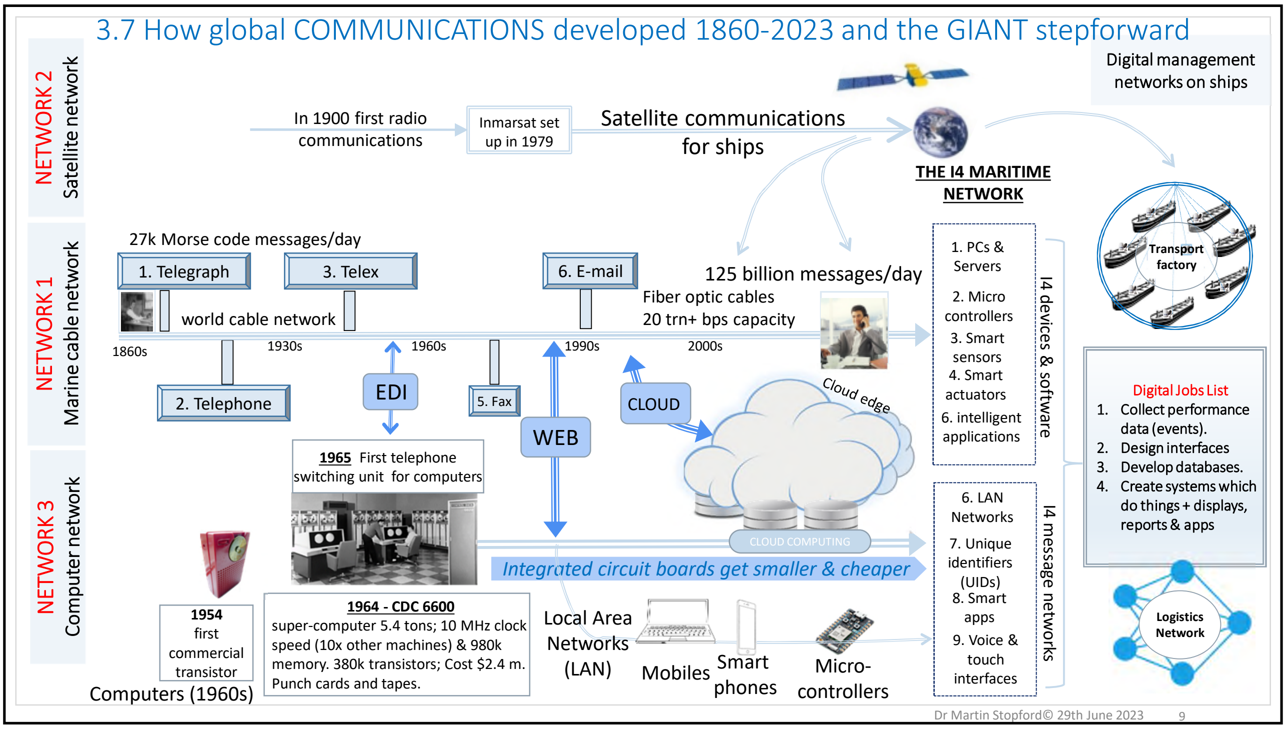
*A "bit" is a binary digit, 0 or 1

7

3.6 Examples – adding value with events, requests & queries

Monitor company's financial, economic and physical performance, with auditable reports.	Develop accounts and KPIs that include things that DON'T HAPPEN.	Collect data on DEFECTS in routing, trim, speed and operational planning	Monitor the use of equipment against PERFORMANCE LIMITS (e.g. crane).	Identify early signs of equipment/system malfunction e.g. gearboxes, failure & CONSEQUENTIAL RISK.	Fine tune engine performance (electronic engine) and DEVELOP PRTFORMANCE ALGORITHMS
RECORD USAGE of materials (e.g. electric energy used by main functions). With KPIs	WARN of complex performance problems (e.g. Rainbow Quest air draft Brooklyn bridge).	Log more CODED DATA to manage mechanical, electrical or manoeuvring models	Establish company performance DATABASE and credible Key Performance Indicators (KPIs)	(machine learning and AI have lots of potential) .	Collect and apply data on minor activities
Electricity - gen set fuel use and DEVELOP OPTIMISATION MODELS for key trades.	MANAGE lighting, powered fans and pumps et cetera with optimised variable frequency drives (VFDs).	Analysis of real savings in lube oil cleaning, propellers, rudder bulbs, hull paints and antifouling, etc	DATABASE of information available to purchasing, operations and maintenance	New buildings - focus on OPERATIONAL COST as well as price - small investments pay back fast.	Display key information- in CAREFULLY THOUGHT OUT dashboards, apps, screens.
		Develop SHIP INFORMATION & ACTION plan	Test against higher energy costs scenario, based on fleet structure and performance.		

8


3.7 How global COMMUNICATIONS developed 1860-2023 and the GIANT stepforward
Digital management networks on ships
NETWORK 2 Satellite network
NETWORK 1 Marine cable network
NETWORK 3 Computer network
In 1900 first radio communications
Inmarsat set up in 1979
Satellite communications for ships
THE I4 MARITIME NETWORK
27k Morse code messages/day
1. Telegraph
3. Telex
6. E-mail
125 billion messages/day
Fiber optic cables
20 trn+ bps capacity
world cable network
1860s
1930s
1960s
1990s
2000s
2. Telephone
EDI
5. Fax
WEB
CLOUD
Cloud edge
1965 First telephone switching unit for computers
CLOUD COMPUTING
Integrated circuit boards get smaller & cheaper
1954 first commercial transistor
1964 - CDC 6600
super-computer 5.4 tons; 10 MHz clock speed (10x other machines) & 980k memory. 380k transistors; Cost $2.4 m. Punch cards and tapes.
Computers (1960s)
Local Area Networks (LAN)
Mobiles
Smart phones
Micro-controllers
1. PCs & Servers
2. Micro controllers
3. Smart sensors
4. Smart actuators
6. intelligent applications
I4 devices & software
6. LAN Networks
7. Unique identifiers (UIDs)
8. Smart apps
9. Voice & touch interfaces
I4 message networks
Transport factory
Digital Jobs List
1. Collect performance data (events).
2. Design interfaces
3. Develop databases.
4. Create systems which do things + displays, reports & apps
Logistics Network
Dr Martin Stopford© 29th June 2023 9

9


Part 2. Digital systems on the ship
TODAY'S SHIPS: HAVE COMPLEX FUNCTIONAL SYSTEMS, WITH MANY CABLES, MANUAL CONTROLS, & OFTEN LIMITED INTEROPERABILITY
Dr Martin Stopford© 29th June 2023 10

10

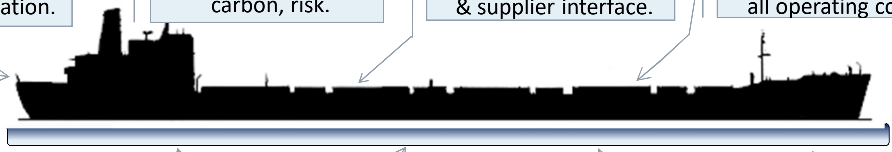
3.8 the shipbuilding challenge is integrating complex on-board systems

1. Propulsion. Integrated control systems with real time diagnostics and in service optimisation.

2. Auxiliary power Ship wide power management systems optimising cost, carbon, risk.

3. Auxiliary machinery Systems managing operations, maintenance, efficiency & supplier interface.

4. Ballast & trim Integrated digital management system optimising performance in all operating conditions



Ships need systems that a) communicate with each other b) easy to upgrade and manage.

5. Navigation Navigation on network with ability to view on shore as well as ship (e.g. Sperry system)

6. Cargo handling Cargo handling systems with cargo management and sharing key data between ship & shore

7. IT & comms Ship systems hosting and managing on board systems. Also rolling out upgrades & providing.

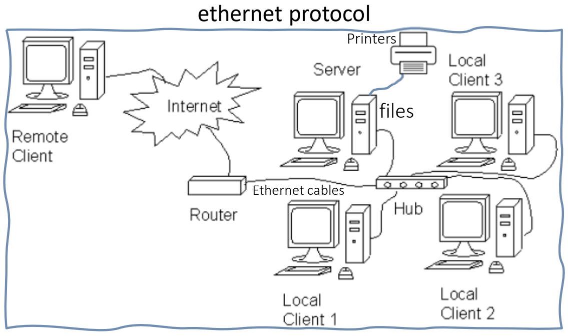
8. Maintenance Ship condition based maintenance system, integrated with company system

11

Slide 9: Most ship systems use local area networks (LAN) to manage systems

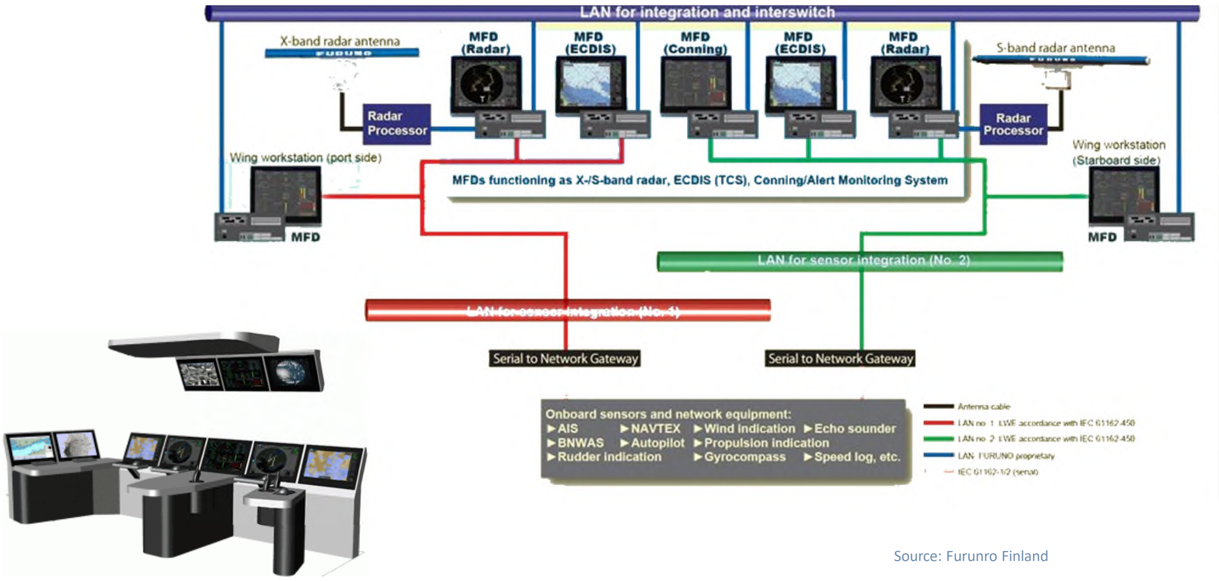
- ✓ A LAN is a network connecting "computers" in a limited area like an office or a ship.
- ✓ A network switch (hub) receives data from one device and forwards it to another.
- ✓ Most use the ethernet protocol with wires or Wi-Fi and file servers.
- ✓ A LAN can support a wide variety of compatible network devices (firewalls etc)
- ✓ Compatible peripherals such as machinery with actuators can be connected using ethernet cables and plugs

The familiar local area network (LAN) using ethernet protocol



12

Slide 3.10: Example of LAN (Local Area Network) for navigation system :



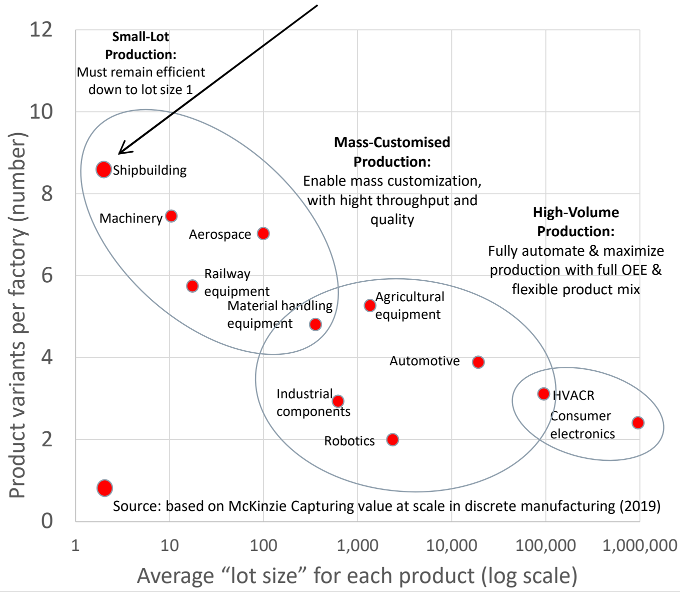
Source: Furunro Finland

13

Slide 3.11:The challenge for shipbuilders developing I4 systems

A. On land only 30% of manufacturing companies are capturing value from I4 (McKinsey).
B. A major problem is that developers "focus on the technology, rather than <u>finding value added and working back to the technology to deliver it</u>" (McKinsey)
C. Company organisation is often a problem: –
    1. Governance unclear.
    2. Anchoring (reverting to old ways).
    3. Lack of clarity on what is "business value".
    4. Limited people & financial resources.
    5. Too many "potential use" cases.
    6. Projects get stuck in "pilot purgatory."
D. today's shipping companies were not designed to do this sort of thing! They will need to change.

Figure 5: Shipbuilding has many product variants & small lot size

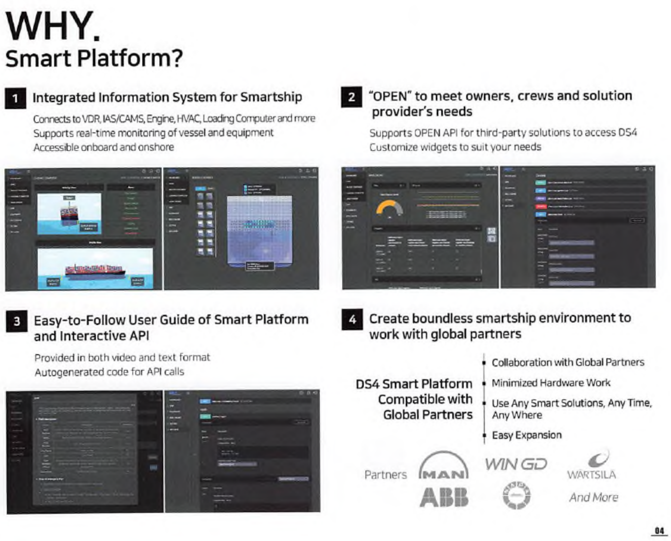


Source: based on McKinzie Capturing value at scale in discrete manufacturing (2019)

14

Slide 12: It's great to see shipbuilders moving into smart shipping:

Shipbuilders move into Smart Shipping



Source: Smartship solution DS4, Daewoo Shipbuilding & Marine Engineering

Dr Martin Stopford© 29th June 2023 15

15

Slide 13: The Kongsberg K-Chief System

1. A standalone system covering many onboard functions.
2. Modular hardware and software applications combined to meet vessel requirements. This reduces interface requirements.
3. Its modular design is connected by local data networks with distributed processing, which breaks tasks into segments, executed in parallel by input/output (I/O) modules near the processing units.
4. Integration allows vessel operation to be covered consistently, with information flow throughout the entire system

Sub-systems can include:

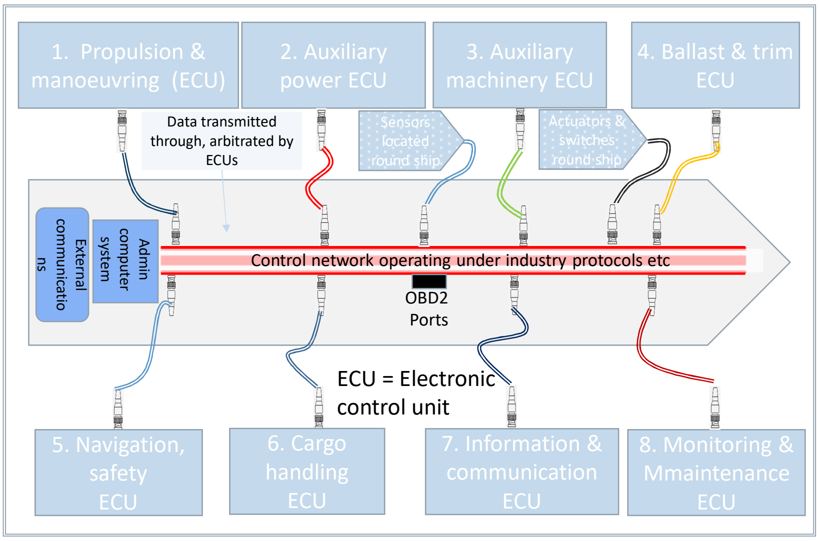
1. Power management
2. Auxiliary machinery control
3. Ballast/bunker monitoring & control
4. Cargo monitoring and control
5. Alarm and monitoring system
6. Auxiliary control system
7. Power management system
8. Propulsion control
9. Ballast automation system
10. Cargo control and monitoring
11. HVAC (air conditioning)
12. Fire system

Dr Martin Stopford© 29th June 2023

16

Slide 14: Can control area networks supplement LANS?:-

1. Replacing point to point wires with networked messages transmitted through a control area network bus could supplement/replace LANs:-
   - ✓ **All systems communicate:**
   - ✓ **Integration** – digital network replaces expensive point to point wiring.
   - ✓ **Functional systems self contained –** The electronic control units do all the communication, and functional systems are self contained
   - ✓ **No computer required** – safety and control

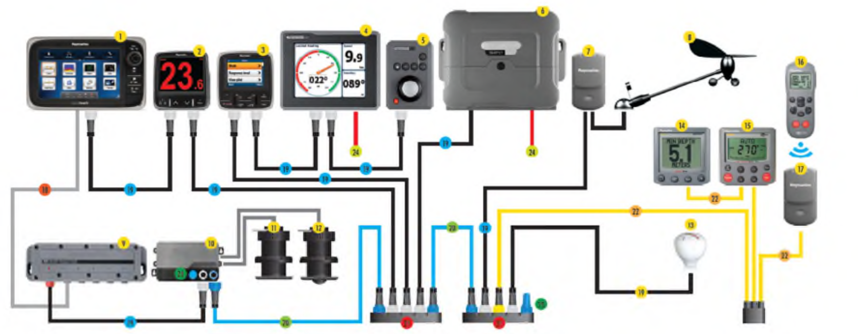


CANbus network for ships – maybe development of NMEA 2000 protocol 17

17

Slide 15: example of control area network designed for use on boats and small ships using NMEA2000 protocol

SeaTalk*ng* is an interconnection bus for Raymarine products. Small diameter cable connectors are used throughout the system to make installation easier. There's a wide range of cable lengths, all with over-moulded plugs, so there is no need to cut or splice cables. Spur cables connect individual SeaTalk*ng* products to the SeaTalk*ng* backbone.



Note: Imagery for illustrative purposes only. Product images shown in suggested system diagrams are not to scale

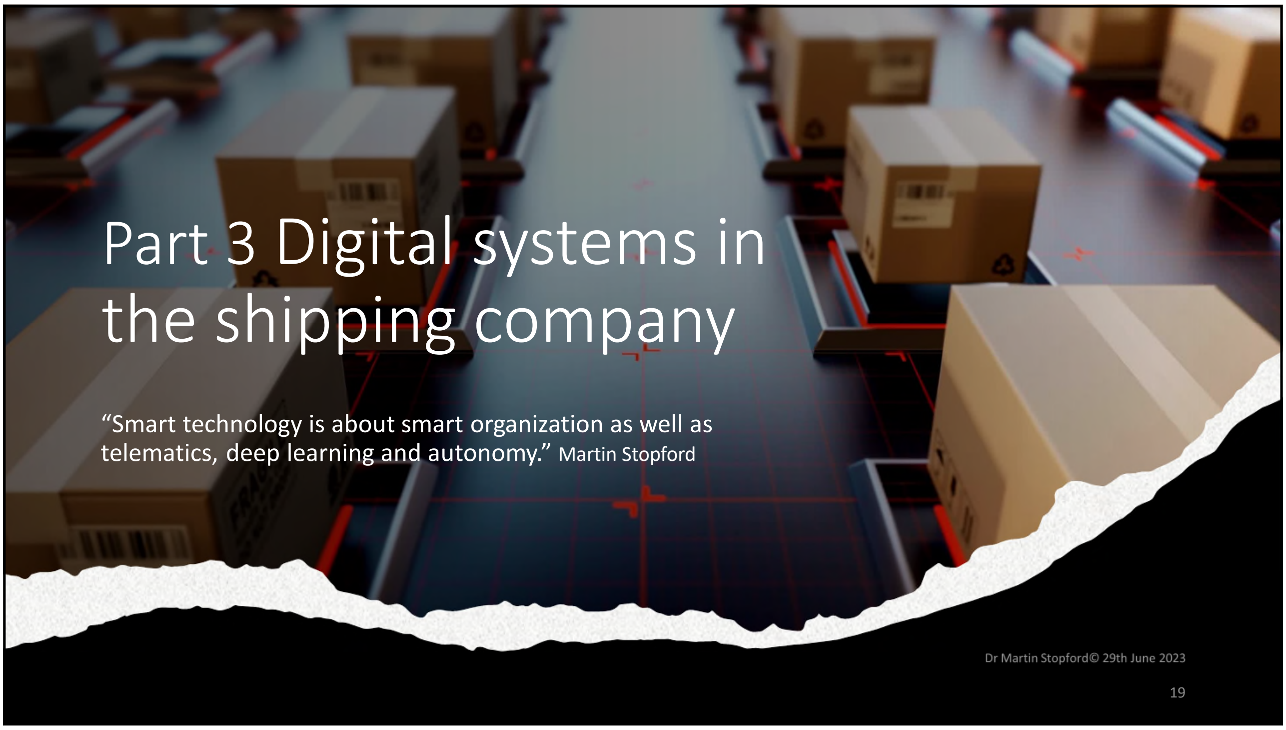
Typical Basic SeaTalk[ng] **System:**

1. New e Series **2.** i70 Instrument **3.** p70/p70R Autopilot **4.** ST70 Plus Instrument **5.** ST70 Plus Autopilot Keypad **6.** SPX Course Computer **7.** Pod **8.** Wind Transducer **9.** Network Switch **10.** iTC-5 **11.** Speed Transducer **12.** Depth Transducer **13.** RS130 GPS Sensor **14.** ST60+ Instrument **15.** ST6002 Autopilot **16.** SmartController **17.** Pod **18.** RayNet Cable **19.** SeaTalk[ng] Spur **20.** SeaTalk[ng] Backbone **21.** 5-Way SeaTalk[ng] Connector **22.** SeaTalk **23.** Terminator **24.** Power Supply

http://www.raymarine.co.uk/cruising/

Martin Stopford - Smart Shipping Revolution April 2020 18

18

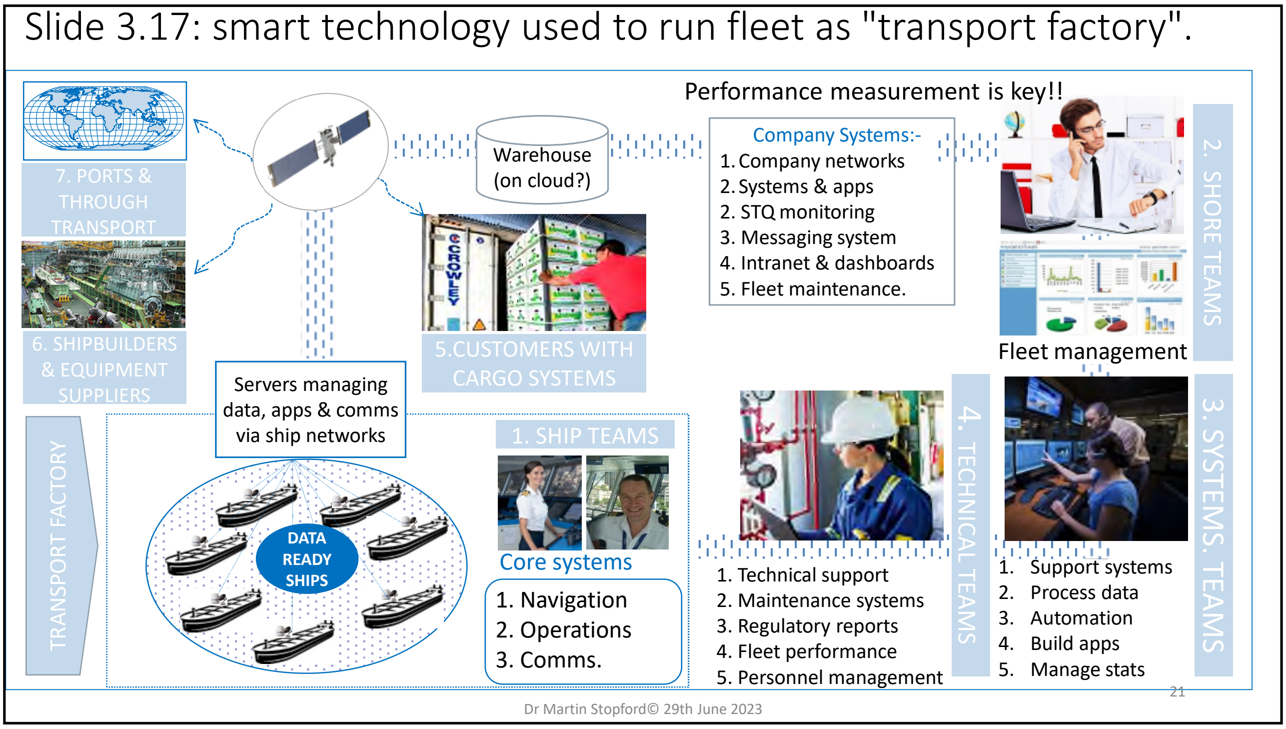


19

3.16: Smart-Fleet-Management (SFM): some key tasks–

1. **Integrate management across the transport chain;** work with cargo owners; ports and inland carriers to schedule materials and services; reducing down time; operating ships at optimum speed; reduce dead freight; avoiding port delay; and cut time out of service for maintenance (e.g. hull cleaning while bunkering etc.).
2. **Develop ship & shore personnel into a productive team:** Organize staff at sea and on land into focus teams with a focus on managing the fleet as a whole. The staff on ships are a valuable resource “working from home”. Digital systems (internet, messaging, dashboards, intranet) build teams and skills.
3. **Manage assets better:** enormously expensive assets. The focus is on the value added by the transport provided - a different perspective. In 2016 Ford Motor Company, said *“We are re-thinking our business models…for years we thought about the “thing”, and how much of it we sold. Now we think about usage”.*
4. **Inform stakeholders about performance:** Reliable information about performance against benchmarks drives better decisions, reduced need for third party monitoring and gets QA systems to work smoothly.
5. **Produce regulatory reports which detail value added:** Digital processing as part of the company management reporting allows reports and dashboards to include hard to get and timely information.
6. **Support through-transport systems:** allow everyone in the transport chain to monitor and manage performance.

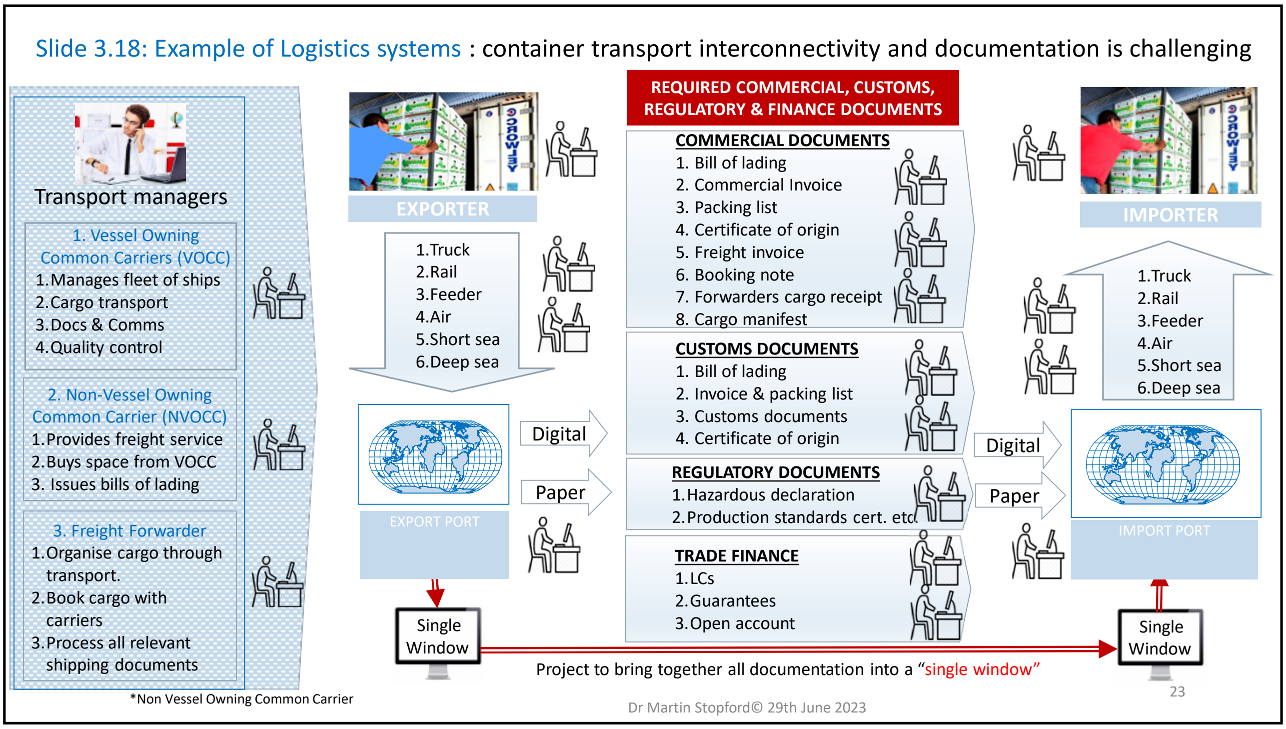
20


Slide 3.17: smart technology used to run fleet as "transport factory".
Performance measurement is key!!
7. PORTS & THROUGH TRANSPORT
6. SHIPBUILDERS & EQUIPMENT SUPPLIERS
Warehouse (on cloud?)
5.CUSTOMERS WITH CARGO SYSTEMS
Company Systems:-
1. Company networks
2. Systems & apps
2. STQ monitoring
3. Messaging system
4. Intranet & dashboards
5. Fleet maintenance.
2. SHORE TEAMS
Fleet management
Servers managing data, apps & comms via ship networks
TRANSPORT FACTORY
DATA READY SHIPS
1. SHIP TEAMS
Core systems
1. Navigation
2. Operations
3. Comms.
4. TECHNICAL TEAMS
1. Technical support
2. Maintenance systems
3. Regulatory reports
4. Fleet performance
5. Personnel management
3. SYSTEMS. TEAMS
1. Support systems
2. Process data
3. Automation
4. Build apps
5. Manage stats
21
Dr Martin Stopford© 29th June 2023

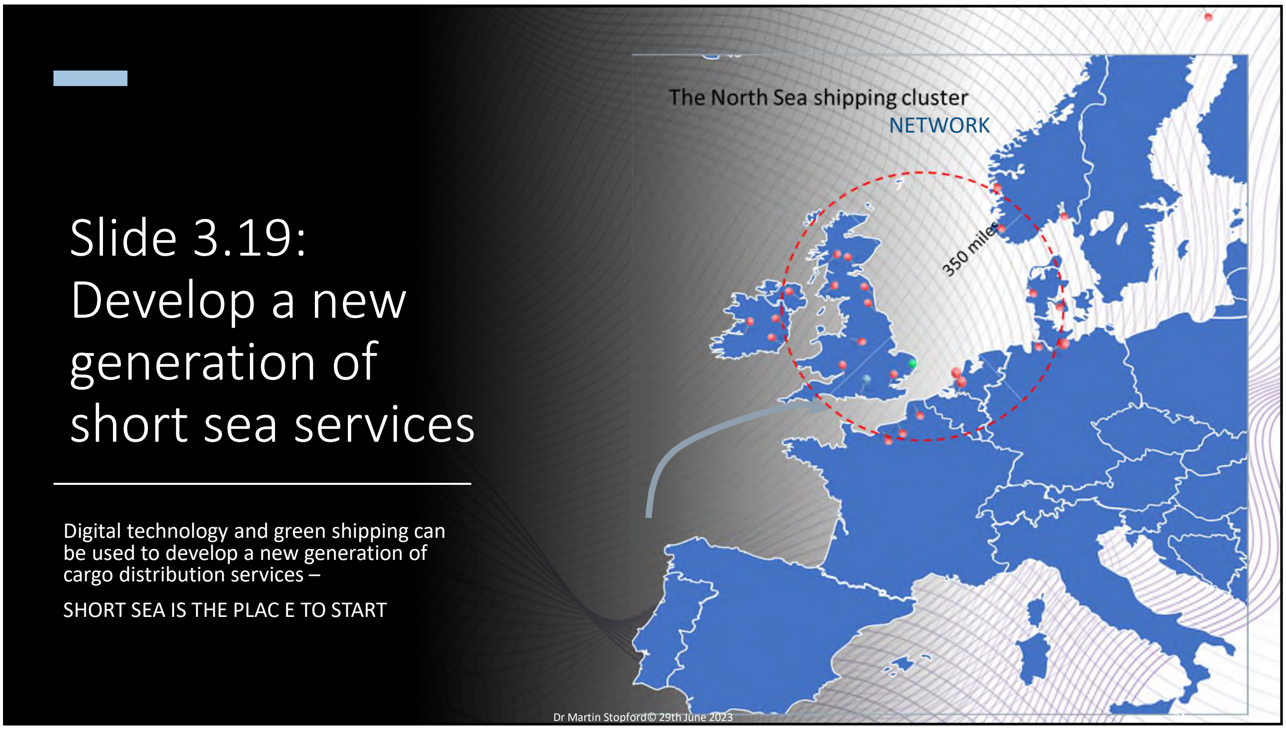
21


4. Integrated global transport systems
The global logistics system was established 50 years ago when Electronic Data Interchange (EDI) was very limited. Despite improvements there is still limited interconnectivity.
Dr Martin Stopford© 29th June 2023
22

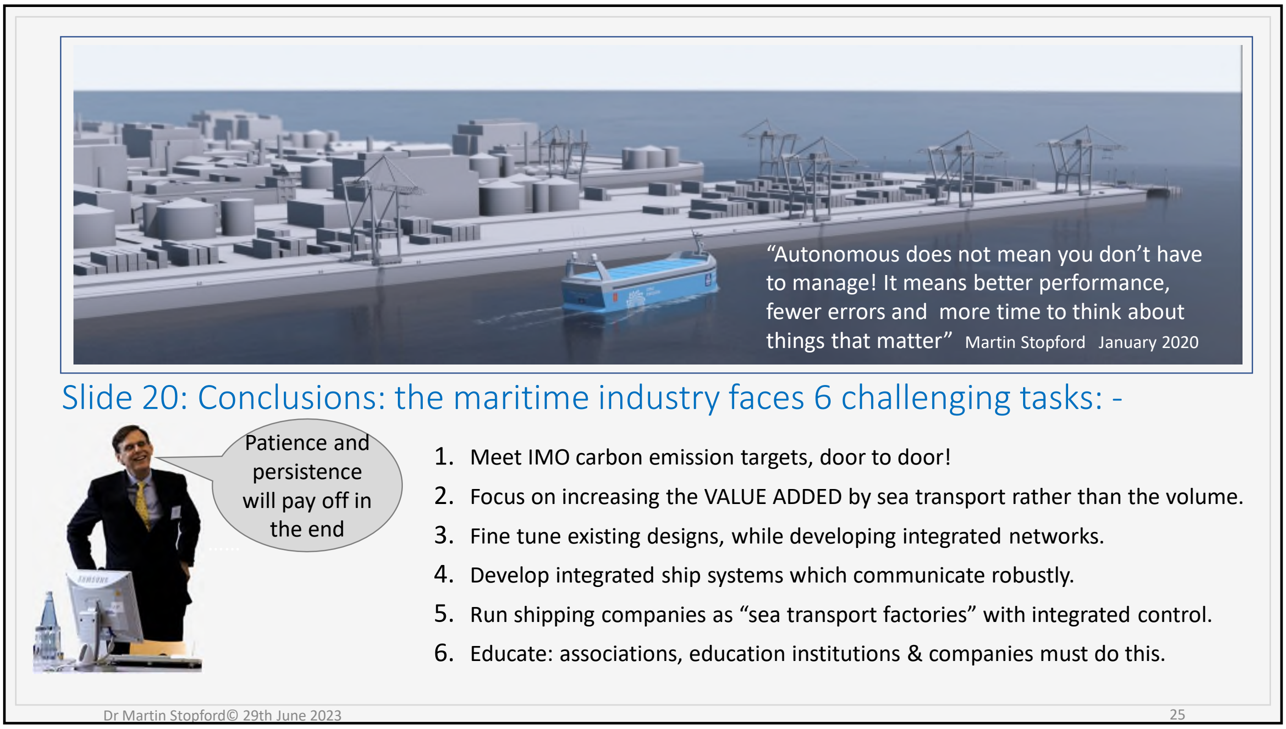
22


Slide 3.18: Example of Logistics systems : container transport interconnectivity and documentation is challenging
Transport managers
1. Vessel Owning Common Carriers (VOCC)
1.Manages fleet of ships
2.Cargo transport
3.Docs & Comms
4.Quality control
2. Non-Vessel Owning Common Carrier (NVOCC)
1.Provides freight service
2.Buys space from VOCC
3. Issues bills of lading
3. Freight Forwarder
1.Organise cargo through transport.
2.Book cargo with carriers
3.Process all relevant shipping documents
*Non Vessel Owning Common Carrier
EXPORTER
1.Truck
2.Rail
3.Feeder
4.Air
5.Short sea
6.Deep sea
Digital
Paper
EXPORT PORT
Single Window
REQUIRED COMMERCIAL, CUSTOMS, REGULATORY & FINANCE DOCUMENTS
COMMERCIAL DOCUMENTS
1. Bill of lading
2. Commercial Invoice
3. Packing list
4. Certificate of origin
5. Freight invoice
6. Booking note
7. Forwarders cargo receipt
8. Cargo manifest
CUSTOMS DOCUMENTS
1. Bill of lading
2. Invoice & packing list
3. Customs documents
4. Certificate of origin
REGULATORY DOCUMENTS
1.Hazardous declaration
2.Production standards cert. etc
TRADE FINANCE
1.LCs
2.Guarantees
3.Open account
IMPORTER
1.Truck
2.Rail
3.Feeder
4.Air
5.Short sea
6.Deep sea
Digital
Paper
IMPORT PORT
Single Window
Project to bring together all documentation into a "single window"
Dr Martin Stopford© 29th June 2023
23

23


Slide 3.19: Develop a new generation of short sea services
Digital technology and green shipping can be used to develop a new generation of cargo distribution services –
SHORT SEA IS THE PLAC E TO START
The North Sea shipping cluster
NETWORK
350 miles
Dr Martin Stopford© 29th June 2023

24


"Autonomous does not mean you don't have to manage! It means better performance, fewer errors and more time to think about things that matter" Martin Stopford January 2020
Slide 20: Conclusions: the maritime industry faces 6 challenging tasks: -
Patience and persistence will pay off in the end
1. Meet IMO carbon emission targets, door to door!
2. Focus on increasing the VALUE ADDED by sea transport rather than the volume.
3. Fine tune existing designs, while developing integrated networks.
4. Develop integrated ship systems which communicate robustly.
5. Run shipping companies as "sea transport factories" with integrated control.
6. Educate: associations, education institutions & companies must do this.
Dr Martin Stopford© 29th June 2023
25

25


THE END
Dr Martin Stopford,
President Clarkson Research
February 2021
Dr Martin Stopford© 29th June 2023
26

26

MMI Webinar 3: Innovative Systems to improve performance.

WELCOME: The theme so far is to expect three things. *Firstly* energy to be more expensive, including fossil fuels. *Secondly* green investment to develop in waves, but "one size fits all" will not work. Each of the 20 or 30 market segment needs its own strategy. *Thirdly* cargo interests, the major stakeholders, will develop a different relationship with in sea transport.

INTRODUCTION: In this session we will discuss innovation that uses digital technology (the I4 revolution) to develop new SYSTEMS and DECISION INFORMATION to deliver more efficient transport and, in a new era of GOVERNANCE, to satisfy scrutiny by regulators and stakeholders. This is the sort of change President Lee Kun-Hee had in mind when, in 1993, he told his managers at Samsung to "Change everything except your wife and kids". Good advice.

Slide 3.1 Agenda: digital systems, which are based on detailed “architecture”, must be commissioned, managed and implemented. These tasks are not easily delegated. In the four parts of this webinar, I will start with the fundamental components of digital systems, EVENTS, REQUESTS and QUERIES. Then develop the role played by systems in ships (PART 2), shipping companies (PART 3) and the global logistics system (PART 4).

PART 1: VALUE ADDED BY EVENTS, REQUESTS & QUERIES.

Digital systems will have a major role in shipping company strategy in the coming decades. I developed effectively they will deliver BIG benefits to sea transport. Management will play a key role in figuring out what needs to be done and finding the best technology tools to roll out new system. It will be difficult.

Slide 3.2: The three tools of digital innovation: at first sight is is hard to see why events, requests and queries (information is obtained by querying events) play such a fundamental role in digital systems. An example from Greek mythology - Theseus slaying the Minotaur of Crete – might help. Theseus has no weapons and the Minotaur lived in a labyrinth Theseus could not find his way out of, even is he won the fight. Ariadne, who is in love with him, gives him a ball of thread to unwind. This records a string of EVENTS as he enters the labarynth. She also gives him a sword and REQUESTS him to do something - kill the Minotaur. He wins and escapes by QUERYING his thread record of the way in, in reverse. OK it's a bit obtuse, but it demonstrates that events, requests and queries are the building blocks of ACTIONS.

Slide 3. 3: Let's QUERY the tanker fleet performance database. The query INFORMS us that in 2023 oil deliveries by tankers were half the level in 1973. Deliveries peaked t 42,000 ton miles per deadweight in 1973 and fell to 20,000 ton miles per deadweight in 2023. The inset table (based on other QUERIES) informs us that over 70 years cargo increased by 500%, and the tanker fleet grew by 900%. Shadow surplus (active capacity of the percent of design capacity) is 43% of the fleet.

Slide 3.4: QUERIES need the right EVENTS recorded: the point here is that the first job the management is to find ways of adding value, and then see if digital technology can help to remove them. The pie chart shows why productivity is low. This ship, the products tanker spent only 53% of its time in transit, and a large proportion that could well have been in ballast. The remainder was spent waiting, manoeuvring and cargo handling. These are problems which mainly circulate about knowledge, planning, coordination and endurance, all of which digital technology can help out with. The system designer must be told by management what the system should do.

Slide 3.5: recording digital events requires the data "frame" identifier: a binary diversion: this slide is about the digital frames (packages) used for messaging between computers. To stream receive data from a piece of equipment, you need to decode the structure (protocol) and identifier. That can be a problem.

Slide 3.6: Examples – adding value with events, requests & queries; this slide provides examples of some of the value added ways of developing digital systems.

Slide 3.7: How global communications developed 1860-2023 & the next giant step: world digital communications network is constantly expand. Modern shipping uses it extensively, but now faces the challenge of a giant step forward.

PART 2: DIGITAL SYSTEMS ON THE SHIP:

Today's ships have complex functional systems, with many cables, manual controls, & often limited interoperability.

Slide 3.8 the shipbuilding challenge is to integrate on-board systems: there are many systems on a ship, so getting it all to work together, then rolling out upgrades is challenging.

Slide 3.9: Most ship systems use local area networks (LAN) to manage systems: digital equipment is managed on board ship using local area networks (LAN) in which computers are connected by cables with standard ethernet plugs (cables are fast & resistant to interference. Developed by Hewlett-Packard in 1976, this is well established. But let's take a closer look at how things work…

Slide 3.10:Example of LAN (Local Area Network) for navigation system: this is a LAN network for the navigation system. The main navigation equipment (radar, ECDI, conning etc) are plugged into an integrated LAN which links to wing workstations. The system also has network gateways linking to sensors & other equipment (wind, echo sounder, autopilot, propulsion, rudder, gyrocompass, speed log etc.).

Slide 3.11: The challenge for shipbuilders developing I4 systems: the big problem for the shipbuilders is their unique manufacturing structure. They are an extreme business, producing very small numbers of very large products, with a large number of different product types!

Slide 3.12: It's great to see shipbuilders moving into smart shipping: But these are dangerous waters, and customers need to understand the business well enough to know whether the promised systems will really deliver, and how hard they will be to manage.

Slide 3.13: Kongsberg K-Chief system: One of the most widely used on board systems.

Slide 3.14: Can Control area networks (CANbus) supplement LANS? Replace point to point wires with networked messages transmitted through a control area network bus could supplement/replace LANs.

Slide 3.15: example of control area network designed for use on boats and small ships using NMEA2000 protocol: Integrated on-board systems require a set of protocols so that different equipment can communicate reliably, putting the most important messages first (arbitration). There is a protocol for small ships (NMEA 2000), but not for big ships. This slide shows a system developed by Rymarine, using the NMEA2000 Marine network protocol, (though it is proprietary).

PART 3 DIGITAL SYSTEMS IN THE SHIPPING COMPANY

Slide 3.16: Smart-Fleet-Management(SFM) key tasks : areas of transport management: this slide lists six ways that company wide systems can be used to improve transport performance.

Slide 3.17: smart technology used to run fleet as "transport factory": smart technology opens the way to running a fleet of ships as a "transport factory". The shipping company becomes the spider in the logistics web for both interregional and intraregional trade.

PART 4. INTEGRATED GLOBAL TRANSPORT SYSTEMS

Slide 3.18: Example of Logistics systems: shows why container transport interconnectivity and documentation is so challenging!

Slide 3.19: Develop a new generation of short sea services: Digital technology and green shipping can be used to develop a new generation of cargo distribution services – short sea is the place to start.

Slide 3.20: Conclusions: the maritime industry faces 6 challenging tasks: - Meet IMO carbon emission targets, door to door!

i. Focus on increasing the VALUE of sea transport rather than the volume.
ii. Fine tune existing designs, while developing integrated networks.
iii. Develop integrated ship systems which communicate robustly.
iv. Run shipping companies as "sea transport factories".

v. Develop professional associations, education, training and personnel.

1,200 words
Martin Stopford
29th June 2023

