SYSTEM INTEGRATION FOR SMART PAPERLESS SHIP

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Abstract

Sea Transportation provides a safe and reliable source for moving people and cargo across the ocean. The government and private sector provide these services, while the Government moves personnel and cargo to support global peacekeeping activities while the civilian sea transportation activities focus on providing leisure cruises and the shipment of consumer goods. These safe and efficient services are obtained through the cooperative efforts of the government and civilian sea carriers, and seaports throughout the world required connectivity raging from within ship system integration and ship sore operation, which has been much facilitated by evolution of computer age. The use of the use of new information technology and interfacing all the associated service areas of maritime industry- sea and shore has lead to reducing papers and hence cutting of threes and beneficial environmental benefit of excess water absorption and greater capture of carbon dioxide. Human race has achieved much civilization and development in recent years until it seem as development is closed to the peak. However, new philosophy under are being promoted in recent years include proactive behaviors, recycling, system integration and conservation to make all what has been built meaningful and efficient. This paper discuss how system integration under smart ship concept within ship and shore.

Introduction

Technological age has always depends on the concept of speed, reliability, cost, mobility, miniaturization and networking. Not until recently concerned about the environment that has been supporting human and the technocrat we have built has become the major drive for technology sustainable and efficient system development. Smart ship shore operations project focus on building smart system using new

information technology and interfacing all the associated service areas of maritime industry- sea and shore. The interconnectivity of control system, computers, software, hardware, electrical, mechanical and other work support system for use in wireless computer network, radio frequency sensor gateway, and the internet for data management activities and operations on board ship. The paper offer conceptual design architecture for prototyping smart ship towards paperless for ships and solutions for barriers that might stand as problem to implementation, innovation and development. This paper focus on building complete macro control system integration between computers, software, hardware electrical, mechanical and other systems as necessary as well as wireless computer network and sensor gateway the principle that can be use in smart ship shore operations as well redundancy for other smart systems. Smart system for ship and offshore could target:

i. Shore base operation : Safe transportation of passengers and cargo through the oceans
ii. Ship based operations : Loading, unloading, maintenance and servicing of ships
iii. Management based operations : Cooperative scheduling and controlling of the world's oceans
iv. Activities for connectivity of the above three

According to the united nation, a typical ICT component consist of the components described in table and most them ends their journeys as shown in figure 2.2.1.

Table 2.2. 1:Components of computer

Material	**%**	
Ferrous metal	32	
Plastic	`23	
Non ferrous metal	18	Lead cadmium antimony beryllium, mercury
Glass	15	
Electronics board	12	Gold silver platinum

Figure 2.2. 1: e-waste destination [Source UNEP]

In the contrary, the computer help us to reduce solid waste of papers, and a thorough cost benefit analysis is required to justify use make balance between use of computer and the computers at the end of t heir life. How nice it will be to have semi conductor industry to recycle the use of the material. Another problem is the effects of the trace metals on our health and ecology. Tailoring IT utilization list for a specific ship application and associated seaport facility, passenger and cargo carrier, or sea traffic

management systems require reference, networking interfacing and integration of infrastructure worksheet of the list of core technology elements associated with system support resources associated services in ship shore operations like : Administration, Finance, Building, including Access, Environmental, Inspection, Security and Safety as well as Communications, Office Equipment, Computer Network Resources, Food Storage and Distribution, Interface, Public Works, Software, Emergency Medical Systems, Marine Systems, Rail and land intermodal system linked with the port operations and door to door services. Necessary interface and integration software could be adapted to facilitate this intelligent transportation work as required.

Requirement for shipboard paperless smart system

Today things we have developed as human are becoming faster and the time to do many, to finish or do more things is not enough, a world that apparently put everyone on illusion of fact that technology has almost reach its peak give rise to today's need for systems integration. In other to further build capacity for use of ICT, and boost its contribution to mitigation of climate change it is important to implement the efficient and sustainable smart system for ship:

i. Design of universal control server for shipboard power control systems.
ii. Building of artificial intelligent development program for the system - With a result to reduce man power, simplify management process and cost reduction.
iii. Connection of the central monitoring station to wireless node, sensor network including the internet through fiber optics and blue tooth -this for easy data transfer and control needed.
iv. Building of a dynamic intelligent system that will provide easy synchronization to automated computation in shipping industry.
v. Building of scalable and efficient system that will reduce transportation cost, easy system management and upgrade

Benefits that can be derived from such system are:

i. Production of potential manpower savings while improving readiness and quality of life through assessing policy changes, innovative cultural and tradition modifications and integration of advanced technology to come up with the need of cybernetic ships.
ii. Reduction of annual operating costs by million, and developed long-term benefits in terms of improved morale and retention of quality personnel. Multimedia digital system on board ship, creation of more space from recreation and training of crews will improve efficiency, reduce homesickness of the crew and improve quality of life for the crew.
iii. Increase in efficiency of the shore infrastructure, QOL increases for operational forces through better customer service and for installation personnel through reduced workload.
iv. Increases in efficiency and subsequent increases in QOL both increase operational readiness
v. Contribution to absolute safe monitoring and management of utility power plant for high reliability, black out detection, and emergency cut out efficiency
vi. Low operating cost and reduced human power as well as -E-billing facilitation and e- interface capability
vii. Stand alone and remote control capability from a long range.

Scope of sustainable smart paperless ship project could lie within the following

i. **Shipboard operations -** Alarm Data loggers, Bridge Movement Recorders, Compass/Internal Navigation, Commercial Radar, Doppler Speed Logs and accessories, Electronic chart systems, - electronic charts, bridge systems and equipment, automatic identification systems, shipboard alert systems, also changing role of class societies, regulation and policy .thematic areas will include.
ii. **Port terminal -** Elevators, Escalators, Fire Detection, Heating and Air Conditioning (HVAC), Electric Power, Safety, Security, Telecommunications, Water and Sewer systems, as well as Leasing and

Financial Management Software to support the Building Infrastructure required supporting the various aspects of the Sea Transportation activities.

iii. **Integration-** Integration and interface through smart and wireless network.

iv. **Software -** Word Processing software ,Spread Sheet software for various reporting system ,Briefing software , Scheduling software , Data base software Electronic Mail software to exchange informal correspondence, Network Browser software , shipboard e-mail software, maintenance management, computer based training, simulators, web services, shipping company software, communications with brokers, charterers and agents, shipping agent systems .

v. **Hardware-** Computer Hardware used to run the software to satisfy the Sea Transportation sectors daily automated IT requirements, Hardware used to manage, monitor, and control radar and other ship management aids,

vi. **Communication** - Communications systems, both voice and data, used to coordinate and facilitate the flow of ships, on-ground vehicle traffic, and requests for seaport services. Inmarsat Fleet, shipboard information services, ship tracking, ship-shore communications by e-mail, data and voice, Iridium, sending weather, chart updates, training materials to ship, sending ship operations information back to shore , Fax, photocopiers, telephones, mobile telephones and radios, vehicles, etc. Global Positioning System (GPS), Radar, Periscope Personnel computers and associated software .Steering Vessel Measuring System (VMS) and Vessel Traffic System (VTS),

vii. **Security**– The project will facilitate use of smart cards to replace our various conventional security systems. Practical application of the ISPS code, training and monitoring the ISPS code, seafarer ID cards, reducing shipboard piracy, container shipping security, port security, Smart and Secure Trade lanes, and container security initiatives.

SSPS Process

To put the SSPS system together, the process could target the following three phase viz:

i. Equipments and testing,

ii. Arrangement, connection, networking and testing
iii. Coding and testing.

Description of Equipment

i. Hardwires
   a) Main devices: PDA, A/D converter, microcontroller device, pc
   b) Network sensors-infrared remote control, water level controller, RS 232 interfaces for A/D converter, digital automation temperature control smoke detector fire alarm controller.
   c) Testing equipment: digital voltmeter, 5volt power supply, digital logic probe, 4 channel digital scope or universal Tektronix logic scope and analyzer.

ii. Software:
   a) Initial design and simulation software: CAD, MathCAD, electronics workbench will be use for initial design, Simulation software, Atic-transmission line simulation, Aviprog-microcontroler device in parallel programming ,Digitemp-read temperature data from USB or wire, Eep-read and EPROM devices
   b) Computer language: assembly language for microprocessor communication (if we need to build or adapt one to our project),
   c) Network integration soft wares java and c++ for wireless LAN communication between the PDA, the device and the sensor and visual basic for auxiliary
   d) communication need and solution

General SSIPS architecture

Wireless device with capability to use LAN and sensor network will be established as needed. Analogue to digital converter will be wired to a computer .The PC could be the main control center that will be loaded with hardware and software interface program we will need for the project, it will be the main control station through with features can be changed and tested on the devices. Network sensor and Bluetooth and

connection to various system will be established to o the various computers, wireless device and sensor and the internet.

i. Server layer: Micro servers are used to host local content and may be embedded in various devices to make them network-aware and remotely controllable. We can use TINI embedded microcontroller to build the micro server TINI is the size of a 72-pin memory SIMM module, has a hybrid 8/32 CPU (DS80C390 - backwards compatible with 8051), 512K/1M non-volatile (battery-backed) RAM, 512K flash ROM, 2x serial, 2x CAN, 1-wire, parallel, real-time clock, and runs Slush (with a command shell similar to Unix), a Java virtual machine (JVM) and Java API. Software includes FTP server, TELNET server, TTY server and HTTP server. A micro server may have interfaces such as CF (mainly for networking), SD (mainly for storage), USB, infrared, and DSP and Clock speed in the order of 300- 500 MHz.

ii. Wireless layer: A user will interact with the cyber-assisted environment through an agent device like PDA's or mobile phone .Wireless network with inter-operability being one of the most important aspects, the standard 802.11b and 802.11 will be used according to nature of the system.

iii. Sensor network layer: networks are used to get real world data, her there is need for gateway to IP sensor, The main module has a microprocessor and an RF chip; the sensor module has the sensors for light, temperature, magnetism, acceleration, and sound. As the role of sensor networks is constant monitoring, radio communication is usually in use. Therefore, gateways between sensor networks and computer networks are needed; their task is to monitor incoming sensor data and invoke hook operations when trigger events are detected.

iv. Middleware layer: To have applications working over heterogeneous embedded networks requires lightweight mechanisms of service directory and remote procedure invocation. Multicast (DNS)domain name service discovery is a good pick for the former functionality and the web based technologies for the latter as JAVA for simple server-side processing and SOAP (simple object access protocol) for network wide distributed processing.

v. Real world user interface: this project will allow user to interact with the real world environment, user interface on the agent device will be a good in thing in addition to the standard web browser interface. Infrared communication will be used for the physical reference, where the IP address of the agent device and the URL of the service on the micro server that is pointed at by the user are exchanged. Voice recognition will also be used for specifying services, where the user's voice is sampled on the agent device and then transmitted to the voice recognition server by the VoIP (voice over IP) technology. The result may be used with the multicast DNS service discovery. Another interesting method we have is location-based service lookup. Other location infrastructures that will be use are 3D video tracking and based station id of wireless will be used for short distance. Switch arrangement to GPS will be provided for ship-shore needs.

vi. Security layer: the security and privacy issues are ever prominent yet posing difficult new problems will be a big issue in this project. We don't want ship or operations to fail. And since the whole idea sis about opening g the network to the net, securing the network is important, security measure will include ID encryptions and using location authentication. Using internet security for protection against long distance intruder. This part will take us to the next phase of the project.

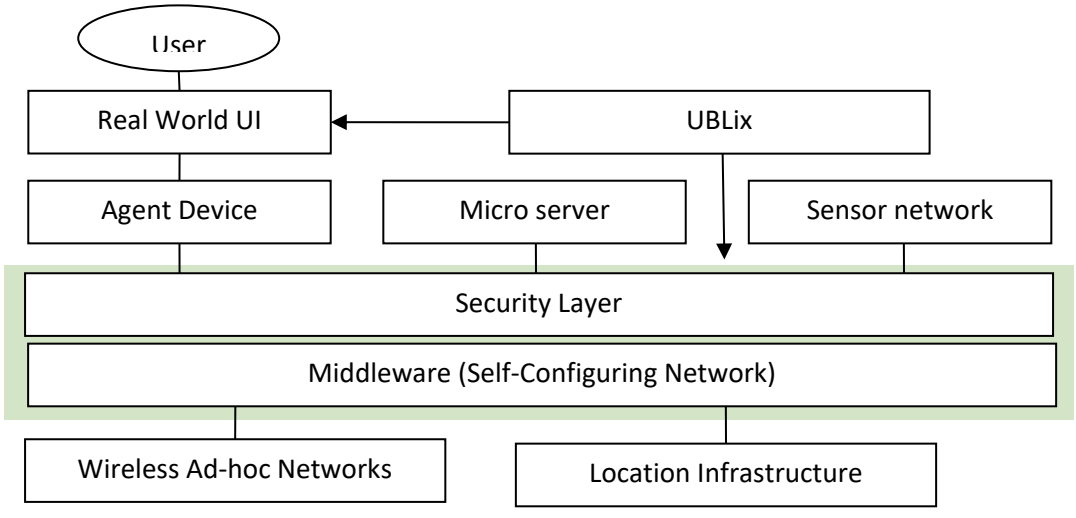

Figure 2.2. 2: System arrangement and diagram

Subsystem operational Framework

This system can be tested on different system, technology could be applies on: Most ship systems are design and to run on analogue built system, in this new digital time, today we have many navy ship built on. Integrated Ship Control System (ISCS or ISC) could replaces obsolete analog ship's control systems with a state-of-the-art, commercial off-the-shelf (COTS) system with a Windows NT operating system or Linux that communicates via dual-honed single and multi-mode fiber optics. The air-blown fiber optic network, programmable logic controllers (PLCs), data acquisition units (DAUs), Intergraph computers, and Henshel hardware components are the backbone of the equipment equipments in this category.

Best practice for shipboard system

Typical example for on board integrated Bridge System (IBS)

This include provision of navigation assurance via automated piloting and ship's course and track analysis with radar and digital nautical chart overlay, including collision, this project will work on required integrating needed from the following on board ships systems:

Actuators

i. 4 rpm controlled azimuth thrusters with indecently controllable azimuth angles
ii. Control commands are transferred from the control room to the ship by a radio link.

Computer system

i. a micro PC onboard the ship running QNX real-time operating system (target PC)
ii. The control system is developed on a PC in the control room (host PC) under Simulink/Opal and downloaded to the target PC using automatic C-code generation and wireless ethernet.

iii. Integrated Condition Assessment System (ICAS) provides condition-based maintenance recording for main propulsion, electric plant, and auxiliary equipment
iv. Wireless Communication System provides hand-held communications for ship's key personnel in or near the ship.

Machinery Control System (MCS) provides main propulsion and electrical plant control + Fuel Control System (FCS) provides an automated control of a ship's fuel fill and transfer operations.

Typical example- for a on board power plant and fuel control system

Determination of power capacity of a particular utility plant and how many substations it can be divided to.

i. # of equipment will be derivative of 1
ii. Two substations with one-step up and step down transformers will be ideal for a prototype design. With nominal 220v input and output voltage.
iii. Auto transformer will be use to determine input and impedance will be use to simulate the load and filters will be connected for of control Station, substation central station will be connected through LAN and Bluetooth to the various computers, wireless device and sensor and the Internet.
iv. Computer- aided system will be connected to the switches and controller and various network devices , but whenever it cannot find a solution it will send alarm or message through the network to human and will learn how the solution was provides.
v. Phase transformer Current transformer Potential transformer Autotransformer Impedance, Circuit breaker, Computers fixed filter, Control filters Switch software simulation.

Focal areas for this model are intelligent routing of the system and Power distribution and control. The use of exiting power line to build the network physical and control could enter e-recycling regime.

Typical example for smart terminal operations:

This will include capability for short range sensing application ashore and on board where the system allows the user to control any device that has ordinary IR remote controls. We prepare a micro server with an infrared port, run a web server with a java script that has information about the remote control signals for the target device, and place it in an appropriate position. The remote control procedure will be according following steps:

i. The user transmits the agent device's IP address in the infrared beam by pressing a designated button. The micro server receives the beam and sends back the URL of the remote control java page on its web server to the decoded address of the sender over the wireless network.
ii. A web browser is started with the returned URL on the agent device; the user then sees a remote control page for which he/she presses one button. A request is sent to the micro server's web server; next, the corresponding JAVA script is executed and the control signal is transmitted to the device. The user sees his request granted. Voice IP technology will be incorporated as necessarily

Typical example for ship shore communication and data sharing

Here we will device application to open and integrate ship shore network and communication system to the internet .this way, communication will be cheaper, but the thing here wile main security satellite transmission and reception dish will be used here.

What can building the above describe systems achieve

i. Paperless desktop
    a. Regional information/data repository
    b. Single interface for all Web-accessible information/applications
    c. Automatic routing and storage of correspondence and instructions
    d. Reduction in labor associated with copying and mailing paperwork
    e. Faster access to more accurate information increases worker satisfaction

f. Reduced workload for admin workers provides more time for other essential tasks

** Naval Air Station (NAS) Brunswick: saves 36,000 sheets of paper annually on instruction distribution alone

ii. Smart terminal
   a. Automated port operations management system
   b. Vessel/Berth/Tug Scheduling & Web Enabled System
   c. Provides improved efficiencies by providing improved communications and near "real-time" monitoring of Port Ops assets
   d. Reduces preventive and corrective maintenance on all port operations equipment, which means less overtime required for already-busy sailors and civilians

iii. Smart Procurement Electronic Data Interchange (SPEDI) has been implemented in the US NAVY
   a. Total e-commerce solution for negotiated procurement
   b. Automated back office processing capability and interface to DFAS
   c. Completely eliminates unmatched disbursements
   d. Just-in-Time/optimized inventory management
   e. Reduces labor associated with order, receipt and bill paying procedures (customers, vendors

iv. Activity-Based Costing/Management (ABC-ABM)
   a. Benefit derived here will be
   b. Provides tools to facilitate management decisions in allocating resources efficiently and maximizing operational efficiencies
   c. Operational efficiencies gained reduce maintenance requirements, which in turn reduce workload
   d. Savings gained through process reengineering can be used to better serve the sailor

v. Intransit material bar-coding
   a. Automated inventory tracking and notification system
   b. Distribution Center automatically notifies customers via email of supply shipments
   c. More accurate tracking of supplies once in the Navy Supply system
   d. Faster delivery of supplies from distribution center to operational units
   e. Supplies directly or indirectly affect QOL of sailor (operational readiness)

vi. Electronics security
   a. Automated electronic access control via Smart Card using contactless card technology (proximity card)
   b. Monitors general base access and special access areas
   c. Central secure surveillance of interiors, exteriors and property parameters
   d. Records management system/access audit/ event recording
   e. Provides increased security status visibility
   f. Reduces manpower requirements while increasing security level
   g. Increased security = safer working environment

vii. Lifeline
   a. Delivers QOL services and programs via the Internet, teleconferencing, satellite broadcasting and cable TV
   b. Web site uses "expert systems" to deliver a comprehensive range of human services and assistance to the total force
   c. Supplements-- does not replace -- traditional QOL community-based service delivery systems
   d. Provides greater access to "high touch" human services using "high tech" modern technologies
   e. Maritime multimedia super-corridor-including training video conferencing
   f. Joint maritime services partnership

viii. Smart base direction

a. Near Term:
b. Installation and Region Interoperability
c. Local Operational Unit Integration into Shore Business Process
d. Mid-Term:
e. Multi-Region Interoperability
f. Long Term:
g. Installation, Region, Headquarters Staff Interoperability
h. Continuous:
i. Leverage existing investments, infrastructure, policies and practices to assist in reducing the cost of daily shore-based operations

Comparative advantage

Theoretical knowledge based on digital electronics, LAN, microprocessor, c++ and other electrical, electronics, computer and communication engineering and ship systems areas will be applied as needed. Installations of systems that perform voyage management, digital damage control information management, wireless internal voice communications, equipment condition assessment, digital machinery control, a Learning Resource Center and a fiber-optic LAN was recommended in the Smart Ship System Assessment report to take full advantage of the synergy between technology and policy and procedural changes and to enable manpower reductions with less risk. Risk solutions and recommendation –the military has always been the first institution that invest a lot to try new things, the Navy's has been involved in smart ship program geared towards reduced cost and man power , while also increasing efficiency. Installation and integration of the latest technologies now provides the fleet with automatic digital control and status monitoring for its vital operational systems thus this has always been the trend of research work, adapting current system developed systems smart system on war ship and smart terminal operations to commercial fleet is a presently need to take us to the level of technology in shipping.

The cost of establishing this system and the network is high- however; suggestion will be made on upgrade of existing facility to lower cost to a greater degree. The above proposed describe system is a complex task, since two heads are better than one combining working with other academic and professional working in this field has been useful and this facilitate the other work we are doing on building the prototypes , system and equipment- in this regard we will working with academic and industrial partners in similar project. Survey and analysis of existing wireless and network system and modification to our taste has been a good tool for us to identify our various goal and necessary upgrade, which will equally reduce the cost of connection and equipment that will be applied. We are presently working on hybrid facility and Selection and building the program tool to execute the control, operation, and research will be made on existing related program in other field and code elaboration will be developed.

Cost and benefit analysis

The cost of analysis to complete the control and network system will be analyzed accordingly. The long term objective of these projects is to identify the most promising labor saving technologies available today for back fit, or projected the future for forward fit. This will potentially save the industry significant manpower funds, in the long term,

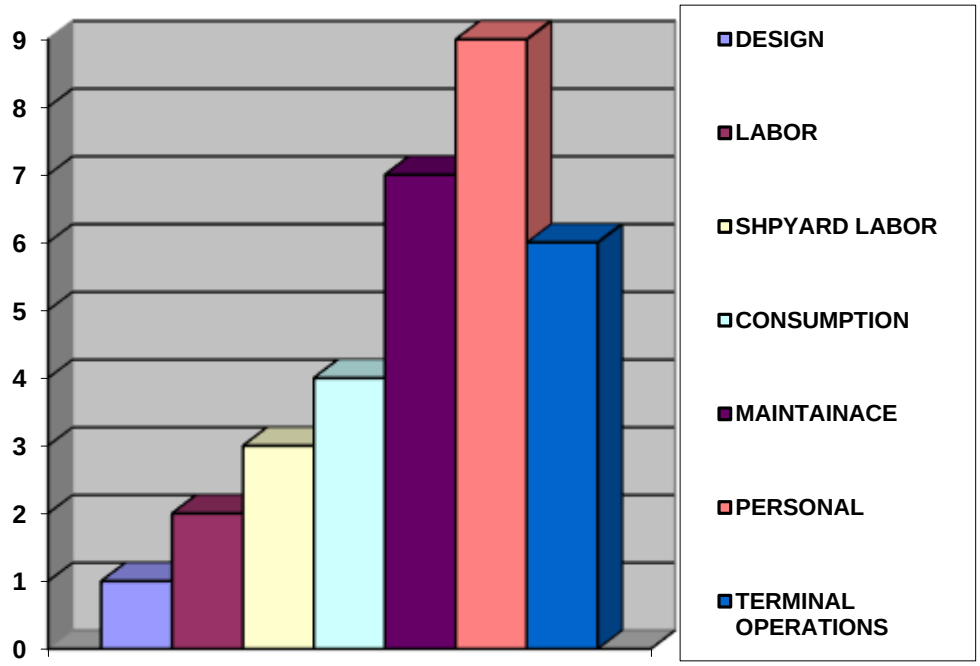

Figure 2.2. 3: Total Ownership Cost Components for a ship [Source: NAS]

Traditional ships need a lot personal, and cutting out this number has always been a priority for many manager in the transportation industry and the answer to this to their applications If information technology challenge This project will avoid Duplication or overlap with Smart Ship endeavors by working with other industry and merge ideas together to come up with the best aim system to control our devices., except in those cases where the initiative is an element of the core infrastructure necessary to implement modern technologies. Information and initiatives will be freely exchanged and shared to increase the efficiency and effectiveness of both programs.

i. Technology transfer prospect : in a world that is going through a wireless revolution , product reduction, reliability , scalability and speed , the above described project will be very marketable and patents for this project will allow technology ad transfer and cooperation within electronics industry .same technology can be use for smart hem and smart industry and facility management .

ii. The advantages of the proposed design would reduced manpower, reduced capital investment, reduced demand for hot/fresh water, improved sanitation, individualized menu selection, no inventory requirement, and reduced storage space. Issue of Intelligent electric power resource management and other electrical or electronic power management are ample areas for improvement. This technology, applied to other platforms, will shown savings in operational and maintenance time.

iii. Potential Improvement: Independent of definitive billet reduction, impacts on design may be measured. Obviously, spaces should be designed to work efficiently, whether manned to historical levels or revised to reflect Improvements in technology or policy revision. Equipments would be multi-functional or accessible to more than one operator. Physical area may be reduced as appropriate to facilitate access by fewer personnel. Efficiencies in stowage are also examples of where design can be modified to best serve the crew regardless of size. On Smart Ship, the majority of the workload savings can be attributed to policy and procedure changes. A new mind-set to review business as usual and develop methods to utilize only those personnel required guided this effort.

Table 2.2. 2: Spaces where similar policy changes could impact

Space	**Policy Impact**	**Application**
Ship office	Paperless ship reduced, and reduction in weight of paper.	Potential impact on need for separate Log Room, engineer's office, etc.
Electronic logbook	Operating logs pared down, periodicities reviewed and revised and data log entry	Employment of automatic sensors and a data base system

	automated portable data terminals,	
Pilot House	Reduction of watch	Use of Ship's Control Console
Automation	Reduction of watches by removing EW Supervisor, plotters, etc.	Use of automated multi-purpose consoles. Reliance on automated systems will require accelerated system rest oral times after casualty
Quarterdeck	Reduced to single watch	Simplified interior communications and alarm access. Automated deck log capability

Risk areas for SSIPS

Major Potential Risk Areas : for everything the is always the bad side, this project has no exemption , therefore extensive work on security for necessary protection are needed and will be the next phase of this project , so far are of identified risks are :

i. Potential Area(s) of Automation Risk: building infrastructure, office and Network systems, and the core seaport/terminal, ship carrier, and ship traffic management Infrastructure could affect the sea transportation sector's ability to conduct critical, essential, and non-essential business, the inability to utilize mobile radios, mobile telephones, telephones, and utility vehicles including support systems e.g., maintenance, etc., and non-essential systems impact would include the inability to utilize basic office support resources e.g., Photocopiers .

ii. Operational: Loss of failure of the vessel's navigation, steering, speed logs, military and commercial radar, Vessel Measuring System (VMS), Vessel Traffic System (VTS), communications and Periscope, control systems, e.g., engine and cargo systems, failure or corruption of the seaport, sea carrier, or sea traffic management systems Data Bases that support the fundamental sector operations such as passenger and cargo reservations and booking, sea planning and traffic flow management, and personnel/facilities scheduling, Mobile Radios and Telephones, Utility Vehicles, and Telephone Service

iii. Port Infrastructure: Loss of elevators, escalators, fire detection, heating and air Conditioning (HVAC), electric power, safety, security, telecommunications, reservation, flight planning, and scheduling systems, as well as Leasing and Financial Management Software. Failure or corruption of the seaport, sea carrier, or sea traffic management systems Data Bases that support the fundamental sector operations such as passenger and cargo reservations and booking, customer billing, sea planning and traffic flow management, and personnel/facilities scheduling.

Sustainability through manning and shipbuilding design:

i. Manning through constant care can only be maintain through training of personal, establishment ICT department to focus on improving ship's performance on board, this project will be beneficial to the improvement of work on ship and shore. First, shore-based training is transitioning to shipboard responsibility - and secondly, there will be will need for embedded on board training program with emphasize on expanded computer skills for both operator and maintainer and average sailor's tenth grade educational level has to be supplemented by extensive onboard training.
ii. Shipbuilding design based on the above, project will be a good guide for ship designer, their space work and partition. Other recommendations are:
    a. **Fleet Modernization and conversion -** Full build integrated design, logistical and planning and management support for modernize old fleet.
    b. **Upgrading fleet with Advanced Planar Antennae -** use of Integrated VHF/UHF/L-Band Antenna (IVUL), Advanced Multifunction Radar Frequency Concept (AMRF-C).
    c. Radar upgrade- Ship systems to use near field radar reflectivity range that provides the capability to measure the radar reflectivity of large structures accurately and with high resolution. Individual component contributions.
    d. **Remote Source Lighting -** remote source lighting technology in marine applications that allows full spectrum effective lighting in hazardous atmosphere environments without the expensive, heavy weight explosion.
    e. Fiber optics cable technology promised weight reduction and lowered interference susceptibility for communications applications.

Mitigation options on impacts:

i. Officer of the Watch manned only when as necessary, change may not have negative impact on readiness and was implemented at zero cost. Wireless communications provides flexibility to have these personnel roving or on-call rather than remaining in concentrated on job. Design sufficient monitoring, Issue: Shipboard Automated Planned Maintenance System (SAPMS) reduced time to perform PMS checks on UHF equipments Impact. SAPMS or similar system would be of more benefit because of potentially more UHF equipments

ii. High Speed Fleet Broadcast system will increases the throughput rate of fleet broadcast by 300% to 9600 bps and enhances ship's HF capabilities by providing single tone modems with interleaving and Forward Error Correction. It replaces existing fleet satellite broadcast modems. Message volumes continue to increase and even, hence higher speeds will be needed. Modems already achieving 56.6K bps a faster system will be beneficial.

iii. High Frequency Radio Group replaces existing shipboard manually tuned/controllable and rigid HF (2-30MHz) systems. HF remains a viable tactical circuit for ship-to-shore operations particularly due to the always present competition for satellite bandwidth. Automating tuning and controlling will increase accuracy and set up speed.

iv. Touch pads replace mice and/or track balls facilitate operator interface and have no moving parts. There may be difficult for the operator because the pitch size of the indicator was too small to see under the finger and the sensor areas had to be brightly lighted in order to find - impacting night vision. Suggestion: Equipments with Touchpad should be evaluated by location, requirement for lighting, and ease of using before full scale implementation

v. EDI system- Resale Operations Management Electronic Data Interchange (ROM EDI) eliminates various paper-intensive operations such as preparing hard copy, monthly transmittals. It improves accuracy while reducing workload.

vi. Automated Log Keeping, reduce paper work on board ship and improve accuracy.

vii. Galley maintenance- is a labor intensive function. It is possible to modify the bulk of this operation without overburdening the individual Sailor through innovative packaging and food preparation. The proposed conceptual design would require an automated ID system, a comprehensive data base, advanced food processing and packaging, and innovative heating technology.

Conclusion

Beside environmental benefit of reducing flooding of land and capturing of green house gases by three, SPS technology will achieve a return on investment in future voyage management, LAN/wireless internal communication and machinery condition assessment that are valuable particularly in reduce risk, and increasing speed these new technology applications will supplement or replace current shipboard systems and subsequently mitigate increased risk perceived from reducing watch standers. SPS could also reduce present day's transportation problems in making transportation system safer and more efficient. Setting, program functioning, & staff skills unification of system in diversity, foster extensive cooperation among professionals, agencies through building integrated information system. It will also improve readiness for change and resources available on pressing issues in marine transportation systems as well further great transformation and reciprocating performance contribution to human civilization.

Reference

Sumit Ghosh Tony Lee, 2000. Intelligent transportation .modeling and simulation techniques for ITS Design, future issues of ITS,CRC ,PP135-165

C.S. Papacostas, P.D. Prevedouuros. Transportation engineering and planning, prentice hall 2001.

Roshini Ratnasingam, Indept study of oxide material for high frequency applicationhttp://www.sysopt.com/articles/soi/index3.html

http://www.cs.berkeley.edu/~pal/research/tossim.html

infosecurity magazine, Dan Houser. network security for submarines pp46-57, august 2003

Geographical information system in transport research. Pergamon 2000.

Mechatronics.W.Bolton. Prentice Hall, 2003.