2050 INNOVATION HUB

22nd November 2019

Berth Utilisation and Cargo Characteristics

Enquiry Phase

MVP Description

The purpose of this MVP is to explore technology and process enhancements to the enquiry phase of the vessel arrival process at a UK port.

The 2050 Innovation Hub is seeking early working concepts / prototype solutions to assist with the streamlining and automation of the initial enquiry phase of the vessel arrival transaction to aid in the provision of timely responses to customers. The requirement is for real time access to all available data sources to enable informed and responsive decision making. We are looking to advance the current 'state of the art' for the Maritime Industry as a whole, not to simply procure existing technology as it stands.

The 2050 Innovation Hub is keen to explore innovation opportunities around:

- Apps
- AI & Machine Learning
- Robotic Process Automation (RPA)
- Big Data
- IoT
- Robotics
- Environmental and Safety Sensors
- Location and Proximity Detectors
- Augmented & Virtual Reality
- Data Process Flow Improvements

Current State

The process of dealing with an initial cargo handling enquiry to the eventual arrival of a vessel is largely manual and complex. It involves large volumes of data from a wide variety of sources. (Appendix 1) All these data sources need to be assessed depending upon different customer requirement scenarios.

Data acquisition can be both verbal and electronic, which is then collated via spreadsheet or a manual form set (Appendix 2). This can potentially lead to misinterpretation of customer requirements or keying errors.

A customer enquiry typically consists of the following basic requirements:

- Provision of costs for the loading /unloading of x tonnes of cargo y

- Details of any berthing restrictions such as tide, draft, air draft

- Working arrangements (bank holiday restrictions/weekend)

- Discharge rates

Ports are required to handle a wide range of cargo types and volumes all with a unique set of challenges and data variables.

For example:

Cargo characteristics:

- Density stowage factor

- Health and safety

- Environment

- Weather

- Berth availability

- Labour and Resource Planning

Target State

The aim of this MVP is to streamline and automate the processes and data inputs used from the first cargo enquiry from a potential customer through to the contractual agreement of a vessel visit to port to enable a more efficient operation and a superior customer experience. The system should be of benefit to all parties and allow visibility of (non-commercial) data throughout the process.

The vision is to develop a system which will automate the enquiry process from start to finish therefore reducing the need for manual input where feasible. The system needs to be accessible to multiple stakeholders across the business and to external customers who would have visibility of the information and data applicable to them throughout the process.

Ideally the system would be able to self-learn through usage to improve decision making and operational practices.

The target benefits of such a system will be as follows:

- **Efficiencies for Ports:** Cost saving, streamlining of the processes and better informed decision making amongst others

- **Safety:** This system should allow ports to share safety information between each other on cargo characteristics, handling requirements, potential issues with vessels or cargoes and highlight any environmental concerns

- **Information Sharing:** The system should act as an information portal for stakeholders such as - Local authority, Local community, port Users, UK Boarder Force (UKBF), Customers, Agents, HMRC, MCA

- **External:** Beneficial for external agencies to see what a port is handling at any one time to help their planning (UKBF resource planning as an example)

- **Learning:** Data could be made available to assist future research projects or academic advancement

The output of the MVP should make significant improvements to the enquiry process and should include the below:

- To improve the customer management process from initial enquiry through to contractual agreement
- Access to and use of historical data for customer insights and trends
- Reduce the time taken from initial customer enquiry to agreement in principle
- Creation of a standardised interface for the customer to complete ensuring all required information is captured from the outset
- Customer centric – Understanding the customers decision making process (where known)
- Scenario planning (what if) to facilitate informed decision making for port and customer
- Maximise utilisation of berth, labour and equipment to benefit customer turnaround time and port deployment of resources
- Alert port staff to quieter periods to focus sales potential (such as lay time opportunities)
- Provide full break down of end to end costs both internally and externally
- Use data captured to enhance learning in order to provide input to future decisions, costings and opportunities
- Timely receipt and turnaround of customer enquiries

MVP Features

The target MVP features are detailed below:

Must Have:

- Simplified form for customer data entry and port verification of requirements
  - Feedback and query options to be included
  - Simple, customer friendly interface and layout – easy to follow and logical flow
- Flexible pricing based on assumed volumes at the time of enquiry
- Standardised pricing matrix to include cargo type and volumes
- Online access to port and customers, with individual user account access
- Unique enquiry number per work stream
- Visibility of previous enquiries and transactions
- Booking calendar showing berth availability and potential window durations
  - Visibility of berth availability and request berthing time and date – to be approved by port staff
  - Berth availability by hour/day/week
- Ability to provide estimated discharge timings at the point of order based on similar previous visits
- Automated reporting, alerting and itemised quote generation
- Centrally collated data
- Digital signatures
- Hazardous cargo details

Nice to Have:

- Customer ability to track progress of enquiry
- Resource availability: Labour and equipment
- Multiple submissions from unique customers

- Chat window for real time assistance
- Opportunity for forward enquiry – up to 12 months in advance
- Access to relevant external data where applicable (AIS, Weather, Environmental, for example)
- Machine learning for lessons learnt and trend analysis reporting to port staff to assist with continual process improvements
- Details for end to end costs for storage, rail or road and onward transit if required
- Guaranteed x hours/days pricing
- Estimated costs for despatch and demurrage if known (more relevant in later phases)

Avoid:

- Automated decision making (assisted recommendations would be acceptable)
- Links to shipping companies
- Advertisements

Advancing the Current State of the Art

The matrix below shows currently available technology and solutions and plots their readiness for use against the development challenge based on the outputs from our previous innovation sprints. The matrix inputs were generated by delegates at our MVP innovation sprint on 30th October 2019.

As an example, *online forms* are commonplace and have low development overheads so would plot in the top right segment of the grid. Resource planning on the other hand, although the technology is readily available, is not out of the box adaptable for this solution and could potentially have high development costs for integration. Therefore it plots to the left side of the gird.

Level of development challenge
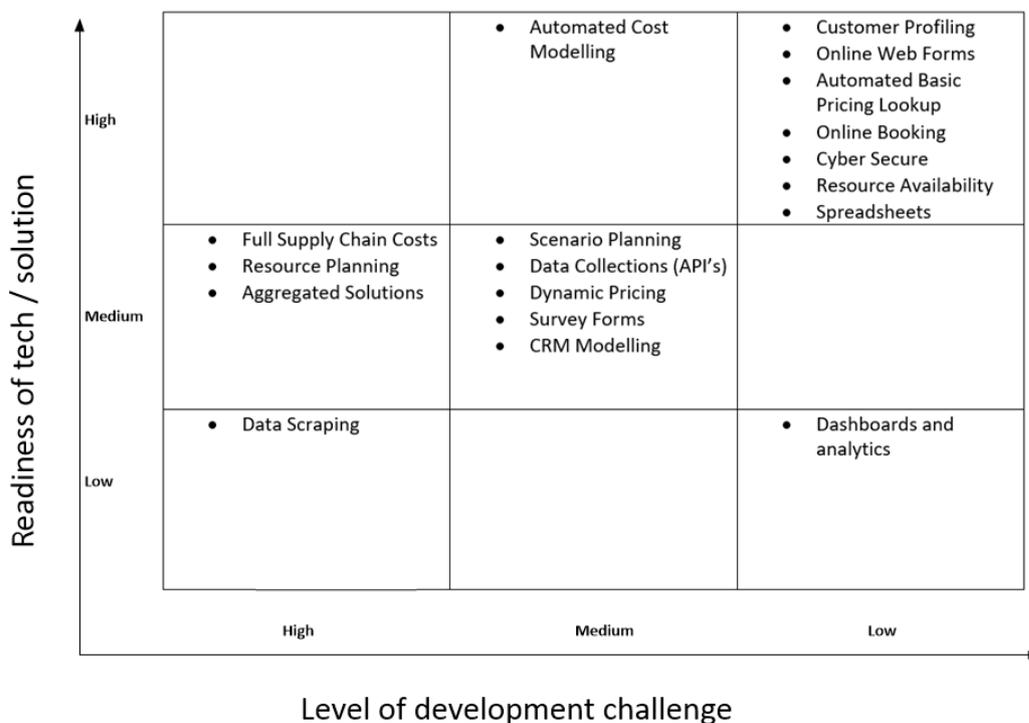
Data Sources

The following data sources will be made available for the hackathon.

Source	Description	Format
Vessel Management System	Management system used by Marine Department to track vessel arrivals, movements and sailings.	SQL Database
Bulk Management System	Management system used by operations department to	SQL Database
Staff Shift Planning	Staff rotas and vessel gang requirements.	Excel Spreadsheet
Historic Enquiry & Planning Details	Details relating to previous vessel visits to the Tyne.	Excel Spreadsheet / paper based forms
Plant Availability	Plant Maintenance Systems	SQL Database / paper based forms
Weather Stations	Real time data relating to wind speed and direction (potentially not relevant at the enquiry phase)	Raw data
Tidal Data	Information relating to tidal levels	Raw Data (port owned tide gauge) and online tidal data sheets.

Data Sources – External

Please note there are numerous sources of shipping information in a variety of formats. The below are all online sources utilised by the Port of Tyne. They are all primarily subscription based.

Access to these systems will not be provided by the 2050 Innovation Hub during the Hackathon, they are intended for information purposes only to demonstrate the type of resources consulted through the full operational process.

What	Description	Comment
AIS	Vessel Tracking	Positional information of vessels
Lloyds Register of Ships	Worldwide Shipping database holding all relevant vessel information	The ports VTS System imports Lloyd's details upon estimated arrivals information being entered.
RightShip	Marine safety and environmental management system.	Utilised for reviewing any historical issues with vessels worldwide.
Weather Forecasting	Details relating to previous vessel visits to the Tyne.	Excel Spreadsheet / paper based forms

Intellectual Property

Innovation Hub "hackathon" terms

The Port of Tyne Authority ("**we**" or "**us**") are delighted to host the 2050 Innovation Hub "hackathon" event on 22nd November 2019 (the "**Event**").

The purpose of the Event is discuss and develop innovative ideas in the area of maritime and logistics technology, with the aim of creating streamlined, efficient and environmentally friendly ways of working in the sector, for the benefit of all participants.

In registering for the Event, you are indicating your acceptance of the below terms of your participation in the Event:

1.   The Event is open to people who are over eighteen years of age and who are invited by us or our partners in the Innovation Hub (a list of our partners can be found at https://www.portoftyne.co.uk/about-us/2050-innovation-hub/partners).

2.   The Event will take place on our Tyne Dock site, at the 2050 Innovation Hub building. Tyne Dock is a security controlled site and you agree to register with our security office, and to abide by all health and safety and security rules whilst on site, and any reasonable instructions that our staff might give you.

3.   You agree to us collecting and processing your personal data for the purpose of running and administering the Event, and for issuing follow-up communications related to the Event.

4.   The event will include photography and videos, and you consent to us and our partners in the Innovation Hub using and publishing those images and videos, in which you might feature, for the purposes of promoting and documenting the Event and the Innovation Hub more generally.

5.   All participants in the Event agree to collaborate with each other in good faith and respectfully during the event. If we feel your behaviour is causing disruption to the Event or upsetting other participants, we may ask you to leave.

6.   You agree that any ideas and suggestions you contribute to the Event will be your own ideas, or ideas which you are permitted to share by the person that owns them.

7.   You acknowledge that sharing any idea at the Event makes it public and might have a detrimental impact on your ability to later apply for formal protection of that idea (for example to apply for a patent).

8.   You agree that any ideas or suggestions you raise or contribute during the Event will be free to be utilised by other participants, including us, in the future. Any project or ideas that are developed by any party based on those ideas outside of or after the Event will be owned by the person that developed it, not by the person that first raised the idea at the Event. In that way, all ideas or points raised or developed at the Event are "open property" and any participants are free to exploit them or develop them separately for their own purposes.

9.   We may decide to change or cancel the Event at any time. If we do, we will tell you about any changes as soon as practical using the contact information you gave during registration.

Appendix 1

Information required	Where from	Description	Why we need this information
What is the cargo	Customer		So we can make sure we have the capability to handle the cargo
Size of shipment			Helps with planning and costing
Stowage factor		In shipping, the stowage factor indicates how many cubic metres of space one metric tonne of a particular type of cargo occupies in a hold of a cargo	Allows us to calculate the size of storage area required and how efficiently we would be able to grab a cargo.
Density	Customer/on line		Allows us to calculate equipment suitability
Weather constraints	Customer		Not all cargo can be loaded unloaded in the rain, wind etc.
COSHH requirements	HSE	- PPE - Exposure limits - Explosive levels	Health and safety requirements
Storage requirements		- Dry storage - Surface it can be stored on	Some cargo needs particular storage requirements e.g. Grain
Angle of repose if a bulk cargo		The angle of repose, or critical angle of repose, of a granular material is the steepest angle of descent or dip relative to the horizontal plane to which a material can be piled without slumping. At this angle, the material on the slope face is on the verge of sliding.	Helps us understand how the cargo will behave in storage and loading.
Equipment required for loading unloading	Customer	- Crane - Ship loader - Shovel - Lifting equipment - Grabs	Ports may not have all the equipment required for handling a particular cargo.
Environmental implications	- Customer - Environment agency - Local authority	- License and regulatory requirements - Noise - Dust - Impact on local area - Contaminate other products	

Appendix 2

Enquiry Summary

Customer / Shipment Details

Customer	
Commodity	
Total Expected Annual Tonnage	
Annual Tonnage Guarantee	
Term of Agreement (years)	
Consignment Tonnage	
No. of Consignments per Year	
Average GT per vessel	
Open or Covered Storage	

Conservancy and Pilotage

Conservancy Part B Category	Semi processed and/or finished metal manufactured products
Pilotage Included in Rate	No
Conservancy Included in Rate	No

Vessel Discharge Operation

Discharge Rate (tonnes/hr)	
Discharge Rate (tonnes/day)	
No. of Days on Berth (per ship)	
No. of Days on Berth (annually)	0

Handling Rates

From (tonnes)	To (tonne)	£/tonne
-		

Storage Rates

From (weeks)	To (weeks)	£/tonne	% Expected
			0%

Appendix 2 (continued)

Operational Requirements

Customer / Cargo	0		Date	
Cargo	0			

Vessel Discharge / Receiving

Bulk Density of Product (tonnes/m3)	
Size of Grab (m3)	
Tonnes per Grab	
Cycles per Hour per Crane	
Number of Cranes per Gang	
Total Cycles per Hr	
Discharge / Load Rate (tonnes/hr)	
Discharge Time Required (hrs)	
Hours per Gang Shift	
Working Hours per Gang Shift	
Tonnage Discharged / Loaded per Shift	
No. of Gang Shifts Required	

Redelivery

No of Wagons Per Day	
Wagon Volume (m3)	
Hours per Day Shift	
Tonnes in Each Wagon	
Tones Lifted per Day	
No of Day Shifts Required	

Labour Utilisation (Personnel for EACH gang)

Position	Grade	Vessel Discharge	Transfer	Receiving / Storage	Redelivery	Vessel Discharge	Transfer	Receiving / Storage	Redelivery	
Cargo Supervisor - Ship	CS					£0	£0	£0	£0	
Cargo Supervisor - Shore	CS					£0	£0	£0	£0	
Crane Operative	A					£0	£0	£0	£0	
Crane Operative - Spare	B					£0	£0	£0	£0	
Plant Operative	B					£0	£0	£0	£0	
Plant Operative - Ship	B					£0	£0	£0	£0	
Plant Operative - Shore	B					£0	£0	£0	£0	
Hatchmen	B					£0	£0	£0	£0	
Securing	B					£0	£0	£0	£0	
Slingers - Ship	B					£0	£0	£0	£0	
Slingers - Shore	B					£0	£0	£0	£0	
Tallymen / Banksmen	B					£0	£0	£0	£0	
Tug Driver	B					£0	£0	£0	£0	
Assistant	C					£0	£0	£0	£0	
Agency Labour Grade B	B					£0	£0	£0	£0	
Agency Labour Grade C	C					£0	£0	£0	£0	
Agency Labour Grade D	D					£0	£0	£0	£0	
Total Labour Requirement		0	0	0	0	£0	£0	£0	£0	
Total Port Labour Cost						£0	£0	£0	£0	£0
Total Agency Cost						£0	£0	£0	£0	£0
Total Cost						£0	£0	£0	£0	£0

Equipment Requirement per Gang

		Vessel Discharge	Transfer	Receiving / Storage	Redelivery	Vessel Discharge	Transfer	Receiving / Storage	Redelivery	
LHM Crane						£0	£0	£0	£0	
Hopper						£0	£0	£0	£0	
Volvo						£0	£0	£0	£0	
Mustang Skid Steer						£0	£0	£0	£0	
FLT 0- 10 ton						£0	£0	£0	£0	
FLT 1- 35 ton						£0	£0	£0	£0	
Tug						£0	£0	£0	£0	
Sweeper						£0	£0	£0	£0	

Plant Cost

Equipment Cost per Gang		£0	£0	£0	£0	
Total Equipment Cost		£0	£0	£0	£0	£0