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Introductory Jingle

Innovate UK KTN connecting for positive change.

Mark

Welcome to the Maritime Innovation Podcast, in this series we will be exploring trending topics that innovators in the ports and maritime sector are always talking about. Following the success of decarbonizing ports and harbours, Innovation Network has reaffirmed our commitment to decarbonizing our industries, including maritime. A lot has happened since 2019 but the maritime sector is now rising to address large global and domestic challenges as we transition away from fossil fuels, to net zero operations, along with ambitious plans to embrace automation, digitization, and striving to improve productivity and safety. We at KTN have assembled teams of leading experts in their fields, drawn from our maritime and ports Innovation Network to join us in discussions related to these grand challenges. My name is Mark Wray, I'm the Buildings and Infrastructure Knowledge Transfer Manager, at Innovate UK KTN. I'll be hosting today's podcast episode. In this episode, we will be exploring what makes a port smart and why we wish to bestow intelligence on inanimate objects. I'm delighted to be joined by our podcast guests, Thomas White, who is Ecosystems Director for Maritime, at the Connected Places Catapult and Richard Willis, Technical Director for Port Technology at Royal HaskoningDHV, who have both been working on a Department for Transport sponsored review of the smart port case studies and built a vision and roadmap for their use. Welcome, gentlemen, and thank you for joining us.

Tom

Hi Mark. Thanks for having us.

Richard

Hi Mark.

Mark

Great, thanks for joining us, really appreciate it. Now, Tom, starting with you. Can you add a bit of context first of all before we unpack some of the case studies and the roadmap? Some 25 million of our homes are fitted with smart metres and many of us have trundled up and down the 375 miles of smart motorways in the UK, with little or no understanding of what they actually are or what they do. I suspect many of us are wondering, what is a smart port? And have I already been in one? Can you give us a quick intro on how a smart port is different from a dumb one?

Tom

Thanks very much. I think it's to start, I think it's important to say that being a smart port isn't really an end destination reached by hitting some metric, or the number of technologies deployed or something similar like that, more fundamentally, a smarter port is one that is really focused on its challenges and deploys new technologies and processes to realise new value. And as well works more collaboratively across their customers and with the wider ecosystem to deliver a greater impact. So in that way, it's much more about how the port works and the solutions it deploys with very clear value focus and of course, as well in all

this, this isn't about any one particular technology. For example, having 5G doesn't make a port smart. It's much more about the applications of that technology and their rootedness in genuine real world challenges. Even with the case of 5G, it's not really about the level of advancement of the technology that's being deployed. It's the same with the 5G case, for example, not all use cases need that level of technology, 4G works fine, if wired connectivity works, that's fine, use it. And more broadly as well, in terms of why different organisations including the UK Government and the UK's innovation support in groups around the country are interested in this is really rooted in the vital role that ports play, to the functioning of the country, both in our regional and national economies. We all know that most of, all the UK imports and exports move through our ports as our connection to the rest of the world. I think as well this was something that the country was really reminded of, during recent events such as COVID, or the Ever Given blockage in Suez, where as we saw, perhaps for the first time in a long while, ports were featuring on the front pages of newspapers, and being talked about in our living rooms as the fragility of global supply chains was so brutally highlighted to us. So as critical gateways to trade and supply chains, the future of our ports and how they work better, how they work smarter and more effectively and target real world challenges has a huge role to play in ensuring a more efficient and resilient future for the UK but as well for the rest of the world.

Mark

So there certainly sounds like there's a lot of challenges there and lots of opportunity then for smart port applications. So, Richard, for this particular set of case studies that you looked at, then, how did you go about identifying what specific port challenges you would pick up on? And how could they be then addressed with some form of smart technology application in the UK? And what sort of findings did you get then from looking at those challenges?

Richard

Thanks, Mark. Well, really, as Tom just outlined, all kinds of ports in the UK could benefit from elements of smartness in their operation somehow, could be to solve particular challenges and operations, asset management, business resilience, commercial partnership with their clients. So frankly, it's not difficult to find a problem that could be solved with a more imaginative use of technology within our industry, sometimes bringing in technology from other industries into ports. So the case studies we looked at in the report, we tried to make a nice mix of common challenges that most ports can identify with, and find some transferable ideas to solve their own issues too, as a showcase. The world of smarter ports, and smarter is an important stress, does not particularly need bleeding edge technology. But it's about the application of blends of existing tools and equipment within the local context of how ports work. It's not really about using heavy enterprise, one size fits all giant solutions, or about investing blindly in a kind of bottomless pit of mysterious AI but designing a good mix of reliable technology that really adds value and solves the problems you have. That's the smarter approach. In the report, we looked at, for example, automated truck ID systems to support check-in for freight, asset tracking offshore in harsh marine environments, using drone and image analysis for asset inspection in difficult locations, and the use of sensors to monitor changing environment conditions to address the challenges of climate change. So all have this common need for capturing data, analysing it somehow, and providing better decision making support to the port. In each case, these kinds of studies would result in improved efficiency of supply chains, improved safety for port personnel, or supporting long

term resilience of the port business, frankly, each of which are vital issues for most of the ports around the UK at the moment.

Mark

Thank you, Richard. Yeah, I mean, in terms of looking at the case studies, I've worked a lot on climate adaptation and resilience over the last decade, and certainly one of the ones that really stood out for me was Porter London's use of Smart Tech, looking to improve its resilience to climate changes. That one particularly caught my eye. It's a big stretch of water through a dense urban area, lots of users on it, lots of users adjacent to it. I should imagine keeping an eye on the climate and the potential for weather event impacts is pretty high on quite a few people's risk register along the river. So what sort of approaches did you look at to making that system smarter, Tom?

Tom

Brilliant, yeah. Thanks, Mark. So for sure, yeah, absolutely. What we were looking at, together with the team, from Royal Haskoning and with the Port of London Authority, is how we might apply more data driven tools to develop predictive climate scenario modelling for the river as a learning digital twin. Obviously, when we think about this problem, there are of course, many factors to consider in developing such a model that are both natural and human in origin, such as tidal movements, rainfall, weather patterns, drainage, sewage outputs, dredging operations, and even more besides, and as well, critically, we need to think about longer term climate change projections, and data to model the different scenarios that we might face in the future. Obviously, this is a lot of data to process and understand. This is where a port or a coastal authority might become smarter by deploying new digital capabilities to better understand the relationships and impacts between these influences, to better see what the future might look like, model different scenarios, plan mitigations and make better decisions in the future to be able to respond to them. But as well, these modelling tools, what they give you isn't just to mitigate potentially negative trends, they could also be used to sandbox new uses for the river in a digital environment to reduce our risk exposure before actually deploying them, such as bringing in new sorts of vessels or deploying new sort of operating models on the river. But importantly, with this work, it's not just relevant to London. I think we have to remember that coastal communities represent about 40% of the world's population, with many cities, communities, and critical infrastructure being located at or near the coastline. Also understanding the impact of climate change, and the different scenarios we might face in the future is of critical importance in making better informed decisions today, to protect those communities and that infrastructure in the future.

Mark

I know for my profession, so my profession is one of being a civil engineer. And I know these ports are significant civil engineering projects, with a lot of capital investment tied up in them, naturally, the owners of those are going to want to look at making the most of that capital expenditure, and looking at extending the operational life of those ports therefore and those assets to the maximum. So asset maintenance strikes me as being an area which is potentially quite time consuming and costly to undertake, but pays off then in terms of maintaining these higher service levels. So how do you explore smart port technology then, around the Shoreham Project for example, to improve this?

Richard

Yeah, thanks, Mark. Our discussions with Shoreham Port were really interesting, as a good case study of a typical UK Port Authority, perhaps. They had some responsibility for assets that were also shared with the general public, which is quite common around the UK for port authorities. So in this case, particularly the shared asset was a road alongside the beach, that's the access road for the port, so used for all the trucks, for cargo of various kinds, but it was also used for joggers and cyclists enjoying the seaside. So it's quite a conflict of port users happening in that same space. And monitoring and repairing the condition of this road was an ongoing challenge for the port. So keeping on top of potholes caused by trucking and things, which for trucks is perhaps not a major issue, but for someone jogging or cycling it can become much more of a risk. So we zoomed in particularly on how to better use technology to measure and forecast maintenance. Using this example, which is perhaps a good example of wear and tear of those civil assets that are all around our ports. As you know, traditional asset condition inspections are carried out by experts doing visual inspections and measurements, sometimes this requires inspecting things underwater, or at height, say a warehouse roof. So that can be really costly, and sometimes also has safety risks too. So we looked at the possibility of using video images, so using drones to reduce some of these risks, and they can capture the video image fine and quite a lot of ports are already doing that to inspect the roofs of buildings and things. So that's not especially new. But the ability to kind of interpret these images into useful grading, where a lifecycle action plan is still reliant on humans interpreting those images. So we've done some work with computer vision and several other sectors, using videos captured by drones or from moving vehicles. This breaks down the images to a pixel level and can classify different conditions such as measuring the size of potholes from historical video captured over time. Measures where puddles form, worn surfaces or other defects in the road. So it's a fast way to analyse quite a long distance of road, quaysides or warehouse roofs and sidings that can be quickly used to quantify what needs repairing, what particular aspects have got worse over time, as historical comparisons can be made, and rates of wear and tear can be measured, particularly important if you see weak areas developing in a sensitive area too. So using that kind of tool can lead you to a forecasting capability to understand where future wear is most likely to occur, even after it's been repaired. We know that that pothole might appear again in three years, for example. So these kinds of tools can be used for any large areas of poor assets, capture data really quickly, and use it for feedback into asset management and budget planning. We wrote this use case for Shoreham and we actually used our own in-house tools to do a road test along this beach road in Shoreham, using video captured from the front bonnet of a car driving up and down to capture the images, this works really well to define where the defects were. And it's something we do at Royal HaskoningDHV in other sectors. So it's a good example of a crossover technology. We use the same technology to monitor motorway defects right across the Netherlands and help the asset owner understand which bits need to be maintained. And in other kinds of high risk areas like airport runways, we also do it for, which are difficult to send a guy out to inspect, we use the video capture to monitor where on airport runways as well. So it's a useful example of a technology that isn't particularly used that much in ports, that could cross over from where it's previously quite well established, and solve some problems.

Mark

Yeah, that's certainly something that has struck me in the last few years now working in the maritime sector and the ports environment, just how much opportunity there is for crossover technologies from other sectors and utilising other things though, there are such a dynamic

and diverse range of challenges at ports. They make them ideal for adoption and diffusion from other sectors. So yeah, a really good example. Thank you, Richard. My transport team at KTN, now when they're not looking at ways to wean our transport system off fossil fuels, the other hot topic for them is, or the other two hot topics for them, are digitization and traffic control lead into automation. So Portsmouth certainly obviously stands out for me there. What sort of aspects of traffic management can be useful for the traffic in and around Portsmouth?

Richard

Yeah, thanks, Mark. I think these two topics are really closely linked together. Of course, we all want to migrate to alternative low carbon fuels, reducing our carbon footprint, but the efficient use of the transport network we already have, will also reduce carbon emissions and also importantly, local impact on air quality. This is especially a hot topic for cities that have ports at the heart of them. Many of the ports around the UK are still close to the centre of the city. Portsmouth is a good example of that, where the impact from truck congestion can have a negative impact on the air quality for the people living there. Also from the ports point of view the efficient operation of their services. So we looked at Portsmouth as a good example of this and we looked at options to automate the truck checking and congestion management process for ferry traffic on cross channel services. Since Brexit, this has become rather more complicated than it used to be with some additional checks and permissions required before you can go across to France. So by thinking about using camera portals over the motorway on the drive down to the port, some distance away, trucks can pass through at their normal driving speed. And images can be captured from the trucks to check truck registration, trailer numbers, and then confirm these against the expected bookings and permit systems such as JVMs and automatically record that the truck is on the way, check him in and help the port to have a further horizon of their planning, saves them admin time down the port with a faster check in process. Therefore, that reduces some of those queues of trucks idling, waiting to check in for the ferry, when the ferry is due. That forward time window, since the Porter would be some distance up the road, could even be half an hour up the road. That also allows you to use some digital signage to communicate to truck drivers if they have any particular admin problems, or maybe arriving just too early for the ship. Whereas previously, they would drive to the port and wait there, you can use digital signage to divert them to a problem solving and truck parking area outside of the city, away from where people live, you can move some of the port admin tasks up there. And the kind of parking and noise and traffic that's associated with that out of town location, has less impact on residents. So from a technology point of view, it's really quite straightforward. It's using OCR camera technology, quite common in lots of ports and container terminals already, and has lots of uses for ferry traffic, integrating with these booking and regulatory control systems to solve some problems for the ferry companies on the ports, and also to help truck drivers too. In fact, we're just starting a project. I was there earlier this week over in Ireland, working together with Brock Solutions, and Adaptive Recognition. We're doing something a little bit similar to this with using OCR to help with the truck checking processes. So it's really something that can really add value to ports and help solve this twin problem of traffic and carbon footprint air quality.

Mark

Excellent. Thank you. So this work was focused on case studies taken from the UK and of course it was funded by The Department of Transport. Clearly the work we've done over the

last couple of years, you know, the UK has really stood out to us as being a global leader in maritime innovation. But where else in the world are the hotspots of innovation on smart or automated ports, Tom?

Tom

Yeah, sure. I think, from a wider perspective as well, in terms of maritime innovation, we have seen a lot of focus on maritime innovation in recent years, where actually there's been a 60% increase in the number of venture capital firms focus towards the maritime and logistics market in the last three or four years as that interest continues to grow. That being said, though, I think historically, we have to recognise that the sector has often been viewed as a bit of a laggard, in being slow to change, and often moving behind sectors such as automotive and aerospace. But from my own experience, over the last few years, nothing could really be further from the truth, where organisations across the world are pushing forward with innovation. And having moved from a relatively immature position, even only five or six years ago, the progress has been absolutely fantastic in future fuels, advanced analytics, autonomous systems, and actually more besides, and just as a point, I would say, actually, if you look at the pace of change in maritime during that time, I would say that this far exceeds that we've seen in other sectors. Particularly, we've seen a lot of this going on in Northern Europe. So for example, in Rotterdam, where there are a lot of fantastic initiatives going on, in smarter parts as well in the Nordic regions, as well, Antwerp. But we've also seen it a lot in the East with Singapore, China and Korea. But as well, we've seen a lot around decarbonisation in the US, for example, with Los Angeles and across the Great Lakes and elsewhere. So this is a truly global and evolving maritime innovation market.

Mark

So Tom, do you think we're competitive with those nations? And we could hold our own? We're in the same sort of league as them. And if yes, who do you think then would be, would make you know, we enjoy a good collaboration in the UK, so who do you think would make a good collaborator for us? Who would we buddy up with in developing smart ports?

Tom

I think particularly when we're talking about smarter ports, admittedly, the UK has been probably, broadly speaking, somewhat behind the curve on many of these initiatives over the last few years. I say, broadly speaking, because there are several hubs of absolutely amazing activity in UK ports from Portsmouth, Aberdeen, Belfast, Felixstowe, and actually in recent years this activity and progress has been accelerated. As well, it's important to remember that even though our maritime economy in the UK has changed significantly over recent decades, with many shipbuilders having gone with the maritime finance market having changed, all that considered, the UK still regularly ranks as number one or two globally in terms of maritime technology and innovation capability. So we're not doing too badly. But there is always more we can do. And I feel that increasing collaboration between land transport operators and shipping companies, energy companies and ports to develop our whole systems concepts, is an area that needs quite a lot of effort and attention on our part, but as well as that, international collaboration on key global challenges should be a key focus for us in the nearer term. A good example of this is in green shipping corridors, where we know that there is an awful lot of innovation taking place in UK ports to explore and develop future clean energy infrastructure. And a lot of this work is genuinely world leading, in hydrogen, in renewable energy systems, in micro grids and more besides, but there's an

immense opportunity for us here in connecting our UK hubs of activity with other ports internationally, to support the scaling end-to-end green shipping corridor ecosystems. There were, to me, some quite clear opportunities to do this with partners, for example, in the Nordics, in Northern Europe and even the far east on key trading routes. Not only would this advance the decarbonisation of global shipping, which is a truly global, complex challenge, but also provide a platform to promote that unique UK technology capability into a global market and create new opportunities for our researchers and technology companies.

Mark

That's great to hear, because so often we hear about the UK being world leading in financial services and insurance and whilst these are highly valuable sectors, it's good to know that we've got expertise, and we can hold our own in some of these technologically complex sectors as well, and this sort of system approach. So that's great news to hear, Tom. So thank you for that. This has been a fascinating, albeit fleeting, look at the future for ports as they adopt these technologies and get smarter. So Tom and Richard, where can listeners go to get further information on your roadmap reports?

Richard

We've only talked about a couple of the ports we studied, but you can read all five of them. We looked at five different case studies. It's on our website, DHV website under smarter UK ports, I'm sure we will share the link in the podcast text, you can look at that there. Just I wanted to bring up another similar project we did with our friends at Connected Places Catapult during 2022, which is a similar kind of theme, which could be interesting. We zoomed in on the Mersey Ecosystem, for our Moving on the Mersey Project, as we called it, where we looked at a similar range of case studies, looking more at freight and passenger transport, really embracing what we could do with low carbon, automated transport centred around the river, as Tom says, bringing in that kind of green fuel and maritime ecosystem into that as well. That's also on our website, Mersey river transport re-imagined. You can read them all there. Frankly, we produce these reports to inspire further developments in our industry. We'd love to hear more from people who are interested in progressing or exploring any of these ideas.

Mark

Fabulous. Well, thank you, gentlemen, for joining me today. We really appreciate you taking the time out to share these insights with us and with the audience. So thank you both very much. And thank you listeners, for joining us, make sure you check out the rest of the podcasts in this series. Also make sure to look at the Maritime and Ports Innovation Network section of our Innovate UK KTN website, where you'll find all the latest information on funding opportunities, news announcements and events to get involved within the sector. So finally, I'm gonna close out with a massive thank you to Thomas White from the Connected Places Catapult and Richard Willis from Royal HaskoningDHV. Make sure to reach out to them, check out their own organisation's websites and all the great information and support that they've got there. Gentlemen, thank you very much.

Outro Jingle

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