

The Inmarsat logo, featuring the word "inmarsat" in a lowercase, sans-serif font with a stylized satellite signal icon above the "a".

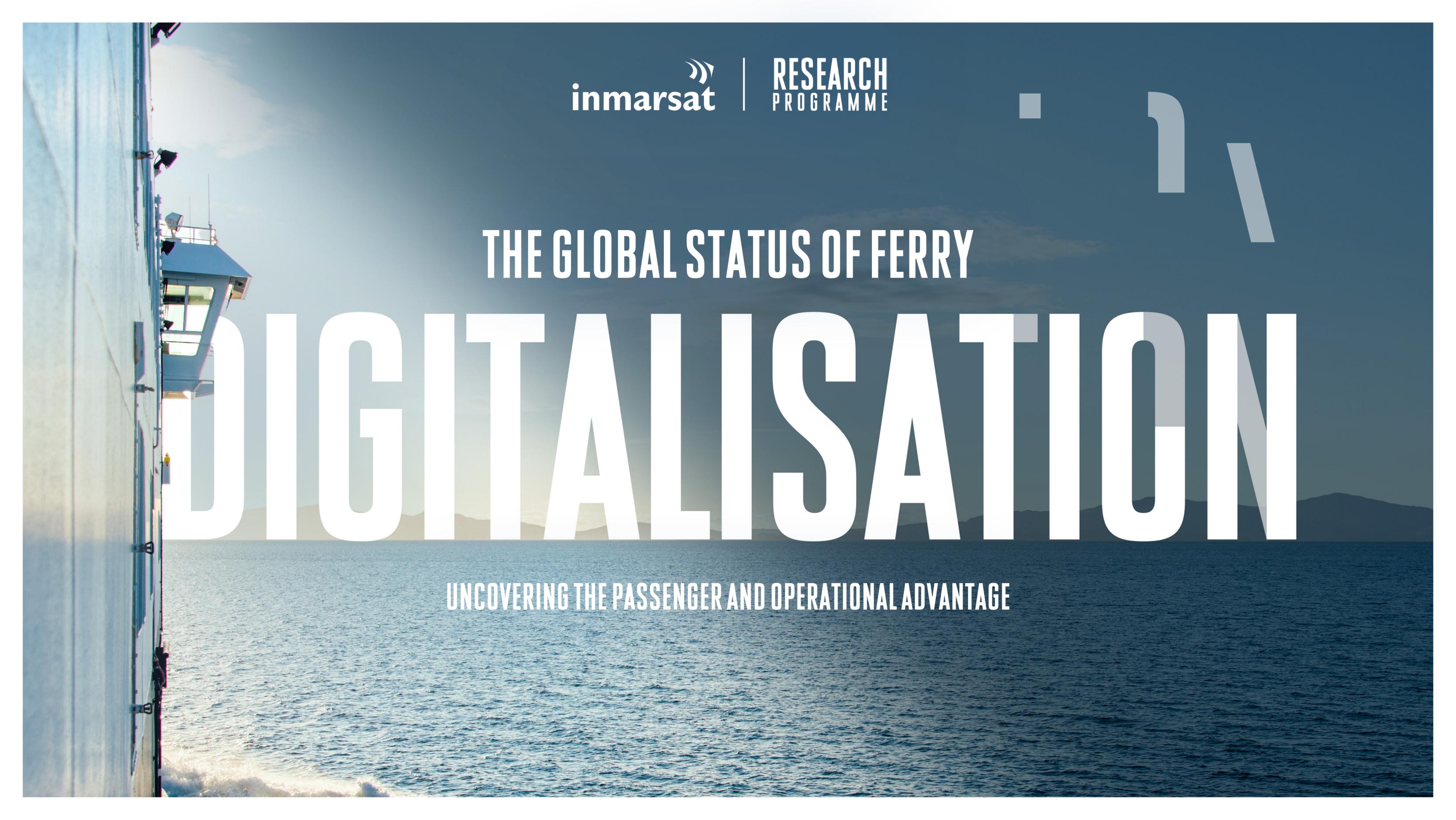
inmarsat

The text "RESEARCH PROGRAMME" in a bold, uppercase, sans-serif font, with "RESEARCH" on the top line and "PROGRAMME" on the bottom line.

RESEARCH
PROGRAMME

A decorative graphic consisting of a small square followed by a large, stylized, light blue shape that resembles a bracket or a stylized letter 'C' with a diagonal slash.

THE GLOBAL STATUS OF FERRY

A background image showing the side of a blue ferry ship on the left, with a bridge visible. The ship is moving across a vast blue sea under a clear sky. The text "DIGITALISATION" is overlaid in large white letters.

DIGITALISATION

UNCOVERING THE PASSENGER AND OPERATIONAL ADVANTAGE

EXECUTIVE SUMMARY

Digitalisation provides the ferry industry with a priceless dual opportunity. Increased deployment of digital solutions can reduce ferry operator costs thanks to a suite of enhanced operational efficiencies. Digital solutions can also assist operators to grow much-needed revenue via an improved passenger experience and boosting ancillary revenues.

These are the findings of a comprehensive worldwide report of ferry operators' current relationship with digitalisation. This thorough analysis, conducted by JG Maritime Solutions Limited demonstrates the opportunities connectivity offers in a post-Covid world, but also the challenges the industry faces in realising the full potential of digitalisation.

These challenges present themselves from all sides: Alongside appreciating an increased need to adapt to sustainability and addressing rapidly changing passenger expectations there is a need to embrace digital solutions to ensure safety and security on the vessel.

Our findings show that digitalisation is the catalyst for all of this. An increased use of connected technologies can create real operational savings. Connectivity also creates an opportunity to enhance – and monetise – the customer experience. It also provides the assurance of security, allowing ferry operators to proactively enhance vessel and passenger safety.

In a post-Covid world ferry operators must take full advantage of digitalisation to ensure they become leaner, more agile and more efficient. We hope this report highlights a number of ways ferry operators can benchmark their own digital transformation process against their peers and, moreover, capitalise on these opportunities.



FOREWORD

A TIME OF CHALLENGES AND OPPORTUNITIES FOR THE FERRY INDUSTRY

Even before the exceptional events of the last year, the shipping industry found itself on the brink of seismic generational change. Digital transformation, critical environmental concerns, particularly sustainability, and the additional administrative burden brought about by the contentious political and economic issue of the day – Brexit – had coalesced to leave the sector facing a number of significant challenges.

Then came the Covid-19 global pandemic. Passenger ferry operators saw key elements of their business and revenue streams almost shut down overnight. The effects were decimating. With non-essential travel now restricted, leading to a reduction of over 95% of their tourist related services, these operators needed to take decisive action quickly. Whilst there were exceptions such as lifeline and freight-only routes, passenger ferry services were suspended or run on a freight-only basis, leading to vessel lay-ups. The financial costs were beyond anything anyone in the industry had seen before. Thousands of staff across the passenger ferry sector were laid off and operators, unsurprisingly, pressed pause on capital expenditure.

When things finally do return to some semblance of normality – or the ‘new normal’ – ferry companies will have to operate very differently. Business models will have to

change. There will of course be the necessary compliance with Covid passports – in whatever form that regulation takes – and adherence to bio certification that demonstrates the ferry has been sanitised and is safe to carry passengers when it goes to sea.

Such actions will hopefully help rebuild and underpin returning passenger demand. Ensuring that passengers feel confident and safe before boarding is vital – particularly when it comes to competition from other transport sectors such as rail and aviation, all of whom will be making their play for passenger bookings.

Connectivity and digitalisation can be the catalyst for this transformation. Digital solutions offer a dual opportunity for the ferry industry of saving costs via enhanced operational efficiencies – reducing fuel usage for example – and enhancing revenue via monetising the passenger experience.



THE CHALLENGES OF TRANSFORMATION

Ferry operators might understand the multitude of challenges facing them, but adapting to them, and in many cases adopting new business models, doesn't happen overnight. Capital investments in shipping are often made in assets and infrastructure that should last for upwards of 25 to 30 years.

Furthermore, rapid implementation of new business practices is often at odds with the infrastructure that enables large ferry operators to function at scale.

Finding a way of mitigating this – alongside pushing a safe, sustainable and profitable return for the industry post-Covid – is key to meeting the following challenges.

Sustainability

In 2018, the International Maritime Organization (IMO) became one of the first industries to commit to tangible targets for reducing carbon dioxide (CO2) emissions. This agreement saw the IMO announce energy efficiency improvement targets of 40% by 2030 and 50% absolute reductions, compared to 2008 levels, by 2050.

As one of the most scrutinised sectors – certainly compared to other aspects of the shipping industry, oil tankers and carriers of commodity cargo for example – the eyes of the world are on the ferry industry. The need to move away from traditional fossil fuels and modernise is paramount.

Original Equipment Manufacturers (OEMs) value always-on connectivity because it enables them to monitor their equipment

and machinery, especially the new, greener-enabled technologies being installed on vessels, which require regular monitoring. This in turn creates greater value because monitoring isn't restricted to when a ferry is in port where its data can be downloaded.

Although there is a perception that satellite connectivity is scarce and expensive, the facts show otherwise, with tens of thousands of ships now using these satellite services on a global basis. Satellite connectivity is increasingly becoming the norm and it will offer huge benefits for sustainability.

Operating efficiency and agility

The disruptive effects of the pandemic require ferry operators to work smarter. This means an increasing need for operational efficiencies and also a pressing need to operate in a more agile manner.

Passenger services are already at the forefront of digitalisation – especially when compared to the wider shipping industry – but more needs to be done over the short-term. Minimising their cost base will be critical, particularly as passenger demand may be unpredictable and slow to reach pre-pandemic levels over the coming years.

Safety and security

Ensuring passenger safety is critical post-Covid. Accelerating the digital transformation that was already happening pre-pandemic will further enable the drive towards recovery. In particular, supporting biosafe vessels and the implementation of touchless technologies will help to restore passenger confidence.

There is also scope for ferry operators to become more proactive in adopting new technology to improve vessel safety. Increased digitalisation – such as monitoring of vessels, more use of data and automation to reduce the burden on the crew – is certainly part of the solution.

Another key point to address is cyber security. Ensuring systems security at all times for those managing remote access to onboard servers is crucial for the ferry operators. Cyber security was included in the International Safety Management (ISM) Code from the beginning of this year and this has provided a welcome regulatory framework to assist ferry operators in their management of systems security and remote access.

Connectivity and changing passenger expectations

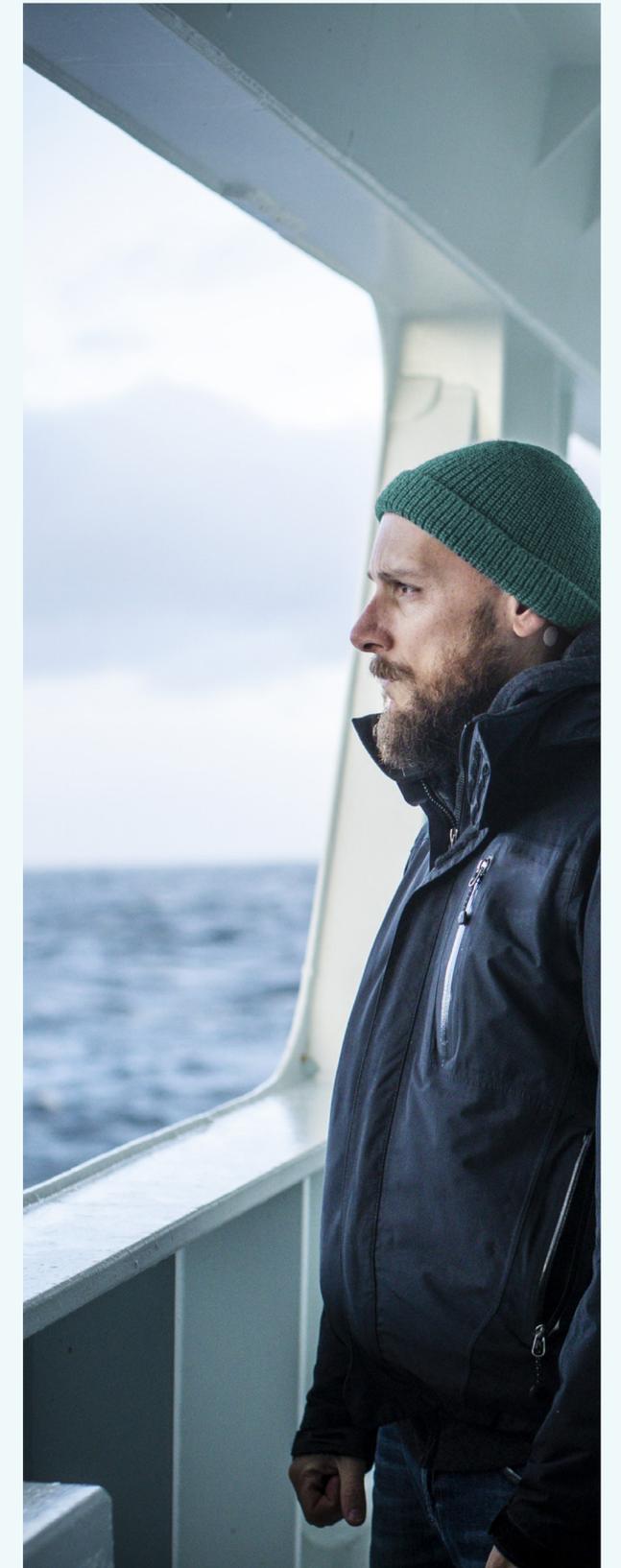
Society's reliance upon connectivity has both accelerated and deepened as a consequence of Covid-19. Regardless of one's age or social demographic we are all more digitally dependent than before. Indeed some analysts have proclaimed that three years' worth of digital and cultural transformation happened in just three months during the 2020's initial lockdown.

This has ramifications for ferry operators. Passengers expect a connectivity service that replicates the one they receive on land, even in the smallest of cafes. Staying connected is not a nice-to-have, but a must-have.

The shipping sector, however, has been slower than other industries to react to the digital revolution that has completely transformed every other aspect of our day-to-day lives over the last three decades.

However, today tens of thousands of vessels are utilising broadband connectivity at sea. Solutions are more affordable and adoption is increasing.

Other travel segments – most notably aviation and trains/coaches – have invested heavily in connectivity in recent years and passengers will likely expect ferry operators to match the onboard experience they receive in the air or by rail/bus.





CHALLENGES BRING OPPORTUNITIES

Heightened efforts towards sustainability, operational agility, safety and addressing a new era of passenger expectations are critical challenges that ferry operators must confront

Encouragingly, all can be tackled by increased digitalisation. Greater digitalisation provides the industry with the aforementioned dual opportunity:

- i) Cost effectiveness via operational efficiencies
- ii) Enhancing revenue by monetising the passenger experience

Operational efficiencies

Decarbonisation and digitalisation complement each other. An increased use of connected technologies can create real operational fuel savings. Digitalising operations creates a continuous and virtuous loop of savings across both emissions and costs.

Better performance data across a fleet of ferries can optimise a raft of operational efficiencies from lower fuel usage to

predictive maintenance. To achieve this ferry operators need to improve the connectivity onboard so they can truly unlock the potential of data and information.

These operational efficiencies and savings can also underpin enhancement of the passenger experience. For instance: reliability, punctuality, service delivery, and overall customer experience. This in turn boosts brand reputation which subsequently creates a competitive advantage.

Customer experience

Today's digitally-savvy, always-on passengers see their ferry journey as more than just a way of getting from one port to another according to Cruise & Ferry. It's an integral part of their travel experience – one that provides them with an opportunity to relax and have fun in a pleasurable environment.

With a mindset predisposed to spend, operators offering their customers a shopping, dining and connected experience similar to that which they receive in airports and in large modern shopping centres stand to gain.

Enhancing – and subsequently monetising – the passenger experience via connectivity is seen a unique way of achieving this.

POST-COVID OPPORTUNITIES

When travel restrictions are finally lifted, it's expected that ferry companies will benefit from pent-up passenger demand more than competing travel methods.

A report at the end of last summer by industry body Discover Ferries found that British travellers felt safer travelling by ferry than by plane, train or coach. Conducted in early September, the survey was compiled from the responses of 2,001 UK consumers. When asked what mode of transport made them feel most safe, 32% went for ferry, compared with 30% for trains, 26% for coaches and 24% for planes.

British travellers felt safer travelling by ferry than by plane, train or coach.

A similar survey commissioned by ferry company Stena Line elicited further promising responses. When asked how the pandemic had changed passenger priorities when choosing how they travelled, 83% said fresh air circulated onboard or the ability to go out on deck was important or very important. Compared to planes, trains and coaches, ferries naturally lend themselves to social distancing, while there is also on some journeys the option to stay in one's vehicle while crossing.

This clearly creates a strategic opportunity for ferries to become the travel option of choice for travellers. Particularly those opting for short-haul travel as opposed to long-haul offerings. Indeed the travel industry has pinpointed the predominance of demand for shorter trips such as staycations, regional trips or travelling closer to home.

THE REASSURING ROLE OF TECHNOLOGY

In a post-Covid world, where ferry operators will have to assuage passenger anxiety and rebuild confidence, digitalisation can not only support passenger confidence, but it can also transform operational efficiency via a new generation of ship technology.

Implementing touchless technologies throughout the journey reduces physical interaction – a notable worry for passengers – and helps with restoring passenger confidence. Card-only contactless transactions and digital ticketing using the passengers' trusted own devices are key here.

Technology's relentless advance also bolsters a new generation of cutting-edge ships. As older vessels are taken out of service they are being replaced by ships equipped with technology that will ultimately save them money and enhance their sustainability credentials.

Vessel hulls can be designed to minimise water resistance, while a network of sensors enable remote monitoring of everything from sailing patterns to fuel and battery usage,

and swell dynamics. These technologies help ensure that ferry operations are optimised for greater efficiency and can also be used to reduce motion-induced travel sickness. Because ferries generally operate between two fixed points, this makes this optimisation easier to achieve.

But the point remains: ferry operators need always-on connectivity to maximise these potential efficiency gains.

HOW CONNECTIVITY CREATES VALUE

The shipping industry is embracing connected technologies in a wide variety of ways.

The value of digitalisation varies depending on how a ship operates. When it comes to bulk carriers, the aim of digitalisation is to reduce costs associated with each and every journey.

Ferries are different. Operational efficiencies are key, but maximising the value from passengers is also critical. Subsequently, ferry operators must balance the connectivity needs of their ships and passengers with the availability and the capability of these digital solutions.

Operators rightly demand prioritised digital services for ship operations. They want guaranteed bandwidth availability for priority systems.

Advances in connectivity and remote data capture are making it possible for connectivity providers to tailor their services more flexibly and cost effectively to a client's needs.

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This includes unlimited data services and providing a range of data capture services from always-on connectivity to timed solutions that clients may only use a couple of hours a day or even on-demand solutions.

Previously, the prohibitive cost and the bandwidth limitations of satellite technology meant the full potential of connectivity wasn't realised. It was used primarily for distress, safety and limited operational functions.

As the barriers to satellite communication reduce, with modern, flexible and affordable services adopted by tens of thousands of vessels across the globe, this is no longer the case.

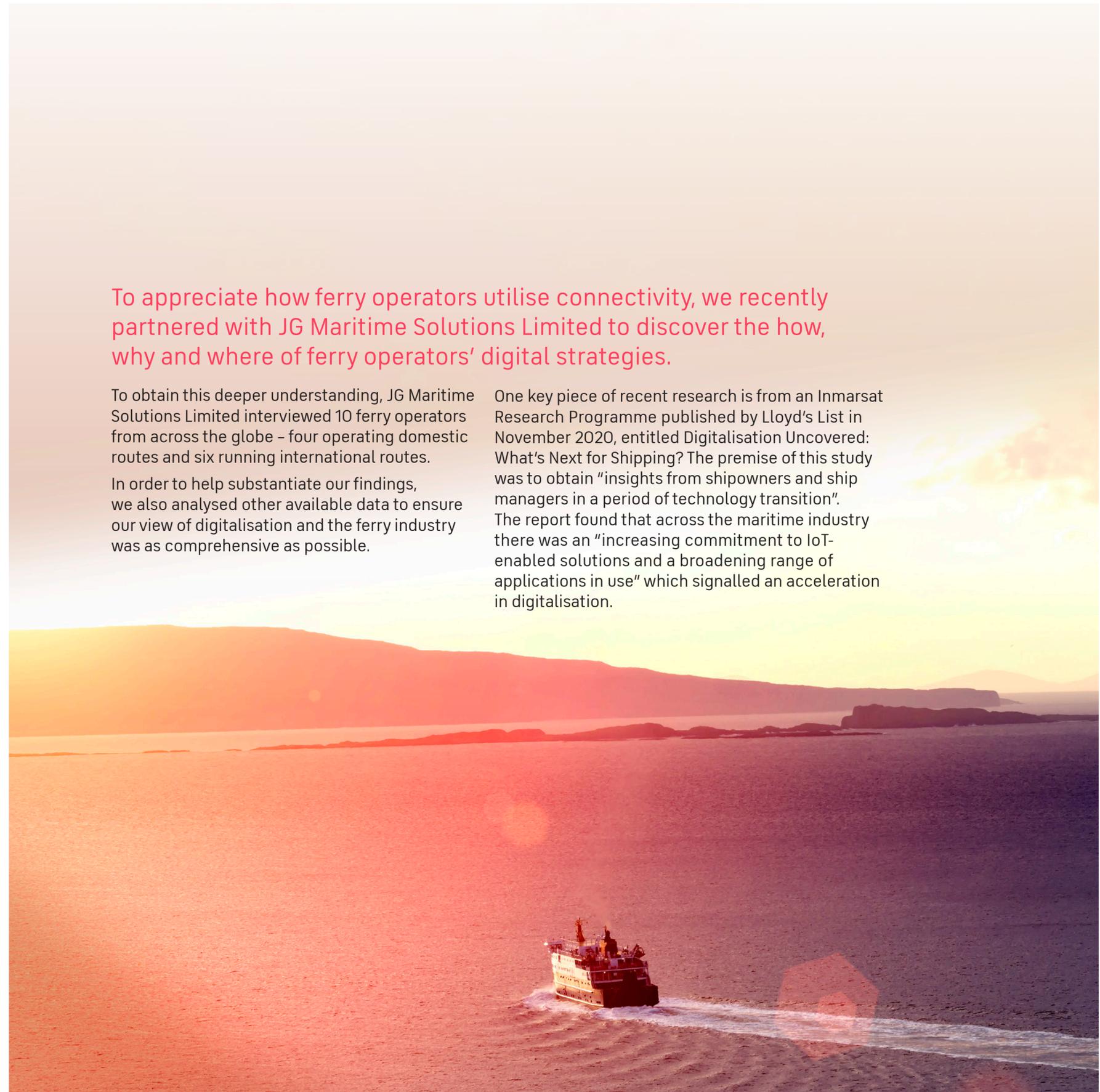
RECOGNISING THE ROLE OF DIGITALISATION FOR THE FERRY INDUSTRY

To appreciate how ferry operators utilise connectivity, we recently partnered with JG Maritime Solutions Limited to discover the how, why and where of ferry operators' digital strategies.

To obtain this deeper understanding, JG Maritime Solutions Limited interviewed 10 ferry operators from across the globe – four operating domestic routes and six running international routes.

In order to help substantiate our findings, we also analysed other available data to ensure our view of digitalisation and the ferry industry was as comprehensive as possible.

One key piece of recent research is from an Inmarsat Research Programme published by Lloyd's List in November 2020, entitled Digitalisation Uncovered: What's Next for Shipping? The premise of this study was to obtain "insights from shipowners and ship managers in a period of technology transition". The report found that across the maritime industry there was an "increasing commitment to IoT-enabled solutions and a broadening range of applications in use" which signalled an acceleration in digitalisation.



A PERIOD OF TRANSITION AND AN ACCELERATION IN DIGITALISATION

By isolating the responses of passenger ship owners and operators in the Digitalisation Uncovered report and comparing it to the industry average, it becomes apparent that digitalisation is viewed differently by ferry and cruise operators compared to other types of shipping.

For instance, while creating operational efficiencies is a key driver for passenger ship owners, their number one driver for digitalisation is to support compliance with regulation and certification. Passenger ship owners are also more likely to recognise how connectivity can create better value for customers, as opposed to all ship owners.

Additionally, and perhaps most significantly, passenger ship owners are twice as likely (8% compared to 3%) as other ship owners to view creating new sources of revenue as the primary driver for adopting digital solutions. And just over one in four (26%) place it as a top three primary driver.

Compared to other industries – for example aviation which has invested heavily in broadband-enabled ancillary revenue streams – this figure seems low, suggesting there are revenue opportunities to be realised by those ferry operators that increasingly adopt digital solutions.

Select and rank the key drivers for your organisation in adopting digital solutions where 1 is the highest priority

- Priority 1
- Priority 2
- Priority 3

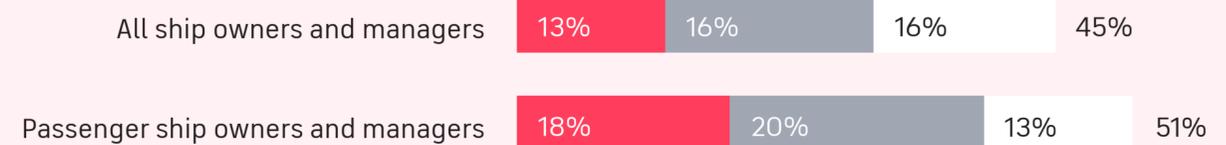
Creating operational efficiencies



Compliance with regulation & certification



Creating better value for customers



Creating new sources of revenue



ADDITIONAL FINDINGS

1.

Passenger ship owners are more likely to expect greater operational savings than the maritime industry average after implementing digital solutions. One in three operators (33%) expect to save more than \$10m in the next 12 months, compared to just one in six (15%) of total operators.

How much are you expecting to save in operating costs over the next 12 months from the adoption of digital solutions?

● Less than \$99k ● \$100-499K ● \$500k-2.49m ● \$2.5m-9.9m ● More than \$10m

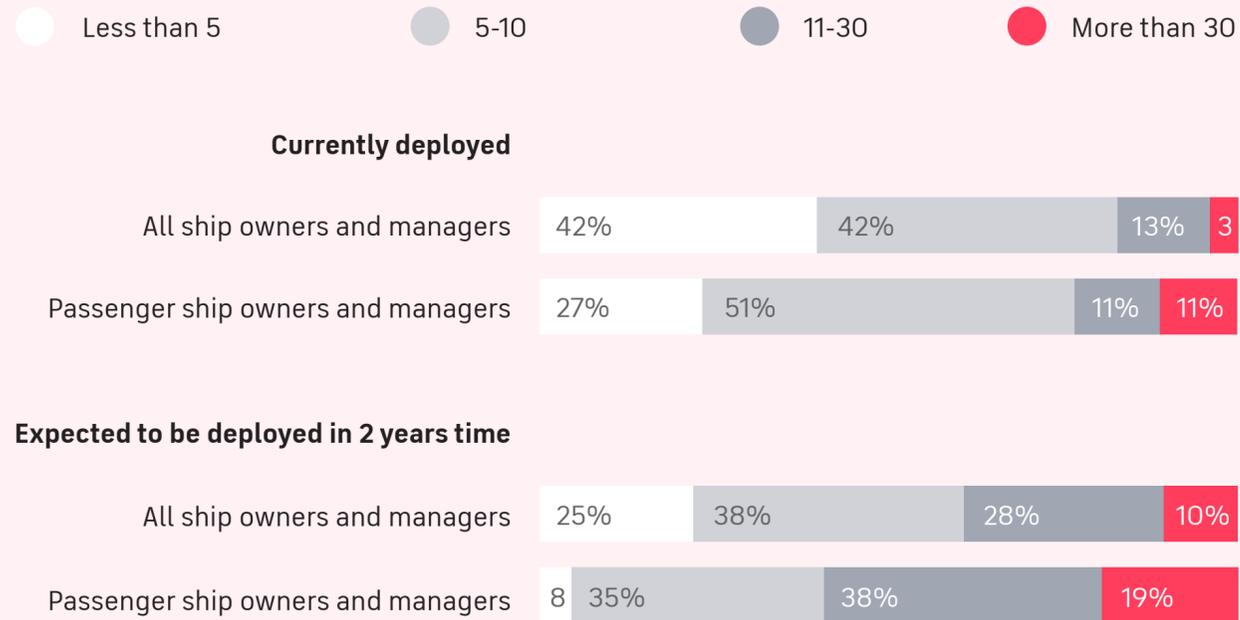
Within the next 12 months



2. Passenger ship owners are more likely to be ahead of the digital solutions adoption curve. They are also more likely to have adopted a greater number of digital solutions per vessel in the future, with one in five owners/managers (19%) likely to have more than 30 solutions deployed within two years.

This can be attributed to the passenger industry's innovative and early-adopter mindset, but it also suggests that this particular digitalisation journey still has a long way to go. It might be helpful for ferry operators to compare their situation to these survey findings. Are they in the mainstream of adoption or do they risk falling behind their competitors?

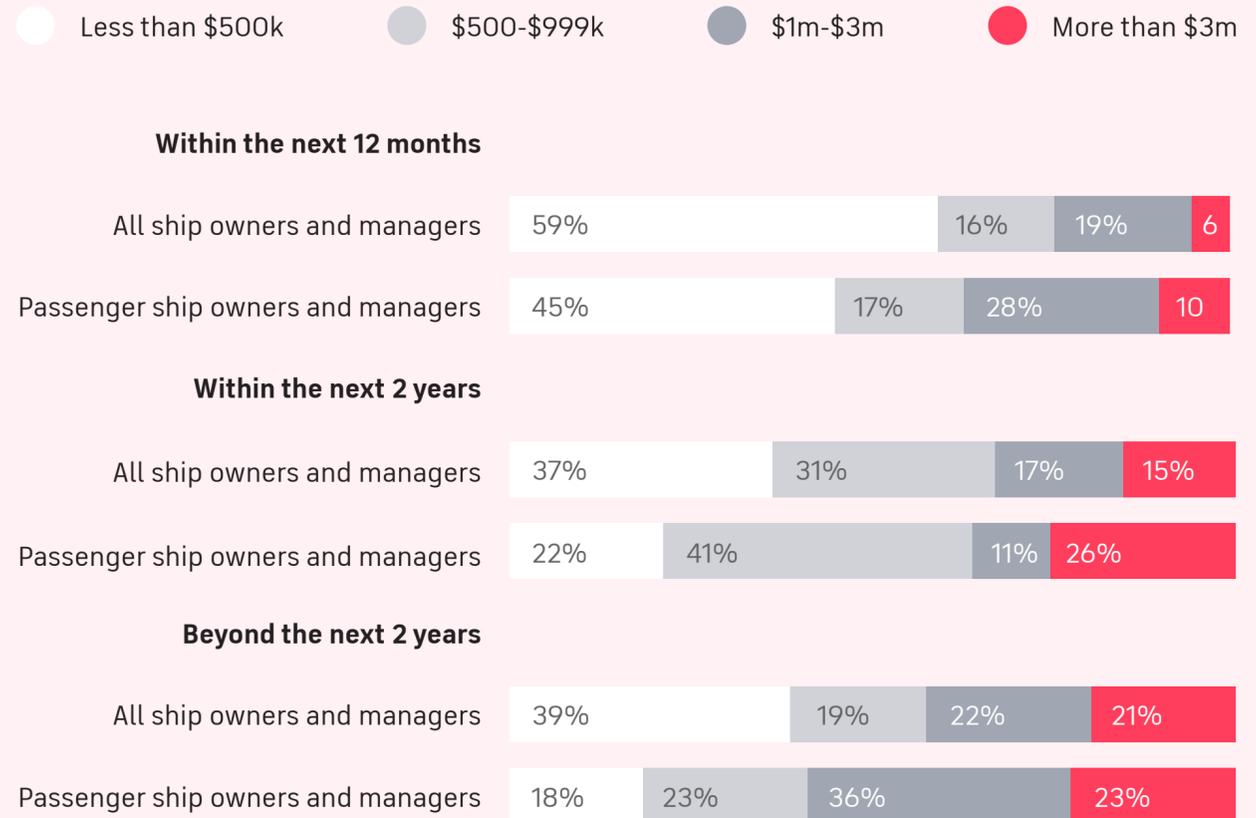
On average, how many digital solutions are currently deployed on each vessel, and how many do you expect to be deployed in 2 years time?



3. Passenger ship operators are preparing to invest more in digital solutions than the rest of the shipping industry. Across three time periods offered – a year, two years and beyond two years – cruise and ferry ship operators are likely to invest more than all ship owners and managers.

Individual ferry operators need to ensure they are finding options to invest further in digital solutions to keep pace with digitalisation transformation opportunities.

Approximately how much is your organisation planning to invest in digital solutions across your fleet in the next years?



And while this report examines all passenger ship operators, we can draw general conclusions for the ferry industry. Higher operating costs and an ever-more digitally-expectant set of passengers are driving investments in digitalisation.

OUR RESEARCH THE VIEW FROM FERRY OPERATORS

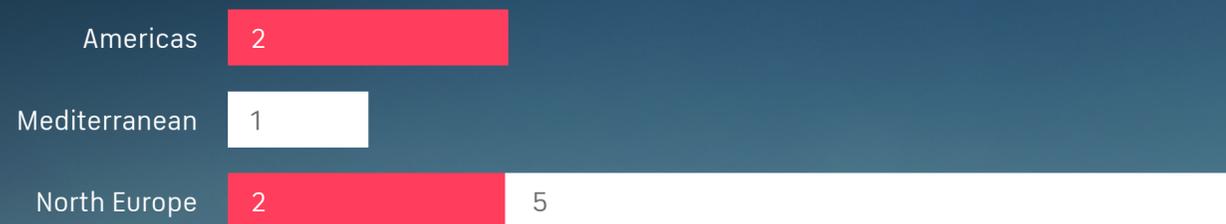
JG Maritime Solutions Limited spoke to 10 ferry operators in December 2020. The aim was to gain a better first-hand understanding of onboard connectivity and digitalisation on ferries.

These included looking for insights on how ferry operators use connectivity, any pain points and what were the strategic drivers that will encourage them to enhance or upgrade current systems.

The global interviewees were a mix of international and domestic route operators:

Interviewee locations & types

● Domestic ● International



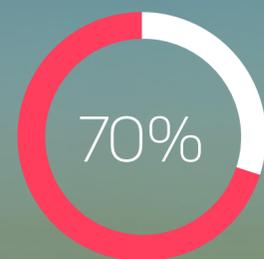
The interviewees represented a range of different trip types and durations:



Operator with routes 0-4 hours in duration



Operator with routes 4-8 hours in duration



Operator with routes 8+ hours in duration

Critical areas covered during the interviews included:

- How ferry operators were currently using digital solutions for operations.
- Where ferry operators recognised that digitalisation was driving value – in the form of return on investment (ROI), plus managing costs and savings.
- What were their operational digitalisation priorities.
- What were their views on passenger experience – how they recognised and understood rapidly changing passenger demands and how they met those expectations.
- What ferry operators thought about the potential of ancillary revenue generation and how they realised the value of the connected passenger.

Strategic drivers

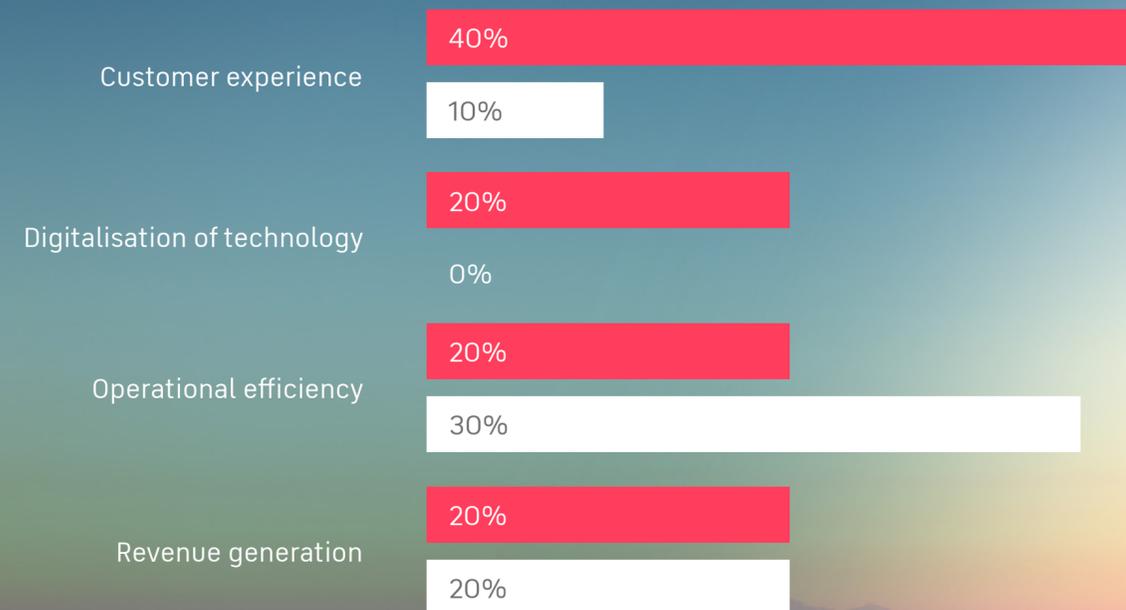
When asked about their primary strategic drivers in adopting digital solutions, supporting the onboard customer experience was the most frequently mentioned.

Improving operational efficiencies was more likely to be mentioned as a supporting driver rather than a primary driver.

Revenue generation was mentioned by 40% of respondents – with two operators saying it was a primary driver and the remaining two mentioning it as a secondary driver.

Types of strategic drivers mentioned

● Primary strategic driver ● Secondary driver



DIGITALISATION PRIORITIES GUIDED BY SERVICE

Their responses demonstrated a clear demarcation between domestic operators' use of connectivity and those operating international routes.

Because the domestic operators were state funded and ran 'lifeline services' to places like Vancouver Island and to remote island communities on the Scottish west coast, their primary motivation was to ensure that connected technologies were "adequate and fit for purpose".

Domestic ferry operators looking to bid for additional governments funds to upgrade or enhance onboard connectivity and digital services have to ensure any business case is in accordance with the government rationale and current transport policies to secure such funds. Such transport policies would apply equally to buses, trains and ferries, so it can be challenging for these operators to gain capital funding.

By contrast, international operators understand the need to keep pace with connectivity, particularly in light of changing passenger demands. In some cases the IT departments of these operators prioritise and dynamically manage the onboard connectivity pipeline capacity. Interviewees noted that in the last two-to-five years passengers' connectivity expectations had changed dramatically and rapidly.

Journey times also play a part in differing responses to digitalisation. As domestic voyages tend to be shorter and often

within reach of the mobile phone networks, passengers can be connected for a significant part of their journey. With international voyages both substantially longer in distance and time, passenger expectations for connectivity are high - they expect to be able to flexibly use social media, browse the internet and generally stay connected much like they do on land.

THE CONSEQUENCES OF GETTING IT WRONG

With many ferry operators chasing the same passengers, the implications of offering poor connectivity are stark. Customer complaints are not only costly to service, but can also affect brand reputation.

Poor quality connectivity can also lead to a loss of revenue in onboard retail - which is something operators don't really want to countenance in the present circumstances. Moreover, a failure to send data ashore can impact a ship's ability to plan routine maintenance or order spare parts on an urgent basis.

So whatever a ferry's business or operational model getting connectivity wrong can seriously affect an operator's bottom line.

A deeper dive into our findings - focusing primarily on data-driven operations and efficiencies and digitalising the passenger experience - follows in the subsequent two chapters.

" PASSENGER SHIP OPERATORS ARE PREPARING TO INVEST MORE IN DIGITAL SOLUTIONS THAN THE REST OF THE SHIPPING INDUSTRY. ACROSS THREE TIME PERIODS OFFERED – A YEAR, TWO YEARS AND BEYOND TWO YEARS – CRUISE AND FERRY SHIP OPERATORS ARE LIKELY TO INVEST MORE THAN ALL SHIP OWNERS AND MANAGERS"

Digitalisation Uncovered Report, Inmarsat Research Programme 2020

DATA-DRIVEN OPERATIONS AND SHIP TECHNOLOGY

Most operators within the shipping industry would recognise that it suffers from a perception of being a conservative industry.

As recently as 2019, an introduction to Inmarsat's Trade 2.0 report noted: "The maritime industry is steeped in history and tradition. The systems and processes that enable maritime trade have been developed over hundreds of years. Some key documents in use today, like bills of lading, would be largely recognisable to a Venetian trader operating 500 years ago."

Even allowing for the impact of Covid-19, many working within the ferry sector today would argue this description is unfair. Operators – as seen in the appetite for, and pace of adoption of, digital solutions in the passenger sector – recognise the opportunities that connected digital operations represent in both optimising costs and enhancing revenue.



SOLUTIONS THAT OFFER OPTIMISATION

There is a clear desire for digital solutions that facilitate optimisation of the ferry journey: use of supplies, fuel, machinery and batteries, preventative maintenance, early warnings... In fact anything that sustains the vessel and minimises the risk of being taken out of operation.

In this sense, digitalisation is already seen as supporting the optimisation of vessel performance such as calculating the most efficient fuel consumption for 'just in time' arrivals. Looking ahead, utilising digitalisation will complement the increased introduction of new ship technology such as hybrid-powered vessels. To gain optimum performance of this new technology, operational adjustments will be required.

Utilising digitalisation will complement the introduction of new ship technology such as hybrid-powered vessels.

Our interviewees also understand the value of data. They appreciate that the more data they can collect – and the easier that is to aggregate and analyse – the more agile, competitive, efficient and flexible they can be, thus driving operational efficiencies.

HOW FERRY COMPANIES ARE DEPLOYING DIGITAL SOLUTIONS FOR OPERATIONS

Our respondents state that they currently use digital solutions for a range of operational efficiencies: optimising safety, vessel performance, the route itself, maintenance and making asset management processes more seamless.

▪ Status of the vessel

Interviewees were quick to point out that operations data that comes from across the ship – from the engine and the bridge – helps them understand the vessel more. This data is exploited to improve operations and the maintenance of machinery for instance.

▪ Assist Captain's decision-making

Connectivity provides vital weather information and the ECDIS for updating navigation charts. It also monitors how the ship sails its particular route; how it approaches the berth and where acceleration occurs. Digitalisation can offer advice on potential improvements to operating practices and improve situational awareness.

Autopilot data collection of previous journeys can, using Artificial Intelligence, help predict future passage plans.

▪ Route optimisation

The benefit of a seamless and more efficient route delivers a virtual Estimated Time of

Arrival (ETA), which means ferries don't have to rush to the point nominated by the port to gain their guaranteed slot. Entry to port is allocated via this virtual ETA, meaning the vessel's machinery and fuel consumption can be set accordingly. Fuel usage is reduced as captains don't have to 'rush to wait'.

▪ Real-time remote access

Our interviewees prize the reliable transfer of data from ship to shore. Real-time remote access to the shore-based Operations Centres, which are deployed by some passenger ship operators when necessary, enables engine monitoring and viewing of ECDIS and radars onboard.

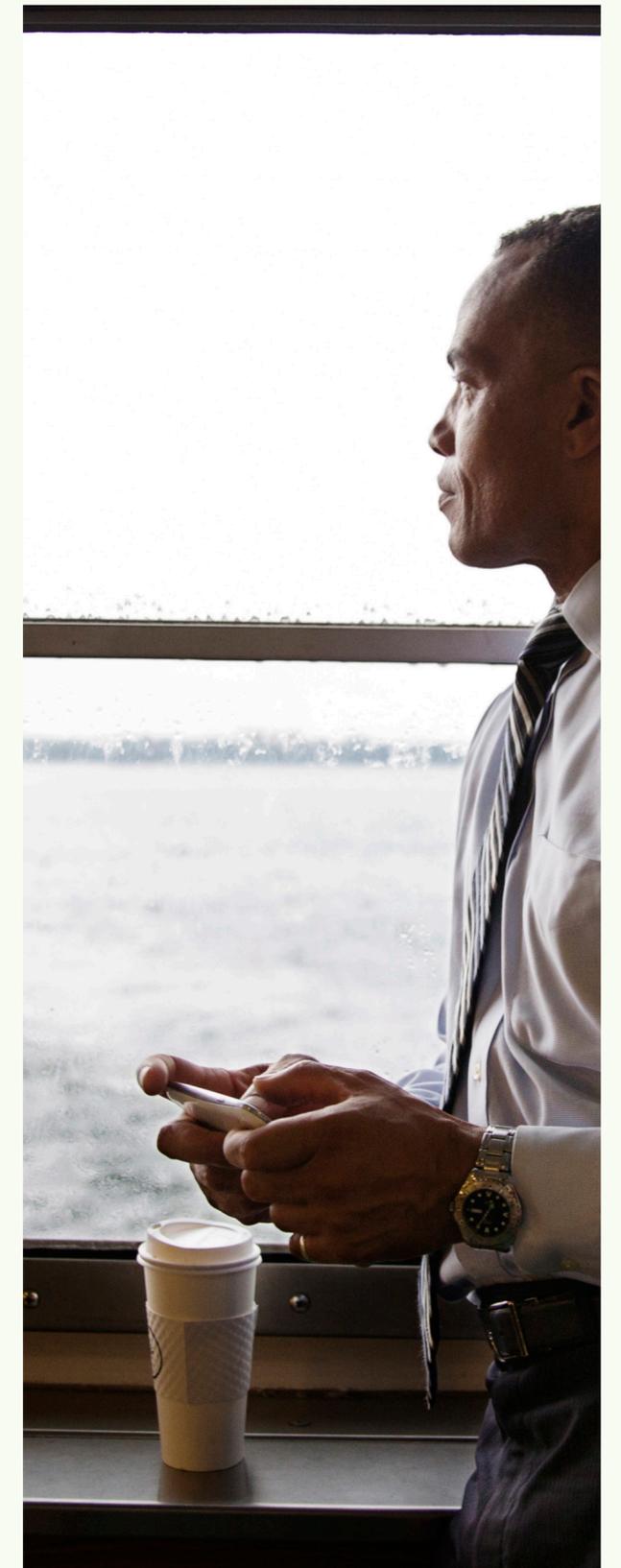
▪ Troubleshooting

When problems do occur these can generally be solved more efficiently thanks to the remote access of onboard systems. Being able to remotely interrogate or view an onboard system is faster and less costly than flying in a specialist from another continent for a vessel visit to remedy faults.

▪ Greater real-time visibility

This is key. Remote access and monitoring of onboard asset management systems allows for enhanced real-time visibility. Being able to understand, in real-time, maintenance systems, integrated operational systems, dynamic voyage and fuel management systems, document handling systems, Wi-Fi networks, spare gear, stock controls and processing of orders, and onboard consumable stock ordering such as food, beverages, and retail items, is critical.

Day to day decision-making is better informed and managing a vessel that may have an operational life of 30 years becomes much more efficient as a result.



MEASURING A RETURN ON INVESTMENT VIA CONNECTED OPERATIONS

Cost savings are a goal for all ferry operators. This is doubly felt at the moment due to the disruptive effects of the global pandemic. So even when operators can't control the passenger revenue pipeline, there is a need and a drive to optimise costs and enhance flexibility via digital operations. Continuous and recurring savings arrive through:

▪ Fuel & emissions savings

Ferry operators recognise that digitalisation can deliver operational efficiencies - even a 1% reduction in fuel costs year-on-year is significant. Furthermore, monitoring, recording and verifying fuel consumption assists in reducing carbon emissions. Cost effective savings are being delivered via new technology, low-carbon fuels, slow steaming, shore power, hybridisation and smarter operational practices.

▪ Condition monitoring & planned maintenance

Operators that use digital solutions for condition monitoring can see their planned maintenance records in the cloud. This is giving a clear ROI when vessel outages are prevented. Collecting and analysing this data is also supporting operators' safety management systems and increasing the efficiency of their operations.

▪ Automation

Further efficiencies include reducing crew costs - especially when digitalisation is facilitating automation of some onboard and in-port processes.

▪ Efficient use of labour

Personnel costs are streamlined thanks to a reduced need to deploy technicians to diagnose issues onboard. Augmented reality glasses are now being used to view a technical issue and stream it back onshore. Technical input, fault diagnosis and remedial guidance can then be provided from ashore.

▪ Remote diagnosis

Remote diagnosis is reducing the high cost of employing technicians from international locations. It also cuts the time needed to diagnose the fault and carry out repairs.

▪ Visibility & asset management

Greater visibility of stock control means fewer spare parts are required to be held onboard individual ships, with spare parts being shared across a class of the same ships.

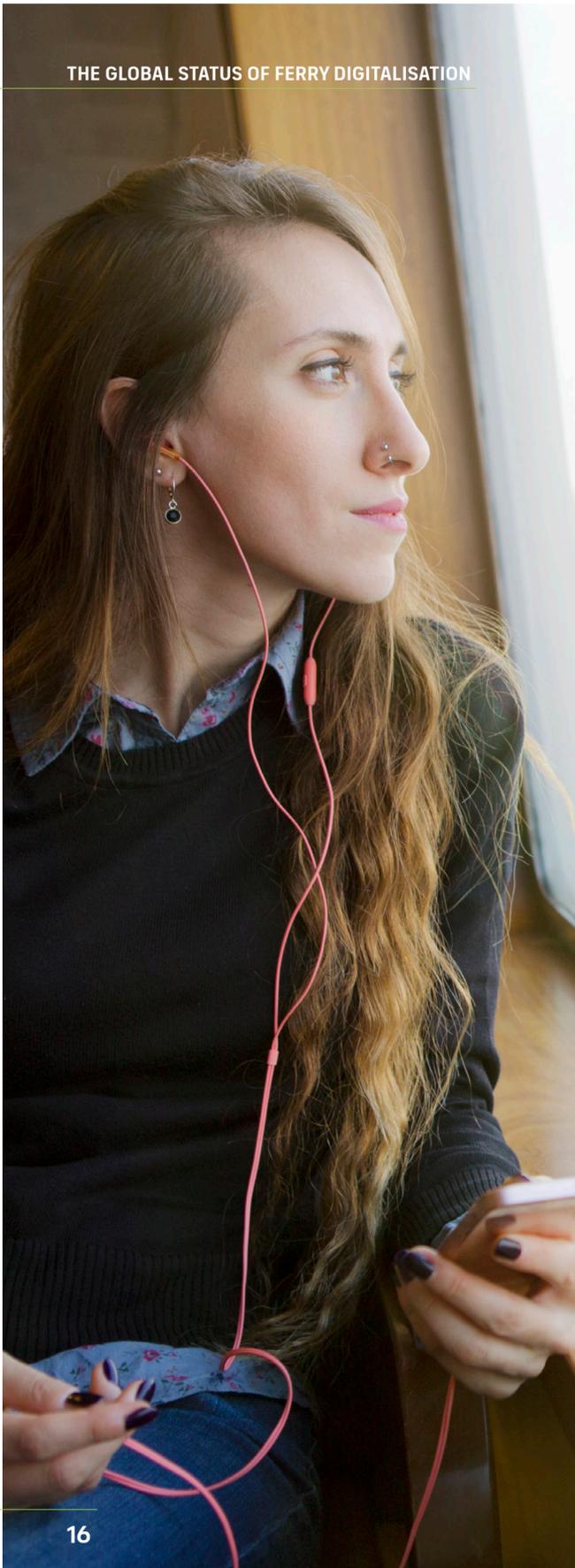
▪ Real-time data critical

Reliable onboard connectivity that is deployed in real-time underpins the most efficient and dependable ROI. Keeping ferries in optimum condition, particularly when they are engaged on multiple voyages daily is challenging, so having access to real-time data is key. The more data ferry operators can access and analyse results in better decisions and performance.

▪ Risk factors

Some operators don't regard data usage ROI, but they do consider the broader perspective of all risk factors, such as cyber security and situational awareness.





NEW SHIP TECHNOLOGY REQUIRES BETTER CONNECTIVITY

Those operators interviewed that had new vessels or existing vessels upgraded to a 'Smart' platform, noted the need for more sophisticated connectivity to support the digital operations. As ships become digitally smarter the need for always-on connectivity is increased.

- OEMs and systems integrators want remote monitoring – via always-on connectivity – to verify the performance of their machinery, the efficiency of the operations, and the benefit of any fuel savings
- As more access to data is requested, operators have to safeguard their secure networks, processes, controls and provide access to those that need it. A current pressure point for operators is that the always-on connectivity that OEMs want is not always possible
- Operators realise that the introduction of new technology – either through the introduction of new assets or by retrofitting new technologies to existing assets – is a strategic driver for connectivity enhancements and upgrades

DIGITAL TECHNOLOGY AND SAFETY

Increased use of technology enables ferry operators to get ahead of safety issues – rather than react to them.

An increasing flow of data – much of it in real-time – assists the captain and crew when it comes to weather reports and nautical charts. More data supports better route optimisation.

Deploying sensors across the vessel allows for better monitoring of the ferry – weight load is now automated for instance. Risks are highlighted in advance. Technology delivers early warning.

Proactive analysis covers engine performance and operational analytics. For example, comparing how different captains operate and manoeuvre the same ferry when it comes to fuel consumption, through machine learning and predictive technologies is a key development. These strategic drivers are essential for an industry operating on tight margins.

A recent 2018 report by Lloyd's Register Foundation highlighted a number of areas when a lack of technology – or substandard/ outdated technology – can be a factor in maritime accidents. These included: 'suboptimal technology informing captains and crews of real-time vessel status'; 'suboptimal emergency equipment, for example lack of equipment making it possible to pinpoint vessel location at any time'; and 'misjudgement of weather conditions'.

In its list of recommendations, the Foundation concluded that it was currently analysing how data can be used to 'identify safety challenges and to track trends'.

Another Lloyd's Register study – this time from 2019 – examined how digital technology can improve safety at sea. Alongside those areas already mentioned, the report pointed to tiredness and mental health/wellbeing as two more contributory factors in accidents.

Digital technology is also vital in taking the strain away from crew members – whose numbers have been reduced in cost-cutting measures.

Maurizio Pilu, Lloyd's Register's VP Digital Innovation, commented: "Some clear opportunities to make a difference were highlighted, which we were able to validate through our innovation ventures with some of our customers. They include fatigue monitoring, assessing general environmental conditions (e.g., temperature) that can affect performance and general crew conditions."

Pilu also underlined how connected technologies can assist with training, capture knowledge and ensure skills are maintained – here he pointed to the use of Virtual Reality (VR) training and mobile apps.

Digitalisation can also improve compliance – moving away from paperwork will ease that administrative and labour burden.

These safety points also have a foundation in driving passenger experience. By ensuring ferries take the correct route, the vessels can avoid swell and shallow ground – two key factors that can detrimentally affect passenger experience.

DIGITALISING THE CUSTOMER EXPERIENCE FOR VALUE

Even in more settled times businesses underestimate customer experience at their peril. The events of the last year have meant that the value of customer experience is even more keenly felt.

Covid-enforced travel restrictions have seen face-to-face interactions with customers significantly reduced. As such, communication at every point during the customer journey – before, during and after – is vital.

As we've already discovered, supporting the customer experience was our interviewees' most mentioned primary strategic driver in adopting digital solutions so awareness of digitising the customer experience is already present.

Even though digital investment can be substantial, ferry operators understand its value in enhancing the passenger experience. Digitalisation can expedite customer loyalty;

ensure ferry travel is a preferred mode of transport; minimise customer dissatisfaction and in turn lower the cost needed to remedy those complaints.

Then there is the potential for revenue generation via ancillary services offered to passengers. This covers everything from streamlining the booking process – offering more than just the ferry journey – accommodation, destination services, upgrades, retail and much, much more. Monetising the passenger experience is the ultimate goal.

MEETING PASSENGER EXPECTATIONS

Our interviewees recognise that passenger expectations have changed rapidly. These digitally-savvy passengers want always-on connectivity and everything that is associated with that. In turn, operators are looking to innovate and improve expectations on price, sustainability, Wi-Fi, food, onboard shopping, accommodation, booking, check-in and other aspects of the journey.

Operators understand the value of ensuring a seamless customer journey from booking the original crossing to the journey home. Using customer data better is also a goal as operators look to personalise the passenger experience.

The operators we spoke to also realise there are different connectivity expectations according to the type of ferry travel: domestic ferries are seen as akin to public transport, whereas those travelling via international ferry see their journey as part of the holiday experience.

As such, passengers using domestic ferries seem to be content with adequate and fit for purpose connectivity services. There were no complaints according to those we interviewed. Passengers didn't even expect to be given the opportunity to pay for Wi-Fi. But this is not an option for international operators.

Because of the enhanced passenger expectations on international routes, those interviewed admitted that there were numerous customer complaints. These were due to an inferior free-of-charge service or a poor paid-for performance. Passengers just expect high quality and reliable connectivity and don't understand when it isn't available.

One interviewee did highlight that Wi-Fi performance was regularly the worst point of satisfaction on passenger questionnaires.

Wi-Fi performance was regularly the worst point of satisfaction on passenger questionnaires.

To try and mitigate the inconsistent Wi-Fi experience, emails were sent to passengers before boarding explaining what the onboard connectivity arrangements were and how to process them. The administrative workload of just fielding complaints and enquiries about Wi-Fi is labour intensive.

REALISING THE VALUE OF THE CONNECTED CUSTOMER

According to our interviewees, onboard connectivity is now seen as a valued strategic point of differentiation.

Customer satisfaction and retention is a clear benefit from meeting passenger expectations.

The halo effect of consistent, reliable, high quality connectivity can even balance out reputational threats caused by bad weather or a ship's technical issues.

Connectivity is also highlighted as supporting crew welfare – with a happier crew, more in touch with home, delivering a better customer experience for passengers.

THE OPPORTUNITY OF CONNECTIVITY AS AN ADDITIONAL REVENUE STREAM

One way of meeting – and even exceeding – passenger expectations via digitalisation is to expand the services ferry operators offer.

From accommodation to tourist attractions at the destination, opening up the potential of ancillary revenue streams is one way of enhancing and ultimately monetising the passenger experience.

But it's vital that ferry operators consider all of the following:

- Charging passengers for connectivity has to be weighed against the quality of the service provided.
- Poor Wi-Fi can erode rather than enhance the value of the passenger experience. Some operators spoke of refunding paid access. This results in both a loss of revenue and disgruntled passengers.
- Some operators use a free premium model by offering a taster session free (30 minutes for example) and then charging thereafter.
- Customers on domestic ferries do not generally expect to pay for connectivity. One domestic operator told us, however, that they offer these services and pass the cost on to the customers. As this strategy is made clear to passengers, few complaints were received.
- Some commercial operators use pricing options based around usage. However, take-up for the premium option has been low. This can help with demand but is considered a poor

use of connectivity's potential to generate additional revenue.

- Overnight operators use connectivity as a way of encouraging passengers to upgrade cabins. By providing superior Wi-Fi in premium cabins this incentivises people to pay for this experience.

FREE WI-FI, PERFORMANCE AND RELIABILITY

Getting passenger demand right isn't just about ensuring as many passengers as possible use connectivity. Providing free Wi-Fi can often see the capacity available fail to meet customer demand.

Subsequently, the international operators we spoke to described Wi-Fi performance as poor when it was delivered free. These operators say they always need more bandwidth to meet demand, whereas others manage bandwidth proactively by optimising capacity to match demand. Pricing strategies can maximise efficient uptake – such as a low-medium-high pricing menu, for example.

Operators told us that passengers accept that Wi-Fi might not be free, but there is considerable dissatisfaction from passengers if having paid to be connected the service is still blighted by a lack of performance – poor reliability or loss of signal.

Operators mentioned that passengers will exchange contact information in exchange for reliable connectivity. This opens up clear opportunities for sponsors, advertisers and other ferry partners.

Operators described Wi-Fi performance as poor

ENGAGEMENT AND ENTERTAINMENT BEYOND CONNECTIVITY

Despite operators recognising the value of connectivity, the vast majority of ferries lack systems that are commonplace in rail and aviation - such as platforms that provide a one-stop shop of digital solutions, including entertainment, travel information and marketing content.

Where entertainment is provided it comes in the form of pre-downloaded movies streamed from local servers. And this would often be localised to just premium cabins for longer journeys.

Some operators said journeys under four hours didn't justify the costs involved in offering an on-demand entertainment system. One operator said an on-demand entertainment service wasn't offered because it distracted passengers from spending money elsewhere on the ship.

THE POTENTIAL OF DIGITAL REVENUE GENERATION

In today's hyper competitive marketplace where ferry companies operate on such fine margins, the sale of ancillary products (from destination excursions to meals onboard) on each crossing can be the difference between profit and loss.

There is a clear appreciation among interviewees that digitalisation opens up more ways to monetise a captive audience.

Alongside some more obvious ways to boost ancillary revenue - from charging for Wi-Fi to supporting and enabling card payments - there are also some opportunities that are, at present, undervalued.

After speaking to our interviewees it's apparent that there are some innovative ways to realise this value:

- Make it easier to buy and create a pleasant experience. Focus on granular targets such as selling an additional cup of coffee to each passenger.
- Ferry ancillary revenue was worth €63 billion in 2017 (having grown from €1.9 billion in 10 years) according to research by ferry technology provider Pharos Data.
- Be imaginative: go beyond traditional onboard activities like duty free shopping, dining and gambling - although these retain importance.
- Passengers don't just want to be transported to their destination. They want accommodation, ground transportation, activities and dinner reservations.
- Joining up these value-added services - both on and off the ship - provides value.
- What are the opportunities to pre-book a table in the ferry restaurant or a destination excursion?
- Offer the option of adding to the existing booking at a later date.
- Data gathered during booking can help create a personalised range of offers.
- Some operators are trialling apps that allow passengers onboard to receive a shopping list from friends or family at home and make those purchases.
- Engage with passengers once they're onboard via their trusted personal devices - this can help trigger desirable behaviours.



SUPPORTING DIGITAL CARD PAYMENTS IS ESSENTIAL TO AVOID LOSS OF ONBOARD REVENUE

Connectivity is crucial for all point-of-sale locations onboard commercially operated ferries. Customers expect to be able to purchase goods in onboard shops, cafes, bars, restaurants, gaming machines and the like via contactless or chip and PIN. Operators need reliable connectivity to ensure payments are secure.

Poor connectivity can limit the potential value of retail revenue.

Poor connectivity can limit the potential value of retail revenue. Some debit card payments might not be verified and unless the passenger is willing to use a credit card another revenue opportunity is lost.

The duty-free opportunity onboard is substantial. This is something European operators need to bear in mind in a post-Brexit world.

AVIATION AND THE CASE FOR ACCELERATING ANCILLARY REVENUE GENERATION

In the face of competition from low-cost airlines, coach travel and the Eurostar, ferry companies need to boost onboard revenue.

The aviation industry has stolen a march on maximising this revenue generation and could therefore be a source of inspiration and information for ferry operators:

- Passengers are charged extra for seat reservation, checked luggage, lounge access or inflight broadband, alongside third-party products such as accommodation and ground transportation.
- Some airline passengers now place Wi-Fi access as more important than inflight meals or entertainment when choosing an airline.
- Airlines report that they get higher connectivity take-up rates on long-haul routes - they can charge a premium for this access.
- Low-cost airlines operating short-haul flights can even see the value of a connected customer because the window for triggering additional sales is extended. Airlines can even sell digital advertising alongside the content passengers are consuming.

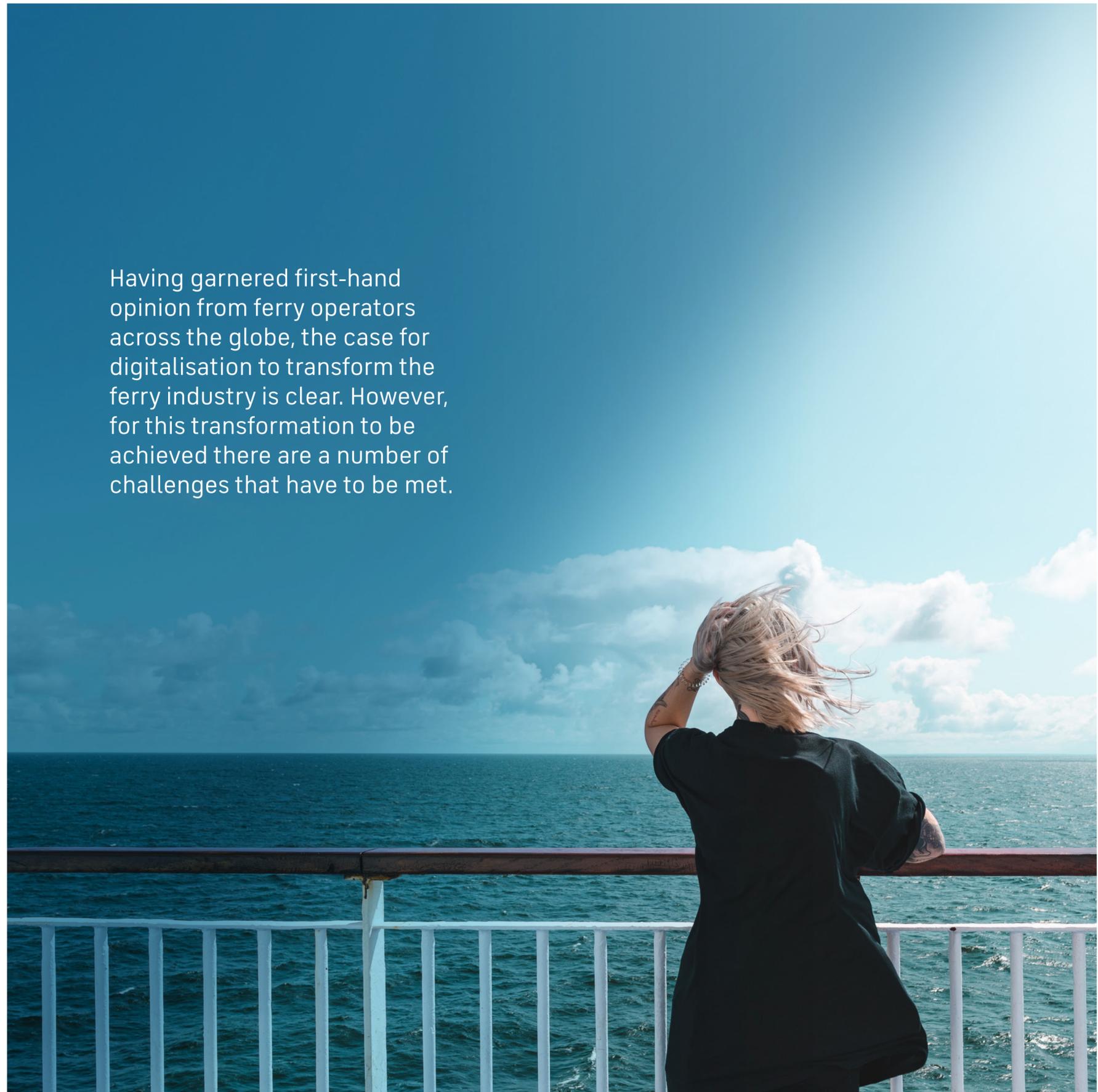
“ FERRY ANCILLARY REVENUE WAS WORTH €63 BILLION IN 2017, HAVING GROWN FROM €1.9 BILLION IN 10 YEARS”

Pharos Data

INCREASING DIGITALISATION

IS A CATALYST FOR A PROFITABLE AND SUSTAINABLE FUTURE

Having garnered first-hand opinion from ferry operators across the globe, the case for digitalisation to transform the ferry industry is clear. However, for this transformation to be achieved there are a number of challenges that have to be met.



BARRIERS PREVENTING THE FULL VALUE OF CONNECTED OPERATIONS BEING FULLY REALISED

Getting data off ships is widely recognised to be a sticking point across the ferry industry.

Towards the end of 2020, Inmarsat co-authored a report with Cruise & Ferry which highlighted this issue. According to Ronald Spithout, Inmarsat's Maritime President: "Before Covid-19, 51% of a survey group of 125 shipowners told Inmarsat that difficulties in getting data off ships in real time represented the biggest obstacle to IoT adoption. Inmarsat's research also suggested that, on average, ferry owners already intended to spend \$2.2 million on internet of things solutions over the next three years."

On average, ferry owners already intended to spend \$2.2 million on internet of things solutions over the next three years.

By virtue of their operations and for reasons explained earlier, domestic ferry operators tend to have less advanced and reliable connectivity onboard. As such, data collected is held onboard and only transferred when in port. The potential savings enabled by real-time data are being lost.

Age of fleet is an issue whereby legacy technology and systems can make it difficult to retrieve data.

Because of insufficient bandwidth, IT departments have to be selective when prioritising data collected. Passenger demand can also affect available capacity.

Some operators can pump up capacity if they need real-time data. However, generally this is a manual operation. Only a few international operators had the capability to manage this automatically and remotely.

Finally, the legacy approach to getting data off ships involves multiple separate systems and connections all trying to capture and transmit data to a multitude of third parties. This results in an expensive and complex tangle for IT departments to administer.

The high cost of previous-generation VSAT satellite connectivity is another major issue for operators. Our interviewees stress that while VSAT connectivity is the most reliable form of satellite communication, a more cost-effective way of providing this technology would result in increased use and adoption.

All operators and their IT departments expressed an interest in integrating 3rd party systems but risk of cyber threats is a major concern. The fear is that opening up systems to access for data capture could compromise cyber safety.

The new cyber security requirements that came into force at the beginning of 2021, resulting in the incorporation of Cyber Security into the International Safety Management (ISM) Code have been welcomed.

THE DIFFERING NEEDS – AND BLOCKERS – FACING DOMESTIC AND INTERNATIONAL OPERATORS

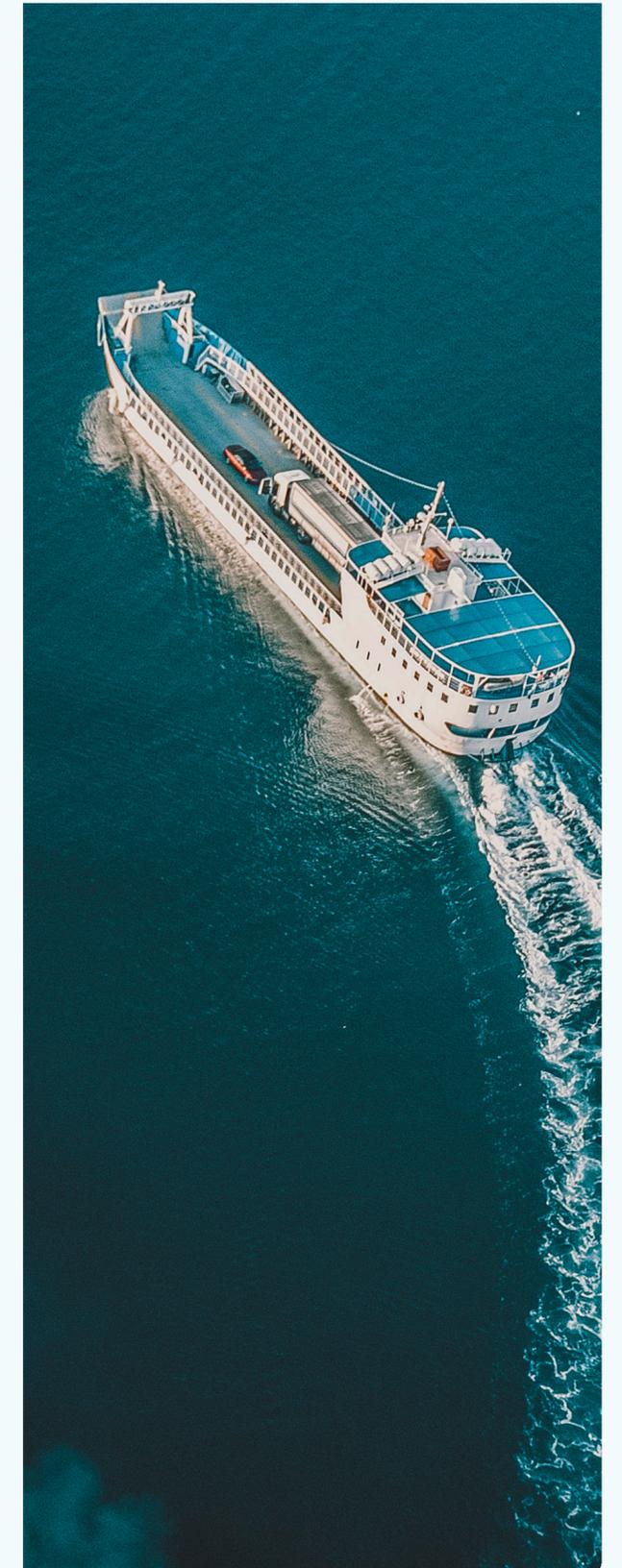
Some large international operators have invested in substantial connectivity programmes.

However, despite market opportunities for onboard connectivity upgrades or enhancements, these risk being deferred due to reduced capital expenditure (capex) because of the effects of Covid-19. Operators need to look for suppliers who are willing to offer commercial models that are flexible and not capex intensive, to ease them through the short term.

There's a risk that some domestic and smaller operators may be left behind in the digital revolution. Convincing stakeholders to invest will be tricky – focusing on increased operational efficiencies and cost savings is likely to be more persuasive than enhancing the passenger experience. They should prioritise solutions that can be implemented quickly and easily with a good balance of ROI.

International operators seem determined to roll out digital solutions in the coming years. This will enable them to collect more data – much of it in real-time – that will in turn allow them to optimise the value of these operational efficiencies and monetise their customer base.

Some domestic and smaller operators may be left behind in the digital revolution.



OPERATORS NEED TO ACT QUICKLY ON THE OPPORTUNITIES

The ferry industry is unique within shipping. It is subject to its own commercial pressures and its own set of customer expectations that it has to manage.

As a result, it views the opportunities that digitalisation and connectivity represent in a different manner to the rest of the global shipping industry.

Our research demonstrates that ferry operators recognise the importance of getting the customer experience right.

Our research – backed up by other reports like our Lloyd's List collaboration, Digitalisation Uncovered – demonstrates that ferry operators recognise the importance of getting the customer experience right. They realise the role connectivity plays in this process – even if the digital solutions they currently offer aren't as sophisticated as they'd like.

Some ferry operators are ahead of the curve when it comes to recognising the relationship between digital solutions and operational efficiencies. But many are not so advanced and risk being held back by legacy systems within the company.

The greater use of real-time data will enable even more incremental savings and push emission reductions. It will also allow ferry operators to maximise value from digitally-enabled, sophisticated smart ship technologies like hybrid or LNG propulsion systems.

There's also a realisation that ancillary revenue is the next big opportunity – especially when demand returns following the easing of Covid-19 travel restrictions. Ferries will be in direct competition with other modes of transport, so additional revenue streams will ease the pressure applied by downward ticket prices. Here the case of aviation is instructive – there is a clear opportunity to increase spend per customer via digitally-enabled means.

To emerge strongly and be in a position to thrive post-Covid, ferry operators must take full advantage of digitalisation to ensure they become leaner and more efficient. They must increase their agility, deliver a safe travel experience that compares favourably to the aviation competition and continue to become compliant with new regulations and sustainability imperatives. Digitalisation is the catalyst for delivering all of this.



HOW SHOULD OPERATORS BE SHAPING THEIR FUTURE DIGITALISATION STRATEGIES?

Thanks to the information gathered from our interviews we can offer guidance on where ferry operators should focus their future digitalisation strategies.

- As new ship technology is rolled out there will be more demand for onboard connectivity to support digitalisation and remote access by third parties. Major conversions onboard to support decarbonisation of the shipping sector, such as electric-hybrid propulsion or clean fuel SMART platforms are likely to be the catalyst for this.
- For those operators currently prioritising and dynamically managing their existing onboard connectivity pipeline capacity, this will mean a change of approach. They should look to collaborate further with OEMs on connectivity that supports always-on monitoring. This could see a dynamically controlled cloud-based service to share information collected from operator vessels onwards to their key partners and suppliers.
- Not all the operators have asset management systems in place. Those without have expressed a desire to proceed down this path. Where operators take delivery of new vessels, or have existing vessels converted to a "Smart" platform with asset or integrated management systems installed, a higher level of onboard connectivity will be required.
- The onboard systems of the majority of operators interviewed can be accessed remotely over the network so trouble shooting can take place to resolve problems. But there are more advanced technologies coming through that operators should start to consider. Examples include VR headsets and glasses that onboard technicians can wear to view an equipment problem and stream information back to shore. This allows technical input and specialist guidance to be provided.
- Operators currently without the reliable seamless connectivity that enables them to transmit data to shore should seek opportunities with connectivity providers to trial options that will optimise their current connectivity solution. Particular areas to look at include enabling dynamic bandwidth management and prioritising operational data streams. Operators should also look to their OEMs to collaborate with connectivity providers and integrate connectivity solutions within their system monitoring services.
- Operators should look to become smarter in their pricing models for passenger Wi-Fi. This will help manage demand and allocate bandwidth accordingly – to high-value customer services and content for example. They should also seek options to expand the capabilities of enhanced onboard connectivity to enrich the passenger experience with destination services, content and retail, together with harnessing advertising to open new revenue streams.
- Robust new satellite technology could trigger new opportunities for ferry operators previously disappointed by satellite service performance to trial higher-capacity services. This will assist them in unlocking the value of digital solutions across the passenger journey.

- Ferry operators will bring onboard retail services back in-house. This is due to retail and revenue management becoming increasingly automated, less labour intensive and more secure, thanks to card payments being assured via reliable connectivity. This could trigger a boom in ancillary revenue creation. Operators re-introducing duty free services will need to ensure reliable connectivity to maintain compliance with customs regulations.
- Operators servicing "Brexiteer" routes need to ensure their onboard connectivity is reliable enough to maintain the operational efficiency gains that digitalisation is bringing them. No less important, they need to ensure good passenger connectivity on these longer routes.
- The inclusion of Cyber Security within the ISM Code from 1st January 2021 was seen as a benefit by a number of the ferry operators interviewed. They felt it was useful to formalise onboard Cyber Security arrangements within the company's Safety Management System (SMS). As such, operators should lose no time in ensuring they implement the new cyber requirements and avail themselves of the wide range of information and support that vendors are providing.
- Operators should look at using connectivity to push Voyage Data Recorder (VDR) data in the cloud if triggered by an incident such as listing, grounding, etc. including the ability to retrieve data leading up to the incident. This will help improve situational awareness, particularly in port areas, and will record 'near miss' data that can be used in future training exercises in order to minimise future risk.

For more information please contact maritime.passenger@inmarsat.com