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Seafood Strategic Outlook

Automation and the UK seafood industry: Summary report

Exploring the trade-offs between new technology, mechanisation and traditional labour resourcing.
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Introduction

This report is a special review focussed on automation and labour in the UK seafood industry. Special review reports explore changes on the seafood horizon with high impact for the UK seafood industry to identify opportunities and threats. The reviews aim to raise awareness and understanding of longer term trends and impacts amongst industry operators and government. This can then support stakeholders in working together on initiatives to address the changes taking place.

This review is an initial exploration of how developments in labour and automation might affect the UK seafood industry. Labour and automation are the means by which essential industry tasks are undertaken. Of particular interest is an understanding of current trade-offs between labour and automation and any threats and opportunities that may arise as these trade-offs evolve into the future.

This report focusses on the broad implications, opportunities and threats for the UK industry. It aims to support the UK seafood industry in understanding:

- The types of operational problems amenable to technology / a skilled workforce in the seafood chain.
- Areas of technology relevant to seafood, and different stages in the seafood chain.
- Areas of seafood oriented to technology / labour.
- Drivers and possible pathways for technology.
- Opportunities, threats and actions that can be pursued.

Labour and automation in the UK seafood industry

The UK seafood industry employs labour, either sparingly or intensively, across all sectors in the supply chain. This involves delivering operational tasks in fishing and aquaculture; ports, markets and logistics; manufacturing; and product preparation, presentation and sales activity in retail and food service outlets. Seafood jobs involve practical and intellectual tasks; may be full time, part time and seasonal; can require generalist, technical specialist, or craft skills; and range from junior to senior roles.

Automation can be defined as '*the application of machines to tasks once performed by human beings or, increasingly, to tasks that would otherwise be impossible.*' It includes mechanical technology, powered machinery, computerised technology and digital technology.

There is a notable difference in the nature of operational tasks, and job roles, across the seafood supply chain. In upstream sectors, there is an emphasis on physical tasks, such as moving and handling large volumes of physical product. In downstream sectors, tasks centre on more complex operations, for example transforming raw material into sophisticated product, or interacting with consumers and anticipating their needs.

The decision to deploy labour or automation depends on the nature of operational tasks – whether they are routine or non-routine and require mental or manual effort – and the contribution, availability and cost of each option. This is particularly important in the seafood industry where tasks can involve wide variation in material being handled (e.g. shelling, filleting, etc) and judgement and flexibility is required.

Human labour offers *flexibility*; with the ability to learn, build experience and adapt to new situations whilst bringing passion to work tasks. Technology and automation can provide *consistency and predictability* with the potential to undertake tasks entirely as a substitute for labour, offer task support to complement existing labour and deliver new tasks or work that labour can't deliver.

The labour/automation trade-off balances the strengths of automation against the weaknesses of labour in task delivery and vice versa. Traditionally, routine tasks have been a focus for automation through mechanisation and non-routine tasks a focus for labour. However, new developments in digital technology are challenging these traditional trade-offs and opening up opportunities for the use of automation in non-routine tasks.

Deployment of labour/automation in UK seafood

Successfully deploying automation depends on having fertile investment conditions; the ability to activate longer term investments and secure their returns. In the seafood industry, such conditions often depend on available volume and security of supply and markets.

The level of automation in UK seafood shows clear differences across supply chains, with high volume chains much more automated than low volume chains. High volume chains with continuity of supply have a higher share of standard, routine tasks making them more amenable to automation. These chains include domestic pelagic and salmon, as well as international sourced whitefish, pelagic, shellfish and salmon (particularly high volume frozen). Low volume chains, with inherent variability and a high share of non-routine tasks, tend to be labour intensive. These chains include domestic shellfish and whitefish, and international sourced whitefish, pelagic, shellfish and salmon (particularly low volume fresh).

Different labour/automation choices are associated with contrasting performance in industry productivity and measures of return over cost. For example:

- A number of large whitefish and pelagic vessels with sophisticated automation are highly productive.
- A number of mid-sized processors are highly productive, however a number of large sized companies have lower productivity.

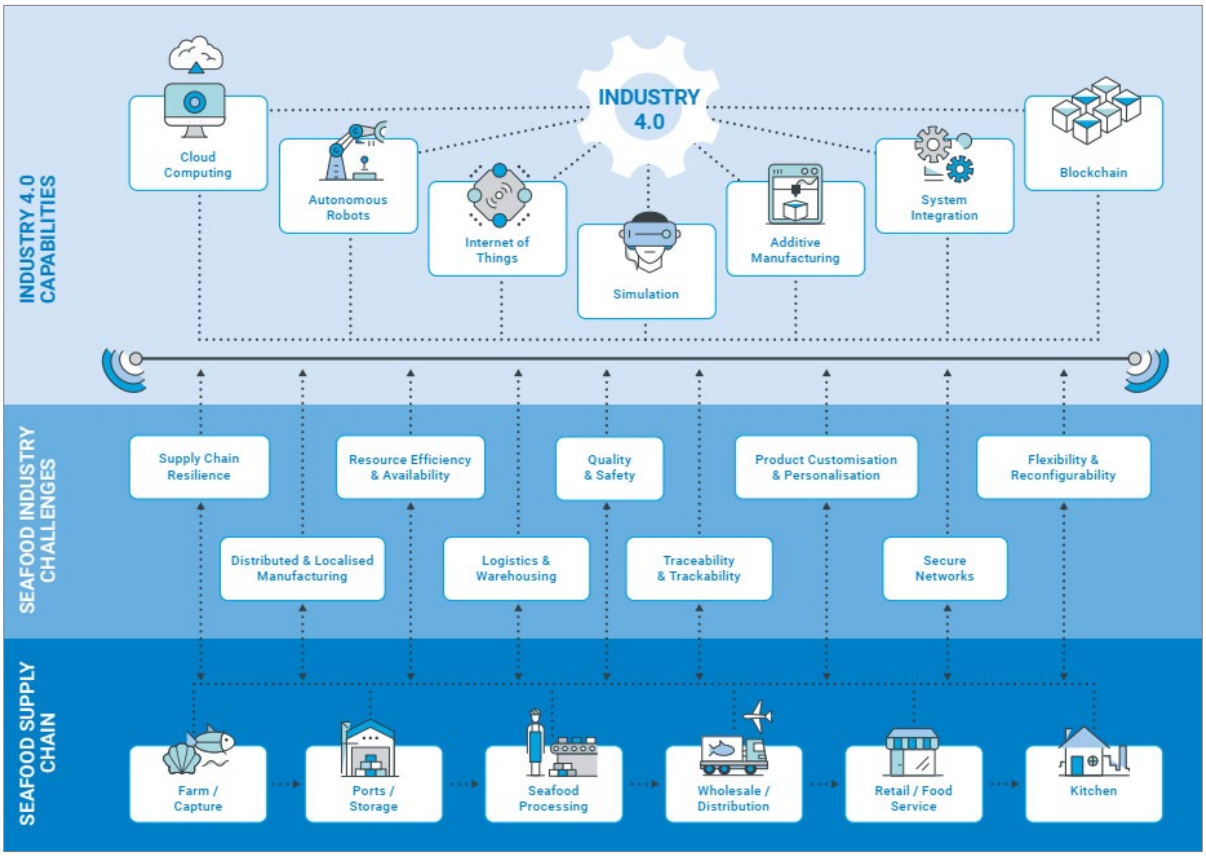
The current labour/automation profile across industry is to be expected, given the balance of drivers across the supply chain in recent years:

- Tasks in seafood supply are both routine and non-routine in nature, with the balance depending on the species being handled and sophistication of final product.
- The availability and cost of labour has been supported by migrant labour.
- The availability and cost of technology has supported mechanical automation.
- Investment conditions for automation in seafood are mixed due to available volume and nature of supply.

Longer term drivers and anticipated changes

Longer term drivers suggest a number of changes over the next 10 years that could change the labour/automation profile across industry.

- The availability and cost of labour is likely to be more challenging, affected by issues including an ageing population and a shrinking workforce; a tight UK labour market; changing migration conditions slowing a supply of labour ready to fulfil low wage job roles; and ongoing perceptions of the seafood industry as unattractive.
- The availability and cost of technology is likely to improve. New digital technologies, and the so-called 4th industrial revolution, will transform automation making it more suited to supporting non-routine tasks and deliver *efficient* but also *flexible* production.
- Automation is due to impact considerably on job roles within the next 10-20 years, making some roles obsolete. However, new roles focussed on complex problem solving, creativity and social relationships may also emerge.



The relationship between Industry 4.0 capabilities and the food supply chain in tackling the challenges facing the food industry (from Bader et al, 2018)

It is anticipated that automation could reinvent food supply chains and address a number of challenges facing the food industry. Automation could support co-ordination on a single platform across an ecosystem of different actors in food delivery. This would enable intelligent food production and consumption systems, with: machines connected through the internet to manage production, storage and transportation, manufacture products and adapt

to new processes, in response to - and in anticipation of - market demand and sales, with limited human guidance.

The digital transformation from a linear supply chain to an 'autonomous ecosystem of firms' will evolve, following a maturity pathway. In seafood, initial steps in this transformation will include:

- the proliferation of sensors that monitor environmental signals;
- blockchain technology that could improve transparency and traceability;
- automatic identification systems (AIS) that could help reduce illegal, unreported and unregulated (IUU) fishing.

As previously noted, the adoption of automation technologies is dependent on fertile investment conditions. Investment conditions may improve for domestic seafood supply chains due to changes in the scale and nature of supply volumes as a result of the UK's exit from the EU. There may also be scope for technology application, and improvements in productivity, in low volume sectors. For example there are specific opportunities to:

- Improve productivity in mid-sized vessels through technology transfer/new build especially in whitefish with greater share of fish in the UK EEZ.
- Explore further automation in the whitefish and shellfish catching sector, in whitefish and shellfish primary processing, and in secondary processing for whitefish, pelagic and shellfish.

Successfully implementing increased automation and realising the benefits will require long term thinking from industry, certainty from government, support for smaller operators and uptake/collaboration with universities. Actions to support this could include:

- Providing financial support for research and development, easing smaller company participation through sensible criteria.
- Canvassing industry for research and development project opportunities and provide cost/benefit analyses to incentivise engagement.
- Identifying and engaging with research partners and technology providers for collaborative projects in research and development.
- For Seafish, building on this initial work, engaging industry to further these support actions and explore areas of potential opportunity in low volume sectors, including whitefish, pelagic, and shellfish and secondary processing.

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