TIP Working Party

CO-CREATION PROJECT

2019-2020

Case study from Finland

OneSea - maritime industry ecosystem

OECD

Disclaimer

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Executive Summary

Overview and theme

OneSea Ecosystem was established in 2015 and it is still active. The ecosystem is supported by the Business Finland funding instrument "growth engine" that provides funding for the orchestration of the ecosystem. The orchestration budget of OneSea is ca. 2 million euros for years 2016-2021.

The very first goals of One Sea were to create common rules, a roadmap for reaching autonomous marine traffic, to dissolve legislative barriers, and to enable effective co-operation. Currently, the ecosystem aims at creating an environment that, both in terms of legislation and technology, enables the autonomous maritime transport system by 2025. The scope of the ecosystem activities and impact targets are both international in nature.

Partners

The OneSea initiative was set during the updating of the research agenda of the Finnish Maritime Industries in the autumn 2015. The ecosystem partners involve 10 firms (5 of which in service industries, 5 in manufacturing), one research organisation, and one government agency. All *partner firms*, except for a Finnish pilotage service company, operate in international markets. Their roles in the ecosystem are research, designing products, experimentation and development, and product launch. The involved *research institute's* role is to make research, experimentation and development, and product launch. The involved *government agency's* role is to give advice on experimentation and development.

Majority of the ecosystem partners are private companies, who have regular interaction with each other. The ecosystem is formally managed by a Management Board (monthly meetings). The International Advisory Board focuses on maritime r&d issues and the National Advisory Board on company and government issues. They both have 1-2 yearly meetings.

Management and evaluation

Orchestrator of the initiative is DIMECC (Digital, Internet, Materials & Engineering Co-Creation), a company co-owned by a 43 industrial and digital companies and 23 research institutes.

All IPR developed in the projects of the ecosystem platform belong to the organizations themselves - the ecosystem as such owns no IPR. The ecosystem operates as a platform for several joint projects and r&d projects.

Milestones and KPIs of the ecosystem are linked to 1) Objectives; 2) Ecosystem members; 3) Execution, and 4) Ecosystem growth. Evaluation methods are: 1) Ex ante: funding stage, internal evaluation of the project; 2) Ex post: external evaluation of ecosystems as intervention: results (turnover, exports etc) and impacts to the Finnish business life and economy.

Key learnings and takeaways

Key success factors of the ecosystem can be summarized as follows: 1) Support for the ecosystem orchestration, 2) Close cooperation of research institutes and companies, and 3) High level of trust. Recommendations for new co-creation initiative to be successful can be listed as: 1) Efficient and open-minded approach; 2) Well-functioning ecosystem rules and preconditions; 3) Trust-based co-operation between partners which treats equally all partners in the ecosystem

The key challenges and learnings are 1) Technical operation environment of the ecosystem is challenging (harbours etc); 2) Exit of the key company/ies can interrupt the whole ecosystem; 3) Excellent leadership competence and capacity are needed to manage an ecosystem successfully.

1. GENERAL CHARACTERISTICS OF THE CO-CREATION INITIATIVE

Name of the initiative*: OneSea

Start date*: 9 / 2016

Expected end date*: Business Finland funding secured until the end of 2021. After this, the initiative is expected to continue based on private funding.

Country/ies where members are based*: Finland, Norway, Japan, Sweden, Switzerland, UK (Inmarsat)

Project budget *: Total planned budget for the orchestration of the OneSea ecosystem is ca. 2 million euros for years 2016-2021.

Share of budget co-funded by members: 56 %

Share of public funding (please provide details of the public authorities providing support): 44 % % (Business Finland Growth Engine orchestrator funding)

Share of budget co-funded by VC or other sources (please specify): 0%

Main focus (please select)*: Research / Economic / Social / Other (please specify)

Goal and objective of the co-creation initiative

1*. What is the vision of the co-creation initiative? (e.g., stimulating research and discourse about a new model of global governance; platform for outcomes-based innovation to save and improve lives in low-income countries)

According to OneSea's web page, "One Sea is a high-profile ecosystem with a primary aim to lead the way towards an operating autonomous maritime ecosystem by 2025. The collaboration gathers together leading marine experts and is a strategic combination of top research, state-of-the-art information technology and business. The work began in 2016, and the aim is to create an environment suitable for autonomous ships by 2025".

1A. What is the rationale behind the vision of the co-creation initiative?

The rationale of OneSea ecosystem is to operate as an enabling platform for the member companies and other ecosystem participants. The platform has two core functions, or tasks. First, the ecosystem promotes the use and adaption of autonomous marine traffic by dissolving legislative barriers and prejudice that prevent the introduction of autonomous vehicles. Second, the platform enables and generates collaborative projects related to autonomous maritime transport system by bringing together ecosystem member companies and other ecosystem partners.

The core of the ecosystem consists of ecosystem members that are described in more detail later on. These member companies also pay a membership fee. In addition to members, the ecosystem also has partners. These partners are mostly associations that cannot afford to pay the membership fee but are still involved in the key operations of the ecosystem. In addition, ecosystem has research programme participants, such as universities and public research institutions that are involved in the r&d projects that take place on the ecosystem platform.

1B. Was it someone's initiative or was it jointly set by all members? Please provide details on the mechanisms implemented to co-develop the vision.

The OneSea initiative, as we know it, was jointly set in the autumn 2015, during the updating of the research agenda of the Finnish Maritime Industries, initiated by the association's research

committee. During this process, a digitalization committee wrote down the goals of the digital development that finally led to the construction of OneSea.

Finally, DIMECC (Digital, Internet, Materials & Engineering Co-Creation), a company co-owned by a 43 industrial and digital companies and 23 research institutes, was chosen by the member companies to orchestrate the OneSea ecosystem. Orchestration includes for example the drafting and coordinating the funding application to Business Finland and operating as the OneSea ecosystem orchestrator.

DIMECC describes itself as a "co-creation ecosystem that speeds up time to market" and "innovation platform that makes leaders and winners meet". Several of the OneSea member companies are co-owners of DIMECC.

1C. Has the vision of the initiative ever been revised? Why?

The vision has remained rather unchanged since the initiation of the co-creation project: the vision and main goals are ambitious and up to now, there has been no need for adjustments. However, since the beginning, the number of key companies in the ecosystem has increased significantly – as lined out by the original target of OneSea. In addition, one of the original key companies, Rolls Royce, sold their entire autonomous maritime operations to Kongsberg. However, the discussions on the OneSea membership of Kongsberg had already started before the acquisition took place, which enabled a smooth transition.

2*. What are the main objectives of the initiative?

In the first phase of the ecosystem (2016-2018), the main goals were to create common rules for the ecosystem members and partners, a roadmap for reaching autonomous marine traffic, dissolving legislative barriers, and to enable effective co-operation and coordinated development between the various actors required. The roadmap creation and implementation was steered by a group of leading industry members. A public version of the roadmap is available online[1]. The goals related to regulatory environment resulted for example in a paper on autonomy level proposals to IMO MSC99. Another concrete example of the achievements of the ecosystem was the set-up of the Jaakomeri test area. The test area is open to all companies, research institutes and others wishing to test autonomous maritime traffic, vessels, or technologies related to it[2].

In the second phase, the ecosystem aims at creating an environment that, both in terms of legislation and technology, enables the autonomous maritime transport system by 2025. In practice, more emphasis is put on integrating the activities of OneSea to the entire traffic sector and increasing the level of internationality. In addition, business models of current operations, such as the Jaakonmeri test area, are being developed. Other concrete outcomes of the OneSea are further r&d and ecosystem projects on the OneSea platform. Some of these are described in more detail in the next chapter. In addition, as one outcomes of successful enabling the ecosystem hopes to see new companies emerging in the markets that it has created by removing legislative barriers.

The ecosystem also plans to continue its operation after the funding of Business Finland ends in 2021. Preparation for this has already started, as the funding share of Business Finland for the ecosystem orchestration has decreased from the initial 50 %.

2A. Are there plans to commercialise the co-created products and/or services? Please explain.

[1] Public version of the roadmap: https://www.oneseaecosystem.net/wp-content/uploads/sites/2/2017/08/onesea_roadmaps-august-2017_paivi-haikkola_rev.pdf
[2] https://www.oneseaecosystem.net/test-area/

Commercialization and profitable business are in the core of this co-creation initiative. The economic targets for the ecosystem are set together with Business Finland, the main public funder of the ecosystem orchestration. These targets include ecosystem members' new turnover, exports and jobs related to the development of autonomous traffic –operations.

However, in the case of OneSea, goals related to business are rather a consequence of the successful ecosystem operations than concrete targets: OneSea's main tasks are related to dissolving the barriers of growth for the member companies related to the business area of autonomous maritime traffic. However, without an enabling regulative environment, it is very difficult to create profitable business in the area.

While the OneSea itself is rather an enabling platform ecosystem, it hosts several more concrete co-creation initiatives that aim at bringing concrete products and services to the market. Two of these are described briefly below.

Design for Value (D4V) program focuses on door-to-door supply chain, which is under digital disruptions and rapidly changing towards an ecosystem of fully autonomous system-of-systems. The research will address the following questions:

- What are the business models and ecosystems to enable business growth during and after digital disruption?
- What are the key technology solutions to enable drive or restrict digital disruption?
- How to engage companies and their employees in the new ecosystem, and external stakeholders in the change?

Sea for Value program (S4V) provides blueprints towards digitalisation, service innovation and information flows in maritime transport. Its longer-term mission is in preparing for advanced autonomous operations and navigation. S4V is a transformative program that aims for wide societal influence by providing concrete research-based recommendations on regulation, business, data usage and sharing as well as for standardization for maritime transportation. The implementation of the program will consist of several projects. The first project focuses on developing and experimenting future fairway services including remote pilotage.

3. What are the main motivations of the different members to collaborate in this initiative (e.g., need for finance, competences and skills, network & connections of members, risk sharing)?

OneSea lists several motivations for different operators in the system. First, the ship owners and operators want to take advantage of the lower capital and operating expenditure - better efficiency, reliability, safety and sustainability. This can be achieved by utilizing digitalisation.

Second, marine industry suppliers and shipyards are actively looking for opportunities to be the first to offer ship owners the latest competitive edge of digitalization. The companies and organizations collaborating in the ecosystem want to be forerunners in their respective fields and the knowledge they share sets them apart from other likeminded projects that are also aiming at enabling and developing autonomous maritime transport. The ecosystem ensures a well-researched, tested and highly capable autonomous shipping network.

OneSea is not the only ecosystem working with autonomous transport. There are several other alliances globally working with the same themes. The distinctive feature of OneSea is the fact that it is industry and business driven, rather than research driven.

Third, the co-creation ecosystem strives to set the course for new industrial standards. With the leadership, participation and steering from the One Sea Autonomous Maritime Ecosystem, the new

standards will correspond with the targets of minimizing accidents, decreasing the environmental footprint of marine traffic, and advancing possibilities for new commercial ventures.

Finally, the ecosystem provides the member companies and other ecosystem partners and participants a common platform for cooperation and co-opetition– a platform that has succeeded in creating co-opetition as it brings commercial competitors together looking for solutions for shared problems. This also poses challenges to the ecosystem in terms of competition legislation. However, some of the targets of the ecosystem, such as the creation of new standards, can only be achieved through the cooperation of the market leading companies.

Functional roles of co-creation members

4*. Please fill in the table below with the following information:

4A*. Specify all members involved in the co-creation process (specifying the number of members per type)

4B*. Choose the co-creation process project initiator(s)

4C*. Specify where members are located

4D*. Specify what are the main activities and responsibilities of members

	A.	**B.**	**C.** Location			**D.** Main activities						
	Members for co-creation	Project initiator(s)	Local/regional	National	International	Priorities setting	Research	Designing products	Experimentation and development	Commercialization / Suppo (marketing, consultancy, etc.)	Product launch	Financial engagement (share of funding, %)
Firms:												
Service	5			1	4	5	5	5	5		5	
Manufacturing	5	1			5	5	5	5	5		5	
Research organizations:												
Public research institutes	1				1		1		1		1	
Universities												
Civil society:												
Non-governmental organisations (NGOs)												
Personal engagement												
Government:												
Public authorities												
Government agencies	1			1					1			
Transnational organizations												

Notes:

5*. Were there any conditions to participate the co-creation initiative? (e.g. amount of funding provided, data sharing conditions, type of expertise, etc.)

While joining the ecosystem, the member companies commit to a membership fee, related to the size of the company (turnover).This fee is used to cover 50% of the orchestration service, which is outsourced. The remaining 50% are publicly funding by Business Finland. The orchestrator company is DIMECC. At DIMECC, OneSea has two fulltime employees to assist the member companies in their efforts.

There are no written criteria or list of conditions for new entrants. However, the current ecosystem members formally agree all new members. The idea of the combination of membership fee and assessment of current members is to ensure that new members of the ecosystem are both committed, and that there is a shared understanding on a mutual benefit. The ecosystem is also flexible: new members can join the ecosystem at any time and old ones leave. The annual fee is similar to all members. This results in a situation where the members of the ecosystem are mostly large companies that already have turnover. The membership fee is paid for a year at a time, and the contract can be open-ended or for a fixed period, such as for one year at a time.

Smaller companies and start-ups participate in the ecosystem through a so-called Intelligence Network. This "start-up and supplier network" has 1-2 events per year.

Q5A. If there were any criteria for selecting members, please, name them

There is no formal criteria for selecting members. New members have to be endorsed and formally agreed upon by existing ecosystem members and pay a membership fee. In addition, all new members must agree on the common goal of the ecosystem: to work together to reach their joint goal of autonomous maritime traffic.

<u>For each co-creation member</u>, please, provide the following information:

6*. Name of organization and its scope of activities (local/regional/national/international) and website (if available)

7*. Please explain the rationale of involving this member in the co-creation project

8*. Please explain the role and main responsibilities of this member in the co-creation project

9*. What is the financial engagement of this member in the co-creation initiative (i.e. what is the share of funding they provide overall and for each of the activities of the co-creation project)?

While it is not possible, due to corporate strategies and trade secrets, to single out the motivations of each company to participate in the ecosystem, on a general level there are at least three reasons that attract companies to participate OneSea. First, the development of standards enables business. Second, participation in a crosscutting ecosystem developing tomorrow's solutions brings not only business opportunities but also increases the member companies' brand value and attractiveness. Third, especially for companies that are not directly related to maritime industry, such as IT-companies, the participation in the ecosystem ensures that they are aware of the future needs of the maritime industry.

DIMECC stands for Digital, Internet, Materials & Engineering Co-Creation. DIMECC operates as the ecosystem orchestrator. As an orchestrator, DIMECC operates as the "playmaker" of the ecosystem. It operates as the project office for the ecosystem activities, ensures that the collaboration between the ecosystem partners is efficient, and that the ecosystem reaches its goals. DIMECC describes itself as the "the leading breakthrough-oriented co-creation ecosystem that speeds up time to market". DIMECC receives funding from the ecosystem members through their membership fees. In addition, DIMECC is

provided with "orchestrator funding" by Business Finland that covers up to 50% of the orchestrating costs.

ABB (ABBN: SIX Swiss Ex) is a technology company. The theme of autonomous ships brings together several strongpoints and specialization areas of ABB, that are electrification products, robotics and motion, industrial automation and power grids, serving customers in utilities, industry and transport & infrastructure globally. While ABB is also the leader in the field of gearless steerable propulsion systems, it is also a dominant player in the autonomous technology. ABB has for example brought autonomous technology to the Port of Singapore[3]. www.abb.com

AWAKE.AI is a collaborative and open data platform company that facilitates ecosystem creation for smart ports and evolving autonomous shipping. The underlying objective of the Awake platform is increasing operational efficiencies and creating new digital services for all actors in the port ecosystem, from port service providers to infrastructure utilization to shipping customers and cargo owners. Towards this end, Awake is developing predictive analytics and models for key processes in harbour operations. To facilitate the involvement of new digital service providers for smart ports, the Awake platform is a multi-sided network for many participants to develop smart port cargo flows and a future marketplace for selling and buying smart port & ship related services. Awake.AI was established after the withdrawal of Rolls Royce from the autonomous maritime operations. www.awake.AI

CARGOTEC is a provider of cargo and load handling solutions with the goal of becoming the leader in intelligent cargo handling. Cargotec has three business areas: Kalmar, Hiab and MacGregor. Kalmar and Hiab provide solutions and services for cargo handling in ports, terminals and on-road whereas MacGregor offers engineering solutions and services for handling marine cargoes and offshore loads.

MacGregor believes that the offshore and marine industries are at the beginning of a new era; employing technology and digital capabilities that could only be dreamt about just a few decades ago. MacGregor invites all major stakeholders for an open-minded, industry transformation cooperation – for a safer, more efficient and more sustainable future. www.macgregor.com www.cargotec.com

ERICSSON is a global company specialised in communications technology and services. The organization consists of more than 111,000 experts who provide customers in 180 countries with innovative solutions and services. Together we are building a more connected future where anyone and any industry is empowered to reach their full potential. www.ericsson.com.

FINNPILOT PILOTAGE's mission is to ensure the safe and smooth flow of maritime traffic. Their work reduces environmental accidents. The company employs over 300 pilotage professionals, who work 24/7 to carry out approximately 25,000 pilotage assignments each year. The company pilots 32% of the ships entering all Finland's ports from more than one thousand different fairways, working tirelessly to provide the safest, highest quality service to their customers. www.finnpilot.fi

INMARSAT is the leading provider of global, mobile satellite communications services, creating fast, reliable connectivity on land, at sea and in the air. https://www.inmarsat.com/

KONGSBERG is an international knowledge-based group delivering high-technology systems and solutions. In addition to merchant marine, the company works with clients within the oil and gas industry, defence and aerospace. As of 1st of April 2019, Rolls-Royce Commercial Marine was integrated to Kongsberg Maritime. www.kongsberg.com

MONOHAKOBI TECHNOLOGY INSTITUTE (MTI Co., Ltd.) is a strategic subsidiary of Nippon Yusen Kabushiki Kaisha (NYK) operating in the technological research and development field. MTI was established in 2004 to utilize technologies and the human resources of *monohakobi* in ways that realize customers' satisfaction and contribute to the global environment. www.monohakobi.com/en

[3] https://new.abb.com/news/detail/39090/abb-to-bring-autonomous-technology-to-the-port-of-singapore

NAPA is a global leader in software, services and data analysis for the maritime industry. It provides data-led solutions for safety, efficiency and productivity in both ship design and operations. Headquartered in Finland, NAPA employs 180 people in the fields of naval architecture, shipping and information technology. NAPA Group has presence in Japan, Korea, China, Singapore, the USA, Germany, Greece, Romania and India. NAPA software are used by shipyards, owners, designers, classification societies, research institutes, authorities and consultancies around the world. www.napa.fi/

TIETO is a Nordic software and services company. Tieto aims to capture the significant opportunities of the data-driven world and turn them into lifelong value for people, business and society. Tieto aims to be customers' first choice for business renewal by combining our software and services capabilities with a strong drive for co-innovation and ecosystems. www.tieto.com

WÄRTSILÄ specializes in smart technologies and complete lifecycle solutions for the marine and energy markets. By emphasising sustainable innovation, total efficiency, and data analytics, Wärtsilä aims to maximise the environmental and economic performance of the vessels and power plants of its customers.

Wärtsilä provides a full range of environmentally and economically sound integrated solutions. The company is leading the industry's transformation into a new era of efficiency with a Smart Marine Ecosystem comprising high levels of connectivity and digitalization. www.wartsila.com

BUSINESS FINLAND is an accelerator of global growth. Business Finland aims at creating new growth by helping businesses go global and by supporting and funding innovations. We aim to develop Finland to be the most attractive and competitive innovation environment in which companies are able to grow, change, and succeed.

In OneSea ecosystem, the main role of Business Finland is to provide funding (up to 50 % of the total orchestrating budget). In addition, the ecosystem members can apply for other funding from Business Finland to promote their R&D-projects, including those projects conducted on the OneSea ecosystem platform. Business Finland also utilizes its internal experts' knowledge and comprehensive international networks, and supports the ecosystem and its participant companies on their way to successful commercialization. http://businessfinland.fi/

2. MANAGEMENT STRATEGY

10*. Who is responsible for co-creation process management?

At OneSea, the ecosystem orchestrator DIMECC Ltd is responsible for the co-creation process management**.** DIMECC has a long history in co-creation and the Finnish innovation system. The roots of DIMECC are in the Strategic Centres for Excellence (SHOKs), co-creation initiatives of companies and research institutes that received notable amounts of public R&D support until 2016. DIMECC is co-owned by a group of former SHOK shareholders, including industrial companies, universities and research institutes. The orchestration is paid by the ecosystems' member companies' membership fees (at least 50% of the orchestration costs) and Business Finland's Growth Engine Orchestrator funding (up to 50 % of the orchestration costs).

According to the rules of the Growth Engine orchestrator funding, as laid out by Business Finland, the orchestrator of the ecosystem uses the funding to activate the network in order to build joint research, pilot and demo projects and activities on an international scale. The orchestrators can, for example, strengthen networks and information exchange within the ecosystem, step up its level of international cooperation, make activities more transparent and develop their impact and continuity in order to expedite the development leading to international exports. The orchestrator funding may not be used for research and development – these kind of development projects should be funded using other types of funding instruments.

Q10A*. Was a steering group or advisory committee set up? If so, please provide details on its role and frequency of interactions.

OneSea has altogether three different advisory committees. All of the following information reflects the situation in the beginning of year 2020.

Management Board consists of five company representatives from ecosystem's member companies and one representative from Business Finland. The management board comes together once a month and steers the work of the ecosystem. Ecosystem's member companies decide on the composition of the management board in membership meetings.

International Advisory Board consists of five experts with vast international experience on maritime R&D.

The National Advisory Board consists of 18 experts from companies, research institutions, ministries and other regulatory authorities.

The experts of the national and international advisory board are not from OneSea's member or partner organisations. Rather they are professionals and researchers from the fields of maritime industry, autonomy, and artificial intelligence, or civil servants from relevant authorities.

Both advisory boards feeds ideas to the development and work conducted within OneSea and comment on the current progress of the ecosystem.

Both the international and national Advisory Board come together 1-2 times a year.

11*. What is the frequency of interaction between co-creation members? (please select) If necessary /Once every few months/ Several times a month / Regularly

Q11A*. Please describe the nature and frequency of interaction between all couples of members

The majority of the ecosystem members are private companies: these companies have regular interaction with each other – concerning both the ecosystem cooperation, shared R&D projects, and other business related matters.

However, the ecosystem also facilitates regular meetings. The management board comes together once a month, and the membership meeting is held four times a year. In the membership meetings the members, for example, refine the ecosystem's strategy or roadmap for the following year. In addition to the management board, there are several working groups that advance the goals of the ecosystem on specific areas and meet regularly.

As a result of the mix of structured and informal interaction, the frequency of cooperation between some ecosystem participants can be daily, rather than monthly.

12*. What are the main means of communication among co-creation members? (Please choose all appropriate answers)

a) Official meetings at the end of the reporting period (quarterly, yearly)

c) Digital tools (e.g., email communication, conference calls, internet platforms)

d) Conferences, workshops, etc. engaging external stakeholders

e) Personal meetings

13. Is there a membership agreement for the co-creation initiative? Yes

13A. Is the agreement formalised? Yes

13B. Please specify the type of the agreement: All of the members sign a co-operation agreement. Other partner organisations, i.e. associations, sing a memorandum of understanding.

13C. Are legal issues related to the ownership of jointly developed IPRs settled in a membership agreement?

Legal issues related to the IPR are settled in the co-operation agreement. The agreement also includes a non-disclosure agreement (NDA).

All IPR developed in the projects of the ecosystem platform belong to the organizations (company or research organization) themselves; i.e. the ownership of the IPR is dependent on the specific project and the project participants' mutual agreement. However, the ecosystem as such owns no IPR.

13D. In case there is no agreement, please explain how members' activities are coordinated

14A*. Who is the owner of data from the co-creation initiative?

The data is owned by the companies or research institutes involved.

14B*. Who is the owner of IP from the co-creation initiative?

The IP is owned by the companies or research institutes involved.

15*. How is the process of accessing research results (for members) organized?

The OneSea as such conducts no research. However, the OneSea operates as a platform for several R&D projects that utilize for example the Jaakonmeri test area, operated by OneSea. If the share of public funding for these research projects exceeds 50%, all of the research results bust be published, according to the state aid legislation.

However, majority of the research conducted by the ecosystem members and other participants is industry research, rather than academic research. In this type of research, the share of public funding is typically less than 50%. If the share of public funding is less than 50%, publication of the research results depends on the companies and research institutes at hand. In practice, some results and outcomes of the research projects are public and published, typically in a public seminar at the end of the research project. The invitations of these seminars are made easily available to all ecosystem members – in practice, the orchestrator delivers the invitations to all member organisations to ensure that all ecosystem members are aware of the events.

The underlying reasons the policies related to IPR and research results are twofold. First, OneSea does not conduct research as such, but only operates as an enabler. Second, in a former Finnish ecosystem funding instrument called SHOK, all research results and IP were shared with all other SHOK members. This resulted in a situation where strategically crucial research was not conducted within the SHOKs.

While the research results related to technological development within or between the companies is confidential, the results of the ecosystem related to advancements in regulation and standardisation, are all being published once they are ready. This policy relates to the nature of the ecosystem – it supports the main objectives of OneSea.

16*. How do you set the balance between data sharing and IP protection?

Membership of the OneSea ecosystem is voluntary. Respectively, the companies that are involved in the ecosystem can share their data as much as they want – there are no set rules on what must be shared. However, a strict attitude of "not sharing anything" is barely a good starting point for a well-functioning ecosystem. On the other hand, as the ecosystem includes competitors, there is a clear and strict policy on what can not be shared, as it would violate the competition legislation.

17. Is public access to either co-creation results or products granted?

The aims of the OneSea ecosystem, related to removing legislative barriers and creating an enabling platform, are such that majority of the results of the OneSea are published. However, when it comes to specific r&d projects conducted by the ecosystem participants, results are often not published, unless the share of public funding exceeds 50%. If the share of public funding is less than 50%, access to the results and products depends on the institutions involved in the project.

18*. What types of intellectual property (IP) protection mechanisms are used (e.g., patents, trademarks, industry design, utility model, complexity)?

According to an expert assessment, nearly all IPs of the ecosystems are patents. The rationale behind is simple: other forms of IP, such as trademarks, do not strong enough protection in the international and highly competitive industry.

18A*. What types of IP are more important for your co-creation processes?

According to an expert assessment, patents make "up to 99.9 % of all IPs" developed in the co-creation process. All IPR developed in the projects of the ecosystem platform belong to the organizations (company or research organization) themselves.

3. PROJECT EVALUATION

19*. Are milestones and key performance indicators (KPIs) set for the co-creation initiative?

If YES,

19A. Are they settled in a membership agreement?

No, these are not settled in the co-operation agreement. These milestones are outlined in the project plan, which is referred to in the co-operation agreement. The project plans are also updated regularly, unlike the co-operation agreement.

19B. Are they essentially qualitative or quantitative?

Both qualitative and quantitative. The qualitative KPIs are rather a checklist of things to be reported regularly, rather than actual performance indicators. For example, change of re-focus of impact targets or business spearheads must be reported. However, this specific "KPI" has no set target levels, either can it be measured.

19C. Please provide the main KPIs (provide up to 5 indicators)

- Objectives: Change or re-focus in the impact target, and/or business spearhead, and/or target markets
- Ecosystem members: number of large, SME and start-ups, and other ecosystem members (authorities, research institutes etc.).
- Execution: roadmap progress / realization of the execution plan, initiated co-operation projects and their fitness to the roadmap, means and amount of networking, the value added of the network orchestrator (quality, including trust and motivation, no. of committed companies).
- Ecosystem growth: ecosystem members' new turnover in/outside Finland, new exports, new jobs in/outside Finland, new attracted investments into Finland

20*. At what stages is the evaluation implemented? (Please choose all appropriate answers): Ex-ante / Interim / Ex-post/ No evaluation procedure

All ecosystems that receive funding from the initiative Growth Engine, including OneSea, are evaluated by the public funding organisation Business Finland at several stages. First, when they

apply for funding and every two years as decisions of the future funding take place. Further, the progress of the ecosystem and the realization of its main targets are evaluated twice a year as part of the funding practicalities. These main targets are set in the initial ecosystem's funding application: they are confidential and set individually for each ecosystem.

OneSea was also one of the four ecosystems that were investigated in the impact analysis titled "World Class Ecosystems and Competitive Business Environment" published in 2019[4]. Further evaluation of the ecosystems will follow, as the ecosystems operations of Business Finland as a whole will be evaluated in 2020. This evaluation will take a look at all "high potential ecosystems" funded by Business Finland. However, the concrete ecosystems have not yet been chosen. In general, individual ecosystems are not evaluated as such, but as a part of larger entities.

For each evaluation stage, please, provide the following information:

20A. What approaches are used?

There are two main approaches. First, internal evaluation, conducted every two years, focuses on whether the ecosystem has been able to follow its own roadmap and meet the goals it has set itself. This evaluation conducted by Business Finland also serves as the main source of information when deciding on the continuation of the Business Finland funding for the ecosystem.

Second, the impact evaluation of all Business Finland's ecosystem operations will take a more holistic look at the ecosystems operations and funding models and how they have succeeded in creating new, internationally competitive ecosystems. This impact evaluation, although it will focus more on systemic level rather than individual ecosystems, will also include "snapshots" of funded ecosystems. These "snapshots" are in essence small descriptive evaluations of several ecosystems considered as notably potential by Business Finland.

20B. What types of data are used?

The impact evaluation will utilize a multitude of different types of data, both qualitative and quantitative: research literature, interview data, questionnaire data, data on company demographics and finances.

20C. How is the evaluation process organised? Who is responsible for it? Are there any external evaluations conducted?

The internal evaluation related to the funding is conducted by the experts of Business Finland. The larger impact evaluation on the ecosystems will be conducted by external evaluators**.**

21. Are the evaluation results open (e.g. published on the website, reports, structured databases, etc.) or closed (used only for the internal goals)? If they are open, please specify.

The results of the evaluation of the ecosystem operations of Business Finland will be public and published on the Business Finland website at the end of year 2020. However, the specific ecosystems to be included in the evaluation have not yet been chosen. Business Finland funds more than 40 ecosystems, OneSea being one of them.

The internal evaluations related to the funding process of individual ecosystems, including OneSea, are not public; however, the main result of the "evaluation" – the continuation, or discontinuation, of the funding is public information.

[4] https://www.businessfinland.fi/496a33/globalassets/julkaisut/3_2019-world-class-ecosystems-and-competitive-business-environmant.pdf

22. What are the implications of any evaluations conducted so far (e.g., revision of KPIs; suspension or termination of funding; penalties and rewards associated to performance)? Please explain.

As the Growth Engine as a funding instrument is rather new, the funding instrument itself and the KPIs are practically constantly revised. So far, it seems that all of the Growth Engine ecosystems that applied for the second 2-year period have been able to secure funding.

23. What are the key success factors of this co-creation initiative?

Although it is still early to discuss the success factors, as we have not yet seen a market break through, there are several reasons why OneSea has succeeded in building and enlarging the ecosystem and securing growth engine financing until year 2021.

1) Support for the ecosystem orchestration. In a previous evaluation[5], companies highlighted the importance of funding for the ecosystem orchestration: "It was highlighted in the company interviews that funding for the orchestration made them run much more smoothly to the benefit of all companies involved." In addition, the involvement and set rules by Business Finland were considered to bring good structure to the management of the ecosystem. According to the company representatives, these rules, set together with the orchestrator, Business Finland, and ecosystem members, make the co-operation between otherwise competing firms clearer and better managed and enable structured co-operation. For example, one of the key companies in the Marine ecosystem interviewed for the evaluation stated that "the participation of a public entity makes the co-operation between otherwise competing firms stronger and better managed".
2) Close cooperation of research institutes and companies. Finland, being a rather small country with long history of successful R&D cooperation, provides good conditions for fruitful and straight forward cooperation between companies and research institutes. While the ecosystem members of OneSea are all companies, other ecosystem participants include numerous universities, research institutions, and non-member companies. These ecosystem participants are an integral part of the r&d and co-creation initiatives that take place on the OneSea ecosystem.
3) High level of trust. It has been recognized that there is high level of trust between the member companies and research institutes. This makes the cooperation smooth and progress faster.

24. Were there any challenges during the co-creation process? Please provide details and explain what caused them.

- The technical operation environment of the ecosystem is challenging. All harbours are different from each other in terms of technical set-up, and the investments made in the marine infrastructure are very long term: renewal of the industry calls for extreme perseverance. In addition, the possibilities for experimentation and piloting are scarce. These attributes of the operating environment - long lags and heavy investments - can be interpreted as one reason for the composition of OneSea ecosystem, as the main partner companies are large multinationals, rather than start-ups. In addition, the time-span of the ecosystem is rather long, covering a ten-year period from 2015 to 2025.
- Typically business ecosystems and co-creation initiatives are built around (at least one) strong key company. If a key company, or even just a key person, suddenly leaves the ecosystem, the continuation of the whole initiative is compromised. In OneSea, there is not one key company, but several. This has both pros and cons. First, with only one key company the direction and pace of work is easily set. When the number of key companies is larger, all decisions are made in consensus. While this makes the decision making of the ecosystem more difficult, it also serves better the goals of the whole ecosystem.

[5] Copenhagen economics (2019): World Class Ecosystems and Competitive Business Environment. Quotes from a case study report related to the evaluation (4 Cases – Developing Ecosystems in Finland)

- Leading a successful ecosystem built around industry needs calls for excellent leadership competence and capacity. According to the academic literature[6], multilateralism is a key component of a well-functioning ecosystem: The ecosystem leader needs to be ready to participate polyphonic discussions and allow low to non-existent levels of hierarchy in order to enable the growth and vitality of an ecosystem.

25. Based on your experience, what would you recommend to a new co-creation initiative for it to be successful? Please explain the main lessons learned from your experience.

Based on the experiences written down in the previous questions 25 and 26, we have come out with the following points:

- Financial support for the ecosystem orchestration.
- Commit the participants by including an entrance or membership fee. This operates also as a market test: if the key companies are not willing to invest in the ecosystem is the initiative really needed? However, a membership fee can also block smaller companies from becoming ecosystem members. As the ecosystem has not experimented with proportional or graduated membership fees, there is no certainty on its impacts on the composition of the ecosystem.
- Do not require or force the companies or research institutes to share their IP, research results, or data with the other ecosystem members. A requirement to share IP and research results effectively keeps companies' most promising and important R&D projects outside the ecosystem. In addition, as the ecosystem includes competitors, not all co-operation is possible due to international competition law – for example sharing of technical details of specific solutions, is not allowed. The ecosystem aims to boost co-opetition that is useful and increases competition, but does not violate legislation.
- Not all bureaucracy is bad: for example, annual reporting cycles can help the ecosystem to clarify its strategy, goals and achievements regularly. The reporting required by Business Finland was also described as "light", especially in comparison to for example EU-funded projects. In addition, the companies are not obligated to do the reporting themselves but it is conducted by the orchestrator company, DIMECC.

[6] See for example Adner, R. (2017). Ecosystem as structure: An actionable construct for strategy. Journal of management, 43(1), 39-58.

4. THEMATIC FOCUS

Theme 1. Co-creation's contributions to digital innovation and AI and effects of data sharing

High level of easy data sharing, robotisation, automated data transfer, and AI are in the core of autonomous marine traffic.

While OneSea ecosystem itself provides rather a platform for its key companies to realize more concrete R&D efforts than to share data, it promotes these themes in several ways. First, OneSea platform creates a familiar and reliable environment where companies can be more willing to share data and expertise with other companies. Second, the standards developed in the ecosystem that enable interoperability are shared with all interested parties, not just among members. However, the members of the ecosystem cover, at the moment, more than 90% of the markets of autonomous marine traffic.

Digital innovation takes place within the companies of the ecosystem – in their private and publicly funded research projects. Awake.AI, a member company of OneSea, is a good example of this. Awake.AI aims to create "machine learning based on transparent data sharing to break down the barriers between ships, ports and other actors in the maritime logistics chain"[7]. According to the company, this "virtual infrastructure", as they call it, will be crucial for ports to be able to handle autonomous ships from pre-arrival, to cargo-operations, and finally to departure. The key challenges Awake.AI solves are related to smooth flow of data between different players, not just within the OneSea ecosystem, but more concretely between the different operators of a port to enable increasing vessel autonomy. Awake.AI is a rather young company, established in 2018, and its contributions to innovations have not yet concretized, for example in the form of patents or other IP. However, the rapidity of its development and ability to build networks is convincing. For example, Awake.AI works together with the European Space Agency's Business Incubation Centre (ESA BIC) to discover ways to utilize the sophisticated technologies of space industry: "You have to control rockets and satellites from the earth. In a sense the idea is just the same with ships that you must control from land."[8] In addition, Awake.AI was granted funding from the Growth Engine initiative by Business Finland in 2019. The ecosystem is called "Awake.AI open platform" described as "services enabled by managing all the digital handshakes between ships and ports, realized as a cloud platform with cost effective APIs".[9] This form of ecosystem challenges the traditional cluster thinking, where the key company is usually an established player, rather than a start-up. These less traditional roles of different companies can lead to increased multilateralism.

In addition to Awake.AI, the OneSea ecosystem includes several other companies that have a long tradition of collecting data and using it to remote monitoring of, for example, malfunctions or maintenance needs of propulsion engines. The challenge is to find ways to safely transmit and utilize all different sources of data to enable the use of autonomous vessels.

The matters related to IPs and data sharing follow the general principals of the OneSea – and Business Finland funding in general. The data sharing between member companies and other participants is voluntary. However, the utility of the ecosystem cooperation to members that are not willing to share any relevant data is barely very high. The patents developed in the projects of OneSea ecosystem belong to companies themselves.

[7] https://www.oneseaecosystem.net/one-sea-adds-awake-ai-to-autonomous-ship-ecosystem/
[8] https://esabic.fi/awake-ai/
[9] https://www.businessfinland.fi/4a6e85/globalassets/finnish-customers/news/cases/2019/awake-130919.pdf

5. POLICY CONTEXT

26*. Was the initiative supported by a specific policy initiative? If so, please provide details on the policy initiative and type of support provided (e.g. amount of funding, conditions of support, selection criteria, reporting obligations, etc.).

This particular ecosystem project, i.e. OneSea, was not initiated by a specific policy initiative or politics in general. In fact, it was built purely based on the initiative of the member companies. However, the political atmosphere of Finland related to autonomous maritime traffic was, and still is, favourable. Finland was the first country to introduce legislation that allows remote pilotage - a very concrete example of the political will to enhance the use of digitalization and automation in maritime traffic. The preparation of the legislation took place before OneSea was formed.

In addition, the Business Finland's Growth Engine –funding instrument was set up as a response to the strong political incentives to support the emergence of successful ecosystems. In fact, the current Finnish government, led by Prime Minister Sanna Marin, and the two preceding governments, put strong emphasis on ecosystemic thinking and the creation and support of platform economy.

OneSea has also good linkages to the relevant ministries in Finland. In fact, the national advisory board has representatives from both the traffic and defence ministries of Finland.

27*. What are the factors (e.g. related to regulations, policy, business environment etc.) supporting and/or hindering co-creation in your country? Please explain.

Some supporting factors: Long tradition of tight cooperation between higher education institutions, research organisations and companies. Availability of public funding for ecosystems; both public funding for R&D activities inside ecosystems and for ecosystem orchestration. As the ecosystem representative sees it, large ecosystemic projects cannot be realized without an integrator that takes care of the practicalities of orchestrating the ecosystem.

Some hindering factors: Rigidities in operating multilaterally, lack of collaborative mind-set and inability to think beyond the walls of a company.

28*. What do you think are most effective types of policy support for co-creation?

Support for the common development agenda. Here public funders such as Business Finland have an important role in bringing up those themes and needs, where companies have aligned interests and complementary knowledge.

Funding instruments tailored for co-creation projects. Co-creation can/should be integrated into the very core of the funding criteria, such as in the case of Growth Engine –funding that is a funding instrument tailored to co-creation initiatives. This also implies that the instruments' funding criteria and targets include metrics related to networks and co-creation, rather than just academic excellence or economic success.

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