

## **New Ventures in an emerging industry: access to and use of international resources**

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### **Abstract**

This paper addresses international activities of young companies in the emerging marine energy industry. We build our study on interviews in eight companies combined with scientific reports and publications. The main challenges for the companies are related to *financing and technology development*. Our findings show that the companies may be divided in three groups: a) three technology and funding driven international ventures, b) one market driven international venture and c) four companies with limited international involvement. The short timespan between establishment and first major international activity for acquiring funding or technology competence is a distinct characteristic of the firms in the first two groups. The last group with no or limited international activity reveals an alternative development path. Our study gives insight in significant firm level differences with regard to international involvement in the pre-commercial phase of development and discusses the implications for researchers, managers and public policy.

*Keywords: new ventures; International new ventures; INV; internationalization; resource acquisition; emerging industry; pre-commercial; marine energy; technology partnerships*

## Introduction

The last two decades, research focusing on International New Ventures (INVs) and Born Global firms (BGs) has developed into a significant research stream as can be witnessed by the number of recent review articles as for example (Aspelund, Madsen, & Moen, 2007; Cesinger, Danko, & Bouncken, 2012; Jones, Coviello, & Tang, 2011; Keupp & Gassmann, 2009; Rialp, Rialp, & Knight, 2005). These types of firms are defined in different ways, but elements of speed, extent and scope (Zahra & George, 2002) of their international engagement are often used in definitions. Examples are firms having their first international activity within 3-8 years after inception (speed) (Knight, 1997; McDougall & Oviatt, 1996), 25 per cent international sales within the first three years after inception (extent and speed) (Knight & Cavusgil, 2004) and having active operations outside their own continent within two years after inception (scope and speed) (Laanti, Gabrielsson, & Gabrielsson, 2007). Existing definitions do, however, typically focus on firms that already produce and sell their product or service.

Rasmussen, Madsen & Servais (2012) state that there has been limited attention to the sourcing side of INVs/BGs and that few studies on the pre-sale phase have been published (Rasmussen, Madsen, & Servais, 2012). The lack of focus on the early phase before sales activities is surprising since authors generally agree that a venture's future internationalization activities and processes are heavily influenced by decisions made close to and before inception (Aspelund et al., 2007; Boter & Holmquist, 1996; Madsen & Servais, 1997; Sapienza, Autio, George, & Zahra, 2006).

We will focus on the international resource acquisition of new ventures in the pre-sale phase of their development (we will use the label INV for these firms if they have an international focus). More specific, case studies of eight companies in the marine energy industry (wave and tidal energy) will be presented. These companies are focusing on technology development and have not yet achieved their first sale since the industry as such is still in its very early stage of development.

We do assume, however, that the industry will prove to be highly global once economically viable marine energy solutions have been developed. We therefore also expect that firms in the industry will have an international focus during their pre-sales activities. Our basic research questions are:

- *What is the extent and scope of international funding and technology partnership among firms in the pre-sale phase in the marine energy industry?*
- *Why and how do such firms engage in international activities?*

- *Finally, we also consider what implications our findings may have for some of the most used definitions of BGs and INVs.*

We have chosen the marine energy industry as the empirical domain because this industry is characterized by having a long time horizon in product development, and the industry is also quite global in its structure and stakeholders. We therefore expect to identify interesting problems and processes related to the topic of this paper.

## **The marine energy industry**

The marine energy industry is an emerging global renewable energy industry which consists of firms developing devices to harness energy from ocean waves and tides. Marine energy is believed to have a great potential due to large and accessible resources combined with placement of power plants outside the scope of user conflicts (Sandgren, Hjort, Pimenta de Miranda, Hamarsland, & Ibenholt, 2007). The industry is pre-commercial; in 2012 still no commercial plants have been installed. However, the first commercial marine energy plants are under way and forecasts project that total global investments in the industry during the period 2011-2015 will be £0.8 billion (Douglas-Westwood, 2011). The industry consisted in 2012 of around 150-200 firms and research has shown that the majority of firms in the industry are mainly young and small ventures (Løvdal & Aspelund, 2011).

This emerging industry is further characterized by several different technological solutions being tested and still no dominant design among either wave- or tidal energy developers. The technology development process is long and capital intensive with several rounds of small and large pilot tests in tanks and ocean environment. The full scale pilots are large physical structures, sometimes weighing hundreds of tons, and installing and operating them in harsh ocean environments leads to high costs for demonstration tests. A large part of the expenses related to demonstration testing is connected to needed infrastructure as grid connection to accomplish the tests. The total costs on developing a project from concept verification to full scale demonstration project has been estimated to £7m-£16m according to the Marine Institute of Ireland (Holmes, Nielsen, & Barrett, 2007), while for several technologies the costs for a grid connected full scale demonstration plant alone exceeds £10m combined with an expected testing period of at least 1-2 years.

The physical size of installations, the harsh ocean environments, the need of external infrastructure and the combination of several different technological skills make development of

marine energy complex. The combination of complexity and high development costs results in an industry full of young ventures with a large demand for external capital and external technology expertise.

The paper is structured as follows. First, in a theoretical part we discuss relevant aspects when defining an INV and present some key elements linked to the understanding of resource access in form of funding and technology development. We then describe the empirical methods and the data material. Next, we present our analysis of the eight case studies and discuss how our findings contribute to knowledge related to the research questions and the existing BG/INV definitions.

## **Theoretical background**

### **Definitions of International New Ventures and Born Global firms**

The research on INVs and BGs has been fragmented with regard to defining the phenomenon (Cesinger, Fink, Madsen, & Kraus, 2012; Svensson & Payan, 2009) but most authors seem to agree that the core characteristics of the phenomenon are: 1) speed, 2) degree, and 3) scope of internationalization (Zahra & George, 2002).

The first studies aiming to define the INV/BG phenomenon in the 90's were originally initiated from two different research traditions, entrepreneurship and international business (IB). Inspired by the IB literature, Knight and Cavusgil (1996, p.11) suggested that born global firms should be defined as *"..small, technology-oriented companies that operate in international markets from the earliest days of their establishment"*. This definition focuses on all types of international operations of a new venture and not on sale per se, but later Knight (1997) incorporated sales as the most important criterion and defined a born global firm as a firm with at least 25 per cent of its sales internationally within three years after inception. This definition is exclusively focusing on firms that have products ready for sale within three years after inception, and it does not include any pre-sales activities. Considering the authors' origin in the IB literature, a focus on existing firms and mainly their international sales activities can be seen as natural.

The more entrepreneurship inspired studies of the phenomenon is exemplified by the widely used definition which sees an INV as *"a business organization that, from inception, seeks to derive significant competitive advantages from the use of resources and the sales of outputs in multiple countries"* (Oviatt and McDougall 1994, p. 49). In addition to sales, Oviatt & McDougall mention the possibility of having international sourcing activities. The definition includes "sales of outputs" and

“use of resources”, but the meaning of the latter is somewhat uncertain. When elaborating on the definition, Oviatt and McDougall comment that: *“The distinguishing feature of these start-ups is that their origins are international as demonstrated by observable and significant commitments of resources (e.g. material, people, financing, time) in more than one nation”* (Oviatt and McDougall 1994, p. 49). This could imply that the term “use of resources” points to the commitment of the INV’s own employees, money or time to be able to sell “outputs in multiple countries”. However, the authors also state that *“some ventures actively coordinate the transformation of resources from many parts of the world into outputs that are sold wherever they are most highly valued”* (Oviatt and McDougall 1994, p. 57). Further, they describe ‘Global Start-ups’ as ventures that *“..not only respond to globalizing markets, but also proactively act on opportunities to acquire resources and sell outputs wherever in the world they have the greatest value”* (Oviatt and McDougall 1994, p. 59). These quotes do demonstrate attention to international sourcing activities, but it is not obvious how pre-sale access to international resources is included as a distinguishing feature of INVs.

Several of the cases presented by Oviatt & McDougall (1994) do have substantial international funding activities, though. The case company LASA had received “European” funding, about IXI they write: *“Funding for the venture was from the United Kingdom, Germany, Austria and Japan”*, and about Momenta Corporation; *“funding is received from Taiwan, Singapore, Europe, and the United States”*. This shows that, when conceptualizing the phenomenon, access to resources through international activities was considered a relevant INV feature by Oviatt and McDougall (1994), even though the widely used definition does not explicitly include access to international resources. As previously stated, international activities related to sourcing have to a large extent been neglected in empirical studies, even though for example Jones (2001) showed that the earliest international activities could be related to sourcing.

In industries with long technology development periods such as the biotechnology industry (Hewerdine & Welch, 2013) and the marine energy industry, it may be of vital importance to gain access to international funding and technology in interaction with international R&D partners before the firm has developed a commercial product. Hence, firms within industries with significant time used for technology development may have been excluded from empirical studies of BGs/INVs simply because of the sometimes quite narrow definitions discussed above. These firms could have been classified as non-INVs, even though they are highly international from inception. In this paper we examine the access and use of international funding and technology partnerships of such firms.

## **Funding sources in the pre-commercial phase**

In the INV literature, the access to financial resources is defined as a key challenge for early internationalization (Coviello & Munro, 1997; Løvdal & Neumann, 2011; Rennie, 1993), and earlier studies have demonstrated that when small firms are developing technology, sufficient financial resources in combination with access to external knowledge are critical (Jones, 2001; Kuemmerle, 2002). The challenge of accessing funding is likely to be an even greater hurdle for ventures in the pre-commercial phases still focusing on technology development without any income from sales. Actually, few studies have focused on how new ventures may access funding across national borders.

To examine this question we need to consider the characteristics of different funding sources and investigate to what extent they could be relevant for new ventures in a pre-sales phase. The different sources of funding we present below are venture capital firms, informal investors, public funding and larger corporations.

*Venture capital (VC)* firms usually invest in start-up or later phases (Clercq, Fried, Lehtonen, & Sapienza, 2006) which make them an unlikely financial source for pre-commercial new ventures in the marine energy industry because of the high uncertainty of technological success combined with high capital demands and the long expected time frames until exit.

*Informal investors or business angels* are private individuals who offer their own equity as risk capital to unlisted companies where they have no formal or family-related connections (Moen, Sørheim, & Erikson, 2008). Studies have shown that informal investors have a higher emphasis on the entrepreneur than VC firms (Mason & Stark, 2004) and are most likely to invest in close geographical proximity of their home or work (Harrison, Mason, & Robson, 2010). Further, they invest at an earlier stage than VCs and other financial institutions including during the pre-commercial and start-up phase (Moen et al., 2008; Reitan & Sørheim, 2000), and have usually a lower investment capacity than VC's (Clercq et al., 2006). We expect that informal investors can be an important local financial source in the early technology development stage for pre-commercial INVs, but less likely to act as an international funding source.

*Public financial support or soft funding* of new technology-based ventures is widespread internationally (Maula, Murray, & Jääskeläinen, 2007) and important in the firm's early R&D- and "feasibility stage". Small scale grants are usually handed out by local public agencies, while larger grants are handed out on the regional, national or international level. Holmberg, Andersson et al. (2011) show that for marine energy companies, the levels of soft funding and public support schemes

are very different between nations because of the individual national policies and the nation's general economic level (Holmberg, Andersson, Bolund, & Strandanger, 2011). Some public grants demand local presence and activities by the companies, and there are indications that access to funding is so important that pre-commercial companies in fact are willing to change their management structure or relocate activity between countries in order to be in a more favourable position for receiving public funding as described by Løvdal and Neumann (2011).

*Corporate funding* is regarded as larger corporations investing in younger and smaller ventures. Large corporations usually have higher funding capabilities than other private investors because they could possess high amounts of capital since they do not have the same portfolio pressure and required rate of return (Katila, Rosenberger, & Eisenhardt, 2008). This implies that large firms have more reasons to invest than only sheer profits, and the most common reasons are access to new technology or foothold in new markets (Benson & Ziedonis, 2009; Schildt, Maula, & Keil, 2005; Van de Vrande & Vanhaverbeke, 2013). For a pre-commercial venture, a corporate investment is attractive as it can involve both considerable funding and access to critical resources such as networks, manufacturing and technology expertise (Katila et al., 2008; Maula, Autio, & Murray, 2005). The future global market opportunities and possibilities to get hold of new technology make pre-commercial firms attractive investment cases for both national and international corporations. However, even with its advantages, we do not know how many new ventures that get access to corporate funding or the international element of such funding.

A brief look at possible funding alternatives points toward an interesting situation. The most likely funding is public technology development support. In order to get such soft funding, there will normally be requirements of local presence in some form. The implication is that if for example a Norwegian firm sources public funding in other countries, then it most likely has to locate at least some of its activities in that country. As a consequence, the firms may establish local alliances, establish subsidiaries or move the entire operations even before they have reached the sales phase. Additional complexity is added with regard to the possibility of funding related to EU support and EU technology development schemes, in principle they may reduce the importance of geographical location and regional/national presence.

### **Technology development and technology partnerships**

Due to their newness, new ventures have limited internal resources and networks which leads to a lack of credibility among partners, suppliers, policymakers and customers (Oviatt & McDougall, 1994; Rennie, 1993), and furthermore their smallness gives them a shortage of skilled human resources

(Madsen & Servais, 1997). These challenges are likely to be even greater for pre-commercial ventures in the marine energy industry where the process of developing technology from the initial idea to a fully commercial solution is complex, expensive and time-demanding. The marine energy industry experiences an ongoing technology battle (Løvdal & Neumann, 2011; Renewable-UK, 2012) where there is a diversified technology development process among firms and lack of a 'dominant design' (Anderson & Tushman, 1990). Thus, all the different technologies in the industry lead to few standard solutions available when supplementing the main technological system with additional subsystems. Even if a new venture might have a unique technological solution, it rarely possesses all expertise within the organization to also manage the complexity needed to verify the idea, conduct experiments in laboratory and larger scale tests in ocean tanks and in ocean environment. This complexity creates a demand for specialized competencies that are not necessarily available locally or within an existing network (Katila et al., 2008). These circumstances give new ventures in this industry motivation and need for being involved with external technology partners (Løvdal & Aspelund, 2011) which can provide access to knowledge.

Attractive technology partners are often larger and more established firms with experience from commercialization and industrialization of related technologies. A technology partnership could for instance involve close interaction among firm personnel (Eisenhardt & Schoonhoven, 1996; Schildt et al., 2005), access to physical facilities such as laboratories and R&D facilities or be focused on testing, developing or integrating external technologies (Van de Vrande & Vanhaverbeke, 2013) as subsystems of the ventures' total system. Such close technology partnerships can boost the capabilities and innovativeness of small firms (Nieto & Santamaría, 2010) and have been found to be beneficial for the smaller firm's development (Villanueva, Van de Ven, & Sapienza, 2012), but it also gains the external firm in form of access to new technology, increasing sales or as a reference in a new market.

In general, the ability to access both financial resources and external knowledge resources is influenced by the firms' technology potential, the human resources within the firm and their ability to attract and cooperate with credible partners. Earlier studies have shown that new technology-based firms are often actively involved in partnerships (Miles, Preece, & Baetz, 1999) and studies on INVs have shown that these ventures can successfully engage in both interfirm collaboration and international partnerships with larger companies to access external resources (Gabrielsson & Manek Kirpalani, 2004; Madsen & Servais, 1997; Phillips McDougall, Shane, & Oviatt, 1994).

Because of the long and complex technology development period we expect the pre-commercial companies to be dependent on external resources for developing their technology and



commercializing their solution. We do expect that both domestic and international large corporations are relevant technology partners. We also expect that new firms with an international orientation will be more likely to find the right technology partners. The reason is that the technological resources needed by the case companies is probably rare and may be provided only by a few companies. In addition, few large companies have the ambition of seeking a strategic position within the industry and are willing to allocate the required resources to engage in the long technology development processes in an emerging industry.

Overall, we expect a significant international orientation among the case firms related to funding and technology partnerships in the pre-sales phase. This is based on the fact that demand for wave and tidal energy solutions is assumed to be very global in nature, but also on the assumption that the firms in this emerging industry have a huge need for capital as well as specialized competencies from partners which may be difficult to find in local or national environments. Based on the case studies, we will be able to describe and analyse these issues more in detail and contribute with regard to what Løvdal and Neumann (2011) and Rasmussen et al (2012) describe as an understudied part of the INV literature.

## **Methodology**

The firm is the unit of analysis and each firm in the study represents an individual case study, but since the study as a whole covers eight different firms it can be described as a multiple-case design (Eisenhardt & Graebner, 2007; Yin, 2009). To increase the credibility and reliability of the study (Yin, 2009), we have triangulated data from interviews with secondary sources of evidence and we have cross-referenced our findings. Our primary sources are eight personal interviews with company representatives, while secondary sources are national and international industry reports, industry conferences in Norway and Scotland, company and industry web sites, news articles and interviews with representatives from public organizations and industry organizations. The interviews were conducted late autumn 2011 and were based on a semi-structured questionnaire addressing key themes and challenges for companies in a pre-commercial and emerging industry. Each interview lasted about one hour. Specifically, the themes were about the basic product idea and company background, technology development, partnerships and collaboration, funding, international activities and policy frameworks. The interviewees had all a deep insight and long connection to the firm and were either founder, CEO or in charge of business development. The interviewees decided location and date of the interview as many of the companies were occupied with projects. Three of

the interviews were conducted via telephone. However, the procedure was the same as for the face-to-face interviews and two members of the researcher group participated in each interview.

In order to be qualified as an appropriate case study object, the firms had to be active Norwegian companies with full-time employees aiming to develop devices for harnessing marine energy via tidal currents or ocean wave. Via search on industry web pages, contact with industry organizations and public agencies, we identified 16 companies which were contacted and asked to participate in the study. Four of the firms turned out to have limited activity with no full-time employees, and four did not respond to our inquiries or did not want to participate with the time limits presented. The remaining eight companies fulfilled the selection criteria and were willing to participate

We transcribed all the interviews and then carried out a within-case analysis of each company where we produced a 3-5 pages summary of each company based on the interviews and additional information from external sources. These case summaries were sent to the interviewees for approval and to ensure construct validity. We then performed a cross-case analysis (Eisenhardt, 1989) by selecting categories as funding sources and technology partnerships which were relevant for our research questions, and by designing tables to analyse and identify common and differential factors.

### The case companies

Table 1 shows some general descriptive characteristics of the case companies. To maintain anonymity, the firms are presented with their industry – wave or tidal – and numbers ranging from 1 to 4. We see that all the eight case companies are relatively young, founded between 1997 and 2010, with sizes varying between 1 to 30 full time employees.

**Table 1: General descriptive characteristics of the cases**

<b>Firms</b>	<b>Established</b>	<b>Employees</b>	<b>Idea developer</b>
<b>Tidal1</b>	2008	1 full time, 6 people engaged in various part-time work	Independent entrepreneur
<b>Tidal2</b>	2004	4 full time, 5-10 people engaged in various part-time work	Independent entrepreneur
<b>Tidal3</b>	1997	25-30 full time employees	Spin-off from utility company
<b>Tidal4</b>	2009	2 full time	Independent entrepreneur
<b>Wave1</b>	2010	3 full time	Independent serial entrepreneur

<b>Wave2</b>	2002	10 in-house, 15 included partners etc.	Developed within existing organization
<b>Wave3</b>	2010	10 part time. Hiring competence from R&D institutions	Originally a spin-off idea from existing company in the '80s. Revitalized in 2010 by existing owners.
<b>Wave4</b>	2006	3 full time, 3 part-time	Independent serial entrepreneur

## Findings

In this section, we show the results of our case-based empirical analysis. To do this, we describe each single case firm briefly, with a main focus on their international activities.

**Tidal1** has had limited formalized international activity during its first two years since inception. Their funding sources were basically the founder's own capital, small local business grants and national public grants of £80 000. The firm is not involved in any formal technology partnerships, but collaborates on a more ad hoc basis with specific local engineering companies. The reason may be that it is still in its quite early development stage in which exploration may be more important than exploitation of external competences. In collaboration with a Belgian firm, Tidal1 actively participates in a two-year long EU sponsored project from 2012. In this project, EU-based SMEs and research institutions are collaborating on developing Tidal1's technology. The firm has only tested small scale pilots in local facilities, but plans to conduct future larger scale pilot tests and demonstration tests in ocean environments in the UK.

**Tidal2** has received funding through several local and regional grants (£270 000) and has also many small private investors. More importantly, Tidal2 has received direct technology development funding (£1.1 million) and technology expertise through two different EU projects, and it has also funded some of the development costs through its Austrian partner who has contributed in technology development partly in exchange of shares in Tidal2. The strategic partnership with their Austrian partner was formalized in 2007/08 and was Tidal2's first major international activity. This collaboration helped in legitimating Tidal2's technology and has worked as a door-opener towards R&D partners and industrial collaboration national and international technology partners. Through their technology partners, Tidal2 receives valuable complementary knowledge on system components and design which are crucial for making their technological solution viable. For example, their Austrian partner is a world leading ski lift producer with expertise within wire systems and has dedicated technical personnel to collaborate closely with Tidal2 continuously from 2008, while their Dutch composite materials partner has provided hands-on knowledge on the mooring system that

the tidal energy device needs. Tidal2 is aiming for a global market and are looking for more partners internationally, but plan to conduct a full scale test of the system in Norway from 2013.

**Tidal3** had until 2007 primarily all activities in Norway receiving £1.3 million in public grants for start-up phase, R&D and scale pilot testing. In the same period, their Norwegian owners, the parent company, two regional investments companies and a multinational energy company, injected £7 million into the company. In 2007, Tidal3 started collaborating with a Scottish firm who invested £1.1 million, and together they established a joint venture in Scotland. More recently, an Austrian hydropower firm has become majority shareholder. In 2007, Tidal3 also received £4.3 million in public funding from Scottish authorities for conducting tests of their full scale pilot in Scotland. Since they still had a head office in Norway with control of the intellectual property they also received a total of £0.9 million in Norwegian public funding from 2007 to 2010.

Together with their international corporate owners, external partners have given Tidal3 valuable technology competences. Norwegian partners have provided complementary knowledge on sub-system components, operations and maintenance, while international partners have applied experience and core technology from the hydro industry, but also complementary knowledge such as integration of the technology in a power producing system. The company relocated to the UK in 2007 because of better opportunities for both funding and finding partners, and state that it would have been impossible to come this far if they had stayed in Norway.

**Tidal4** has had limited international formal engagement during its first three years of existence, but the firm had an international orientation right from inception when identifying companies which could supply them with special solutions. For example, when developing their turbine they searched globally for leading expertise on hydro turbines and got in touch with a Canadian turbine specialist from whom they received tailor-made services on an ad hoc supplier basis. Their funding comes from the two founders themselves combined with £220 000 in Norwegian public grants so far, and they have only some informal collaboration with local industry firms. In fact, Tidal4 considered to move to the UK right after inception because of better public support systems and infrastructure there, but decided not to because of personal preferences and priorities among the key personnel. Today, they regret they did not move the company to the UK in the beginning, and estimate this decision has potentially cost them two years of development.

**Wave1** was established only a little more than one year before data collection. The firm has received a total of £70 000 through start-up grants, and a larger Norwegian energy company has financed the company's first tank tests. Otherwise, they have no technology partners and are not

engaged in any international activities, but are highly aware of international opportunities as for instance production in China and more lucrative support schemes and potential market in the UK.

**Wave2** has had an international focus from inception through their multi-industry parent firm and network. The company has had basic funding from their parent firm and received public grants of at least £0.3 million in Norway. The firm has many international partners as key suppliers on R&D, other wave companies and industrial firms with complementary specific expertise. One example is a partnership with a UK-based engineering firm who specializes in structures in harsh physical environments. This partner has helped Wave2 reduce costs in specific areas including manufacturing, deployment and installation of their device. As a leader of a partner consortium consisting of two other industry firms and a university, Wave2 has received £2.4 million from UK authorities for conducting pilot tests there in 2012. Wave2 has collaboration with both Swedish and UK-based wave companies on non-critical areas of technology development like operative matters, practical experience and exchange of supplier experience. The company's viewpoint is different than the other case companies who consider the benefit of cooperating with competitors as minimal because of too varied technological challenges. Wave2 has already moved part of their operations to the UK because of market size and support schemes, and will consider moving more activities out of Norway.

**Wave3** is a joint venture between a Norwegian multi-industry firm and a Norwegian hydropower firm. Since its establishment a little more than a year before data collection, the owners have provided the company with both funding as well as complementary knowledge. The company has only received small scale public grants for technology testing and has had only limited collaboration with potential Norwegian technology partners. So far, they have had very little international activity, but state that they are likely to perform pilot tests abroad in the future.

**Wave4** has had an international orientation from the start, and received funding already two years after inception from a Swedish investment company wholly owned by a business angel. It is now the company's majority shareholder. In addition, the founder has injected more equity into the company and it has also received public grants in Norway of £1.4 million. Wave4 distinguish itself from the other case companies with a more distinct focus on close cooperation with end-customers such as utility companies or authorities in targeted global markets instead of partnering with international technology developers. This strategy has been a door-opener to dialogue and potential funding from the respective customers' national agencies. Wave4 has been granted £155 000 from New Zealand authorities for setting up a pilot plant there in 2014. The firm also signed a license agreement with a Turkish energy company in 2009, and is working closely with Spanish partners.

Wave4 has also a completely different view on the end-market than the other case companies. Instead of focusing on the larger future markets as for instance the UK and the US, the firm has targeted a niche market consisting of off-grid island communities globally where electricity is expensive because the only electricity sources are for example expensive diesel generators.

## Discussion

This section analyzes the research questions by conducting a cross-case analysis. Below we will discuss the contribution and implication of our findings with regard to the extent and scope of international funding and technology partnerships in the firms as well as the questions of why and how they engage (or do not engage) in international activities in these areas. Finally, we discuss the implications of our study with regard to the definition of the INV phenomenon.

### The extent and scope of international funding and technology partnership

Table 2 presents the case companies' international funding sources and their technology partnerships. As it appears, most of them have some international activities in this pre-sales phase. There are, however, quite large variations among the firms.

**Table 2: International funding and technology partnerships among the case companies**

	<b>International funding resources</b>	<b>Technology partnerships</b>	<b>Technology partnership focus</b>
<b>Tidal1</b>	Active participation in product development project sponsored by EU	No strategic technology partnership, but collaboration with specific local engineering companies.	Partners contribute with concept development and small scale testing. Seeking for investors and strategic partners.
<b>Tidal2</b>	Important funding through two EU projects (£1.1 million). Funding through international technology firms who receive shares and/or production contracts as payment.	Strategic technology partnership with Austrian wire producer. Technology collaboration also with Dutch, British, Finnish, Swiss, Canadian and Norwegian partners. Cooperate with universities in Norway and internationally, first tank test conducted in the UK in 2006.	The different industrial partners contribute with expertise on their specific field both in planning and testing phases. Partners receive shares or exclusivity.
<b>Tidal3</b>	Received £1.1 million in equity from Scottish renewable energy firm in 2007. Austrian hydropower firm who now are majority shareholder invested unknown amount in 2010 and 2012. Funding from UK authorities for full scale pilot testing in 2007 (£4.3 million).	Many national and international technology partners. Established Joint Venture in Scotland together with Scottish firm. Different owners (Austrian, Scottish and Norwegian firms) have contributed with technology development.	Owners provide both competence and secure financing. Partners have applied experience and expertise from oil & gas subsea industry and hydro industry. Needed international complementary expertise to move further towards commercialization.

<b>Tidal4</b>		No strategic technology partnership. More informal collaboration with industry firms.	Looking for the best solutions globally. For example Canadian turbine manufacturer designed tailor-made solutions for them.
<b>Wave1</b>		No strategic technology partnership. Testing scale models at Norwegian university.	Need strategic partners to further develop the company.
<b>Wave2</b>	R&D-grants and support from EU-programs. Received £2,4 million out of a £7,4 mill project (together with 3 partners) from UK authorities.	Has many established technology partners, also within mother-firm. Close relationships with key suppliers and some other international wave energy firms. Cooperation with R&D institutions in Norway, Belgium, Portugal and the UK.	Has cooperation with Swedish wave company where they exchange knowledge and test facilities. Strategic partnership with UK 'hostile environment' engineering firm which have complementary expertise.
<b>Wave3</b>		Joint Venture between hydropower and multi-industry firms. Owners have complementary knowledge and are industrial partners for the technology developers. Some collaboration with other Norwegian firms. Large network through parent organizations.	Dialogue with R&D institutions, some exchange of experiences with competitors.
<b>Wave4</b>	Swedish private investor is majority shareholder and has invested £3.2 million. Acquired £155.000 in public funding from New Zealand authorities through customer-collaboration.	No strategic technology partnership. Collaborates with end-customers in New Zealand, Spain and Turkey.	Collaborates with international end-customers in niche markets as off-grid island communities. Collaboration increases local presence and give technology legitimacy both in Norway and abroad.

If we summarize the findings from table 2, we see that half of the case companies (Tidal2, Tidal3, Wave2 and Wave4) have a strong international orientation towards funding resources already in the pre-commercial phase. These international funding sources vary from a private investment company (Wave4), larger technology firms (Tidal2 and Tidal3) and public grants (Tidal3, Wave2 and Wave4). Further, three of the case companies have formal technology partnerships (Tidal2, Tidal3 and Wave2), all with international partners, while Wave4 has signed formal collaboration agreements with international end-customers.

Tidal1 has weaker international activities since it is limited to funding through an EU sponsored technology development project, but participation in this project gives a potential of meeting and collaborating with international firms and research institutions. The remaining three firms (Tidal4, Wave1 and Wave4) do not have international activities, but all of them have ideas and plans of international activities pertaining to testing, production, funding, or other activities. In general these firms are quite young, often established 1-2 years before data collection. This may be a reason why they have not yet realized their ideas about international activities. In fact, these companies have not received any external private funding and do not have any formal technology

partnership at all with the exception of Wave3 which is a joint venture between two Norwegian industry firms.

Table 2 also shows that most of the case companies' international activities are within Europe, and especially from the north and west of Europe, with an exception for Wave4 which has partners and activities also in Oceania and Tidal2's Canadian partner.

Figure 1 below, illustrates that case companies with significant international activity regarding funding or technology partnerships, are also highly internationally oriented on the other dimension. In principle, a company could search for funding outside of Norway, but conduct technology development within Norway. Or it can use an opposite approach with funding from Norwegian sources only and technology development internationally, but none of these situations are observed among the case companies. It seems to be so that technology development arrangements are connected to funding. For example, companies establish partnerships with local firms to be in a better position for receiving public grants for technology development and pilot testing in other countries, or technology partners receives shares or invest own equity into the venture. In addition, some of the interviewees state that international technology partnership agreements increase the credibility of the firm and are positive in discussions with both potential investors and when applying for public grants at home and abroad.

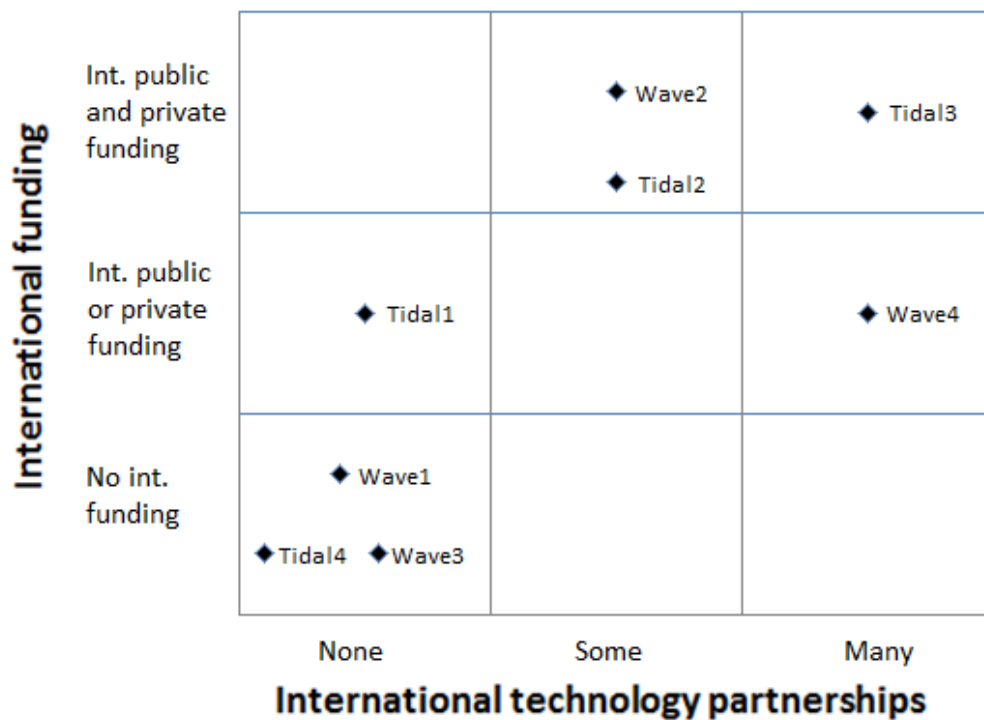


Figure 1: The degree of internationalization among the case companies



Another striking result is the willingness of some companies to relocate activity even in the pre-sales phase. Tidal3 and Wave2 have moved all or some operational parts of the company to the UK as a consequence of better funding possibilities and ongoing partnerships with firms located there, Tidal4 evaluates moving the company to the UK because of better funding possibilities, infrastructure and potential partners while China is a likely production location for Wave1 because of the considerable lower production costs. This reflects the degree of international orientation of the companies as well as the importance of funding and technology development in these early phases.

### **Why and how do these firms engage in international activities?**

The case companies report access to capital and technology development to be their greatest challenges. All of the companies have been able to receive initial public grants from Norwegian authorities, but this is not enough for the companies when they plan to conduct larger and more expensive pilot tests. Norway is Europe's largest producer of hydropower and a net exporter of electricity in a normal year, which gives Norway low electricity prices and low demand for new renewable energy. This situation in combination with a booming oil and gas industry creates limited interest from both Norwegian authorities and industrial firms to invest in new renewable energy as the marine energy industry. This fact combined with more generous funding schemes internationally, especially in the UK, is the companies' main motivation for searching for funding internationally. The reason for searching international funding is thus triggered by a push as well as a pull effect.

A consequence of the search for international funding is that companies look for international technology partners as well as attempts to establish local presence in foreign countries that offer attractive funding schemes. This is clearly demonstrated in case firms that have established presence and/or engaged in technology partnerships abroad. Except for partnerships driven by funding considerations, there is a clear pattern, especially among the most internationally oriented case companies, that they aim for partnerships to get access to critical external technological resources. Here, international technology partners are very attractive because of access to unique technology resources which very few companies possess even internationally (for example Tidal2's partnership with an Austrian wire producer or Wave3's British "harsh environment" engineering firm) and because of small interest in marine energy among Norwegian energy and manufacturing firms.

The international technology partnerships have been differently organized by the case companies, partly depending on the need for funding in combination with specialized technologies. Tidal2's closest partner has dedicated personnel collaborating continuously with them on technology

development. This has been financed on the partner's expense, but also by offering shares in Tidal2 to the partner. However, the partner's main motivation might be that their firm is likely to be a big supplier of parts to the final system if Tidal2 successfully commercializes their solution. Wave3 has set up a technology developing consortium with their partners aiming to conduct a pilot test in rough ocean environments. This solution has given them access to grants from UK authorities, but also more dedicated efforts from their partners in the development and testing of their pilot device. Tidal3 on the other hand, established a joint venture with a Scottish firm to continue the technology development in Scotland, which further lead to major international private investments and public grants to the company. In general, it seems as results are more profound when the case companies enter into partnerships with higher commitment from both partners. Such partnerships require a long-term orientation and clear targets, but also high degrees of trust among the partners.

Wave4 collaborates with end-customers in targeted markets, but not so much with technology partners which is different than the other case firms who have entered technology partnerships before targeting potential end-customers. An example is a project Wave4 has launched together with a New Zealand based energy company where they aim to deliver wave power to an off-grid island community through a pilot in 2013 and scale up later. This collaboration has so far resulted in international funding in form of a grant from New Zealand authorities and has, in addition, given Wave4 insight into more diverse customer needs and behaviour.

Based on this, we can divide the case companies into three groups;

1. *Technology and funding driven internationalizers* (Tidal2, Tidal3 and Wave2)

These companies have ventured internationally mainly to enhance their technology development process either by finding technology partners, by seeking access to more funding, or a combination of the two.

2. *Market-driven internationalizers* (Wave4)

This company is different from the other case companies because it clearly separates the marine energy market into segments where it targets a niche market. Its main international focus has been to approach end-customers in these potential markets globally.

3. *No or limited internationalization* (Tidal1, Tidal4, Wave1 and Wave3)

These ventures are so far only thinking about international engagement. This might be because they have not been able (Tidal4 and Wave1) or willing (Wave3) to access international resources. These are the youngest among the case companies with least progress in technology development and thus lesser need for technological expertise which

might explain their limited international activities so far. However, as table 3 below shows, Tidal2, Wave2 and Wave4 had already extensive international activities at the same age.

The motivations and actual forms of international activities are thus quite diverse among the case companies, but the overall findings suggest that an international engagement has been beneficial for case companies in group 1 and 2 for accessing more funding and for strengthening their technology development. For firms in group 3, a likely outcome is longer development time and an even longer way to a commercial market illustrated by Tidal4's estimation that the decision to not internationalize had cost them potentially two years of development. This raises the question why not companies in group 3 are more focused on international engagement, especially since there are high visibility among competitors' international funding sources and partnerships, and strong factors that push (limited funding) and pull (beneficial policy regimes, higher abundance of funding and technology partners) companies abroad.

### **Early international sourcing activities are neglected in the INV literature**

The findings show that already before having a commercial product ready, four out of eight case companies have a high international activity level and the case descriptions show that all see the end-market as international or global. Four ventures (Tidal2, Tidal3, Wave2 and Wave4) have received international funding from a variety of sources (private investors and investment companies, larger firms and research grants) originating from New Zealand, Sweden, Austria and the UK. Important partners are located in the Netherlands, Sweden, the UK, Finland, Austria, Spain, Turkey, New Zealand and Canada. In fact, most formal technology partnership agreements are with international partners. Further, table 3 below shows that three out of the four internationalizing companies were three years or younger when doing their first major international activity.

**Table 3: First international activity and age for selected case companies**

<b>Case companies</b>	<b>First international activity</b>	<b>Age of first international activity</b>	<b>Degree of international activities</b>	<b>Scope of international activities</b>
<i>Tidal2</i>	Formal technology partnership with Austrian wire producer in 2007/08	3 years	Many international technology partners International private funding	Technology partners are from Europe and Canada
<i>Tidal3</i>	International technology partners and owners in 2007	10 years	Many international technology partners	Technology partners and owners are from several European countries

			International private and public funding	
Wave2	Have had international partners from inception through their mother firm and network from 2002	From inception	Many international technology partners International public funding	Technology partners are mainly from Northern and Western Europe
Wave4	Swedish investors in 2008, Turkish license agreement in 2009.	2 years (but international focus from inception)	Some international partners International public and private funding	Partners are from New Zealand, Turkey and Spain. Investor from Sweden

Even though we have found case companies that are international basically from inception (speed), with a large extent of funding from international sources and many technology development partners (degree) from all over Europe, Canada and New Zealand (scope), they would still not be characterized as a BG according to Knight's definition (1997) since they are in a pre-sales phase. Our study therefore strongly supports the inclusion of other aspects than sales when categorizing firms according to their degree of internationalization. The mindset of management in these firms is clearly international and their early international activities will definitely provide the grounds for subsequent international sales of their solutions. In order to understand their international activities in for example 2020 it is important to understand their initial internationalization process.

Oviatt and McDougall's (1994, p. 49) definition of an INV, on the other hand, does include sourcing side activities. In relation to the case companies in this study their definition is therefore much more relevant. As mentioned earlier, however, Oviatt and McDougall did not clearly state how the term "*use of resources*" in their definition should be interpreted. Based on our study we suggest defining an INV as "*a business organization that, from inception, seeks to derive significant competitive advantages from the **access to resources**, use of resources and/or planned or actual sales of outputs in multiple countries*". This definition stresses that obtaining access to international resources (for example funding) is an important issue for firms in industries such as the marine energy industry. In order to capture the special features of INVs we argue that it is necessary to include international sourcing activities even in early development stages because these might be key elements in order to understand also the further development of these newly established and internationally oriented firms.

## Implications and future research avenues

This study has concentrated on an understudied part of the INV literature and has shown that new ventures could have extensive international activities on the sourcing side where they acquire critical resources as capital from international private and public funding sources and technology competence through active involvement with international partners.

For business managers, this article shows that a new venture's international engagement already in the pre-sales phase could increase the possibility of accessing financial and technological resources. The observed link between international technology partners and international funding for the pre-commercial companies could imply that companies able to attract international partners, either in technology development or as future customers, increase their funding possibilities.

This study also demonstrates how companies can exploit international opportunities created by different policy regimes already in a pre-commercial phase. For policy makers, this shows that there is a risk of companies moving their activities to other countries before they start to generate income, even though they have received early stage soft funding from local authorities. Such implications should be carefully considered when creating policy regimes for emerging industries.

For research, our study has demonstrated that INVs could exist also in the pre-sales phases and that the INV definition presented by Oviatt & McDougall (1994, p. 49) should also consider international sourcing side activities in order to understand further development of new and internationally oriented ventures. Further, our results have shown that the international activities before first sale could be extensive, and for industries with long technology development periods such activities could be of vital importance for securing access to crucial resources. Based on the findings in this article, it would be interesting to further investigate why some new ventures choose to internationalize early in the pre-sales phases while others are more reluctant to do so. What do such strategic choices mean for the companies in the long run, and which group of companies will succeed best? Another promising research area would be how the international activities in the pre-sales phases affect future internationalization pattern and future sales in international markets. Especially, how the different international funding sources have impact on the future internationalization progress of the firms. Another promising area could be the dynamics and coherence of funding and technology development in the pre-commercial phases for ventures which are capital intensive and have long technology development periods.

A clear limitation is that this study only consists of Norwegian companies from the marine energy industry. It would be interesting to see if similar results are to be found among companies in other countries and industries, and specifically within countries with more attractive policy regimes than Norway as for example the UK. Similar studies of international activities among companies in other emerging industries or industries with long technology development periods would also be interesting, and especially with larger quantitative surveys to investigate the extent of the phenomenon.

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