



Re-viewing entrepreneurial universities through alumni engagement

Diamanto Politis · Lise Aaboen · Ann Elida Eide ·
Dag Håkon Haneberg

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Abstract The paper contributes to re-viewing entrepreneurial universities by expanding the understanding of the role and impact of alumni engagement in this context. Embedded in a stakeholder theory perspective, we develop and test a framework that identifies social, behavioural, cognitive and affective drivers of alumni engagement. We conducted statistical analyses to test hypotheses on a sample of 493 entrepreneurship graduates from Venture Creation Programs (VCP) at three major universities in Scandinavia. Our theorising and findings suggest that alumni engagement is multifaceted—encompassing providing and connecting functions. Furthermore, the analysis suggests social, behavioural and affective drivers to accelerate alumni engagement. Future studies of entrepreneurial universities should focus more specifically on how entrepreneurship education and university managers may prepare students for becoming engaged alumni.

Plain English Summary What spurs entrepreneurship graduates to actively engage as alumni in the entrepreneurial university ecosystem? Our theory and

findings shows a nuanced view of alumni engagement, emphasising two key functions: the resource providing function where alumni share hands-on experiences, and the connecting function, mediating stakeholder relationships. Rooted in stakeholder theory, our study elucidates the substantial impact of social, behavioural and affective drivers on alumni engagement. Notably, the significance of peers emerges as a pivotal factor, shaping both the providing and connecting functions. This underscores the critical role of the social aspect in propelling alumni engagement, accentuating the importance of social networks and entrepreneurial communities in fostering entrepreneurship within the university. The study calls for a comprehensive understanding of the value of cultivating enduring alumni relationships, positing them as co-creators essential for fortifying the entrepreneurial university's third mission. In essence, our findings advocate for strategies that prioritise and nurture social bonds among entrepreneurship graduates to enhance the entrepreneurial university's vibrancy.

Keywords Entrepreneurial universities · Alumni engagement · University ecosystems · Entrepreneurship education

JEL Classification L26 · A23 · O10 · I23

D. Politis (✉)
Sten K Johnson Centre for Entrepreneurship, Lund
University, Lund, Sweden
e-mail: diamanto.politis@fek.lu.se

D. Politis · L. Aaboen · A. E. Eide · D. H. Haneberg
Norwegian University of Science and Technology
(NTNU), University in Trondheim, Trondheim, Norway

1 Introduction

Entrepreneurial universities play a central role in catalysing economic and social development via knowledge exchange and interactive learning (Guerrero et al., 2015). Their influence rests on their ability to stimulate innovation and new venture formation through university-industry interactions and networking with stakeholders (Etzkowitz et al., 2000; Guerrero et al., 2016). Moreover, the enterprising culture on campus encourages faculty and students to engage with the surrounding university ecosystem in an entrepreneurial manner (Guerrero & Urbano, 2012; Klofsten & Jones-Evans, 2000).

Over the past decades, entrepreneurship education has become a central feature in vibrant university ecosystems (Meyer et al., 2020; Pocek et al., 2022). By engaging students in deliberate practice in close collaboration with various stakeholders in the ecosystem, entrepreneurship education functions as a catalyst for highly skilled and specialised talent that promote venture creation and innovation in and around the entrepreneurial university (Belitski & Heron, 2017). In addition, it serves as a viable platform for connecting with and engaging enterprise-oriented alumni to energise knowledge-intensive entrepreneurship and fostering technology transfer (Baroncelli et al., 2022).

The growing literature on alumni engagement opens for re-viewing the role of entrepreneurship graduates as a potent force that strengthens and vitalises the entrepreneurial university. In this respect, it is increasingly acknowledged that graduates from entrepreneurship education not only serve as productive agents for entrepreneurship and innovation in the regional economy (e.g. Breznitz et al., 2019, 2022; Eesley et al., 2016). In addition, they are co-creators of the vibrant and dynamic resources and competencies that create the very lifeblood of the entrepreneurial university (Baroncelli et al., 2022; El-Awad et al., 2022). In this regard, the alumni engagement of entrepreneurship graduates has the potential to support the university's teaching, research and technology transfer missions (Clarysse et al., 2022; Meyer et al., 2020).

While the literature has yielded important insights about how entrepreneurship graduates produce valuable economic outcomes and outputs in university ecosystems (Meyer et al., 2020), there has so far

been limited attention to the cyclical process where resources and networks provided by engaged alumni feedback into the university. Specifically, there is little research on the alumni engagement of entrepreneurship graduates despite their systemic function in building an institutional framework of knowledge commercialisation in the entrepreneurial university (Brush, 2014; El-Awad et al., 2022). As a result, there is little theory informing about the drivers of alumni engagement and how they contribute with critical and timely resources and networks that boost current students' enterprising spirit and employability.

Against the above, we pose the following research question: what encourages graduates from entrepreneurship programmes to engage as alumni in the entrepreneurial university ecosystem? By 'engage', we broadly refer to the alumni's involvement in different functions embedded in the university context that support entrepreneurial activity and learning in the university-based ecosystem. More specifically, we distinguish two key alumni engagement functions. The first is a providing function, where alumni serve as resource providers for current students by being guest lecturers, serving as mentors or showcasing their start-ups (El-Awad et al., 2022). The second is a connecting function, where alumni are assuming the role as dealmakers by providing local stewardship to current students, connecting them to valuable stakeholders such as customers, suppliers, collaborators and investors (Feldman & Zoller, 2012; Malecki, 2018). To advance current theory and research, we build a framework embedded in a stakeholder theory perspective (e.g. Bischoff et al., 2018; Gianiodis & Meek, 2020) where alumni engagement functions are perceived as outcomes of social, behavioural, cognitive and affective drivers embedded in collaborative interactions in the entrepreneurial university ecosystem.

Our study makes significant contributions to theory and research on the entrepreneurial university. First, we explicate two key alumni engagement functions that strengthen and vitalise the entrepreneurial university by providing valuable resources and networks connected to financing, legitimacy and knowledge. Second, we develop and test a framework embedded in a stakeholder theory perspective that identifies social, behavioural, cognitive and affective drivers of alumni engagement. Third, and building on these insights, our theorising advances the literature

by re-viewing the role of entrepreneurship graduates as co-creators of the resources and competencies that makes and revitalise the entrepreneurial university.

We structure the rest of the article as follows. The next section presents our theoretical framework, where we develop hypotheses of social, behavioural, cognitive and affective drivers of alumni engagement among entrepreneurship graduates. After that follows the method section, where we present the sample and variables. Then we present the analysis section where the results are offered. In our final section, we discuss our findings in light of the entrepreneurial university literature, with implications, limitations and suggestions for future research.

2 Theoretical framework

2.1 Ecosystems of entrepreneurial universities

The entrepreneurial university has emerged as a powerful concept that identifies the evolution from traditional education and research missions towards economic and social development through science and technology-based entrepreneurship and innovation. Essentially, embedded in the triple helix innovation model (e.g. Etzkowitz et al., 2000), entrepreneurial universities seek to foster technology transfer, firm formation and regional renewal via partnerships and networks. In this regard, they play a pivotal role in strengthening the bridge between academia, industry and government, thereby promoting knowledge-driven innovation in the surrounding ecosystem.

Entrepreneurial universities reside within a surrounding entrepreneurial ecosystem that nurtures the creation and dissemination of cutting-edge scientific knowledge and technology (Guerrero et al., 2014; Hayter, 2016; Siegel & Wright, 2015). This entrepreneurial ecosystem comprises various intermediary organisations that optimise the contributions of universities by empowering aspiring entrepreneurs, facilitating knowledge exchange, expediting efforts aimed at technology commercialisation and bolstering the emergence of innovative start-ups (Fuster et al., 2019; Hayter, 2016). By being firmly embedded in the ecosystem, universities empower and motivate potential academic entrepreneurs, including graduates and other individuals, to embark on launching, funding and supporting high-impact ventures (Brush, 2014;

El-Awad et al., 2022; Hayter, 2016; Siegel & Wright, 2015).

Entrepreneurship education has been recognised as a central feature of vibrant entrepreneurial university ecosystems that create value for society and the regional economy (Bedö et al., 2020; Bischoff et al., 2018; Tether & Tajar, 2008). Research suggest that entrepreneurship education graduates play a central role in keeping the ecosystem dynamic and vibrant (e.g. El-Awad et al., 2022; Meyer et al., 2020). For example, they often develop their ventures close to the university, thus contributing to job creation and economic growth in the local ecosystem (Larsson et al., 2017). They may also be engaged as coaches or mentors for students (Hägg & Politis, 2017) or as investors in student start-ups (Colombo & Piva, 2020). In this regard, their enterprising activities feed back into system conditions via curricular, co-curricular and research activities, which foster innovation and new economic activities (Brush, 2014; Wright et al., 2017).

2.2 Types of alumni engagement: providers and connectors

Our framework rest on two alumni engagement functions provided by entrepreneurship graduates that has the potential to accentuate knowledge flows and accelerate the creation of innovative startups in entrepreneurial ecosystems. First, we identify the ‘providing function’, where alumni serve as resource providers. In this function, alumni are sharing their hands-on learning experience as guest lecturers, serving as a mentors or by showcasing their start-up for students, thus contributing with valuable resources that develop and sustain value creation in the university ecosystem (Baroncelli et al., 2022; El-Awad et al., 2022; Meyer et al., 2020). Second, we identify the ‘connecting function’, where alumni serve as dealmakers. The connecting function provides active stewardship for current students by connecting them with valuable stakeholders such as potential customers, suppliers, collaborators and investors.

Both functions advance the mission of entrepreneurial universities by strengthening the institution’s reputation as an engine of innovation and economic growth and building a culture of strong stakeholder commitment that foster long-term university-industry collaborations. Moreover, they accentuate the role of

alumni as embedded stakeholders in the university ecosystem who are part of the curriculum and educational experience of the entrepreneurial universities. In this vein, alumni mediate stakeholder relationships, making purposeful connections and facilitating the development of industry-related skills and opportunities for current students, thus contributing to increase the vibrancy of the entrepreneurial university ecosystem (Feldman & Zoller, 2012; Malecki, 2018).

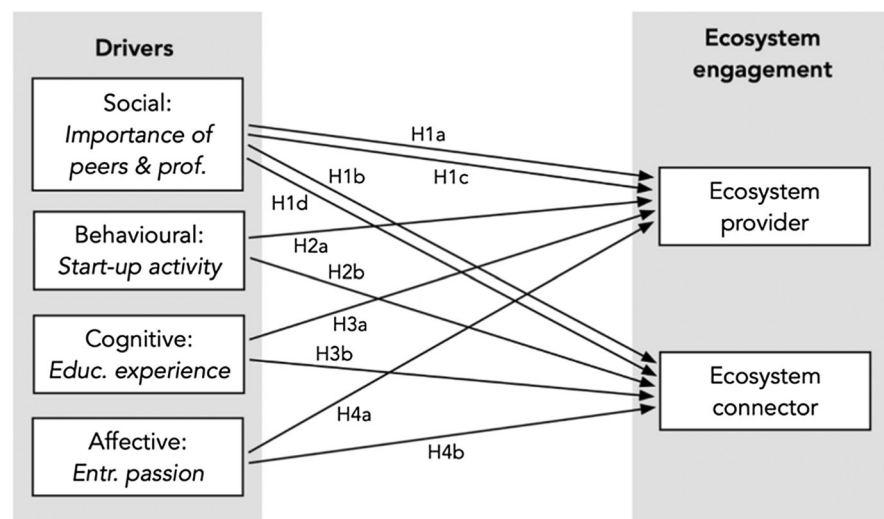
2.3 Drivers of alumni engagement—a stakeholder theory perspective

In this section, we explicate the drivers of alumni engagement by developing a set of hypotheses embedded in a stakeholder theory perspective (e.g. Bischoff et al., 2018; Gianiodis & Meek, 2020). Stakeholder theory, in its original form, aims to explain how certain individuals or groups can influence and be influenced by business activities they are involved in (e.g. Freeman, 2010). When we apply this perspective to entrepreneurial universities, it elucidates the crucial significance of recognising stakeholder relationships within and around the entrepreneurial ecosystem (cf. Bischoff et al., 2018). More specifically, the perspective highlights how alumni engagement can be enhanced when universities leverage stakeholders to build long lasting relations that foster the progress and expansion of the university's teaching, research and technology transfer missions (El-Awad et al., 2022).

As we are particularly interested in alumni engagement activities that contribute with valuable resources and networks increasing technology transfer and knowledge-intensive entrepreneurship, our study focuses on entrepreneurship graduates from venture creation programmes (VCPs). In this vein, VCPs have been identified as a specific type of action-based entrepreneurship education that builds on deliberate practice and collaborative learning in the surrounding university ecosystem. Using the creation of a new venture as a main vehicle for learning (Lackéus & Williams Middleton, 2015; Sørheim et al., 2021) enables students to learn from their own venture projects and making useful contributions beyond the classroom (Kearsley & Shneiderman, 1998). As such, they become co-creators of the vibrant and dynamic resources and competencies that create the very lifeblood of the entrepreneurial university (Baroncelli et al., 2022; El-Awad et al., 2022).

Action-based entrepreneurship education programmes such as VCPs foster certain drivers that may influence entrepreneurship graduates to continue engage in the university ecosystem as alumni. Guided by the stakeholder theory perspective, we posit four key drivers of alumni engagement, namely social, behavioural, cognitive and affective drivers. We discuss the four drivers below and argue for how each can drive the alumni engagement of entrepreneurship graduates in the university's ecosystem, as depicted in Fig. 1.

Fig. 1 Summary of the hypothesised relations.
Source: Authors



Social driver of alumni engagement The social driver of alumni engagement highlights the role of network ties in fostering stakeholder engagement within the entrepreneurial university ecosystem. The pedagogical approach characterising VCPs encourages students to build a network to boost their entrepreneurial spirit and employability (El-Awad et al., 2022). The network consists of fellow graduates, *peers* and other stakeholders within the university ecosystem, including faculty members, support organisations and entrepreneurs (Meyer et al., 2020). We refer to this latter group as *professionals*. Serving as hubs for the exchange of knowledge and insights, the social network plays a pivotal role in facilitating access to essential resources and aiding business development (Brush et al., 2001).

The networks developed during studies can advance the entrepreneurial career (El-Awad et al., 2022). In this regard, many entrepreneurship programmes have alumni associations that are active in maintaining network relationships among the alumni and in initiating new relationships between current students and alumni, thus allowing both knowledge exchange and community building via social events (Baroncelli et al., 2022; Haneberg & Aadland, 2020). However, the importance put on relationships with peers and professionals may vary across different stages of the entrepreneurial career, and these relationships may evolve over time with potential role overlaps (Fayolle et al., 2016). Graduates who value their network of peers and professionals can thus be expected to show higher levels of alumni engagement, where a higher importance placed on these networks translate into activities that make them more involved in providing and connecting functions in the ecosystem. Based on the above reasoning, we formulate the following hypotheses:

H1a: Higher perceived importance of peers is associated with higher engagement as an *ecosystem provider*.

H1b: Higher perceived importance of peers is associated with higher engagement as an *ecosystem connector*.

H1c: Higher perceived importance of professionals is associated with higher engagement as an *ecosystem provider*.

H1d: Higher perceived importance of professionals is associated with higher engagement as an *ecosystem connector*.

Behavioural driver of alumni engagement The behavioural driver relates to the pursuit of entrepreneurship through involvement in venture creation activities. Students enrolled in VCPs pursue new venture creation as the main learning vessel during their studies (Haneberg et al., 2022). Engaging in venture creation provides an authentic learning arena that enables interactions with real customers, collaborators and investors, thus interacting with various stakeholders in the actual business world. This means that entrepreneurship graduates encounter first-hand experience of the struggles and rewards associated with entrepreneurship.

Graduating from entrepreneurship education opens up multiple career paths where only some graduates will continue with venture creation activities as a natural step in their careers (Alsos et al., 2023; El-Awad et al., 2022). For those who do, the achievement become a visible symbol of entrepreneurial prowess that make them better known in the ecosystem. Additionally, the positive contributions of their businesses to the local economy and job creation may further elevate their reputation and influence within the community. This success is likely to catch the attention of the community where the graduate may be seen as a role model and source of inspiration for others. In this regard, alumni who start up a venture after graduation are more likely to be invited to share their hands-on learning experiences as speakers and guest lecturers that in turn makes them more engage in providing and connecting functions in the entrepreneurial ecosystem. Based on this discussion, we derive the following two hypotheses:

H2a: Involvement in start-up activity after graduation is associated with higher engagement as an *ecosystem provider*.

H2b: Involvement in start-up activity after graduation is associated with higher engagement as an *ecosystem connector*.

Cognitive driver of alumni engagement The cognitive driver relates to knowledge and skills acquired from entrepreneurship education in key

areas in the entrepreneurship field, such as opportunity recognition, business modelling, marketing and financing (Jones et al., 2017; Martin et al., 2013). In a VCP, the learning context is defined as ‘real’ and authentic since students act as real entrepreneurs rather than mimicking entrepreneurial activity (Aadland & Aaboen, 2020). Entrepreneurial skills and knowledge are therefore actively developed through real-life experiences and interactions between students and stakeholders in the entrepreneurial university ecosystem (Lackéus & Williams-Middleton, 2015; Pittaway, et al., 2015; Williams-Middleton et al., 2019). Higher levels of perceived educational experience can thus be expected to fuel feelings of increased self-value and capability to undertake and support entrepreneurship in subsequent careers (Alsos et al., 2023), and the improved self-confidence may further encourage the sharing of experiential skills and insights with others who may seek their assistance (El-Awad et al., 2022).

In addition, entrepreneurship graduates with higher perceived educational experience may also identify with other members of the university ecosystem via social systems of exchange (Johannisson, 1987; Scheidgen, 2021). Since entrepreneurship graduates have actionable knowledge about resources available through social networks in the university ecosystem (El-Awad et al., 2022), they are also likely to actively connect with different stakeholders in the university’s ecosystem when they identify themselves with other members of the university ecosystem (Baroncelli et al., 2022; Zozimo et al., 2017). Based on the above, it seems fair to argue that the perceived educational experience motivates graduates to engage in undertaking roles as providers and connectors in the university ecosystem. Based on the above reasoning, we formulate the following hypotheses:

H3a: Higher perceived educational experience is associated with higher engagement as an *ecosystem provider*.

H3b: Higher perceived educational experience is associated with higher engagement as an *ecosystem connector*.

2.4 The affective driver—entrepreneurial passion

The affective driver of alumni engagement The affective driver relates to the strong psychological emotions that entrepreneurs may show in the process of starting a venture. One of the most critical assets for entrepreneurship graduates who pursue an entrepreneurial career is the feeling of intense commitment and deep care for inventing, founding or developing a new business, commonly referred to as entrepreneurial passion (Cardon et al., 2009, 2013). A growing body of research acknowledges entrepreneurial passion as a key learning outcome in entrepreneurship education (Fellnhöfer, 2017; Neergård et al., 2022). The experiential learning techniques commonly applied in VCPs trigger affective and motivational outcomes that may promote consciously accessible intense positive feelings associated with the engagement in entrepreneurial activities. As a result, education may cultivate higher levels of entrepreneurial passion (Kayes, 2002; Mandel & Noyes, 2016; Politis et al., 2019).

Graduates from entrepreneurship education with higher entrepreneurial passion can be expected to engage as providers and connectors in the ecosystems of entrepreneurial universities. For example, studies suggest that alumni who engage in venture creation, a strong indicator of entrepreneurial passion, often maintain relationships with their home university throughout their entrepreneurial careers (Berggren, 2017; Matlay, 2009; Meyer et al., 2020). Entrepreneurship graduates with a high passion for entrepreneurship may, in this respect, cultivate their strong emotions towards entrepreneurship by helping peers access networks of potential customers, distributors and investors (Meyer et al., 2020; Perren, 2003); providing specialist business knowledge (Crisp & Cruz, 2009; Nabi et al., 2021); and serving as mentors to prospective entrepreneurs (Hägg & Politis, 2017). Based on these arguments, we outline our two final hypotheses:

H4a: Higher entrepreneurial passion among alumni is associated with higher engagement as an *ecosystem provider*.

H4b: Higher entrepreneurial passion among alumni is associated with higher engagement as an *ecosystem connector*.

3 Method

3.1 Research design and empirical setting

To test our hypotheses in this study, we conducted a quantitative study of entrepreneurship graduates from three master's programmes in entrepreneurship at three of the major universities in Scandinavia. The three programmes are venture creation programmes (VCP), for which the pedagogical approach is described in extant literature (Haneberg et al., 2022). A core characteristic of VCPs is that a full academic curriculum is integrated with new venture incubation (Ollila & Williams-Middleton, 2011) where the VCP makes use of an extended group of stakeholders—including alumni—to offer both academic contents and incubation services (Lackéus & Williams Middleton, 2015). In this vein, the VCP context offers a well-defined environment where alumni engagement in the entrepreneurial university ecosystem is central and can be assessed systematically.

VCPs exist in many forms (Smith et al., 2022), and since VCPs are integrated with their regional environment (Lackéus & Williams Middleton, 2015), the geographic and sociocultural context is influential and important to consider methodologically for this study. Therefore, three VCPs at major universities in Norway and Sweden were chosen as the empirical context for this study. The three VCPs are similar with respect to their geographic and sociocultural context; have been in operation since 1997, 2003 and 2007, respectively; and admit students from a diverse set of backgrounds, such as engineering, business, social sciences and medicine. While several VCPs have been established in more recent years, the longer history of the three selected VCPs makes analysis on extensive alumni data possible, which is an important selection criterion for this paper.

Graduates from the VCPs either continue working as entrepreneurs or take on other types of entrepreneurial and intrapreneurial roles in society (Alsos et al., 2023). Alumni from the three VCPs are thereafter continuously invited as guest lecturers, panellists, advisors and mentors in the respective programmes. The VCP students are encouraged by faculty to contact alumni to receive business advice for their venture projects. Moreover, the VCPs active support alumni associations that maintain frequent interaction between the alumni. Likewise, the VCP students

experience how the alumni are important contributors to their learning and ventures, thus fostering students' subsequent alumni engagement post-graduation. Hence, the large extent of alumni interaction in the university ecosystem is also an important selection criterion for this paper.

3.2 Sample and data collection

In late 2018, we collected survey data through administering an online questionnaire to 1109 alumni of the three VCPs. After four reminders, we received a total of 555 responses corresponding to a 50% overall response rate. For this study, we excluded non-complete responses from 62 graduates thus leading to a final sample of 493 graduates for our analysis. Demographics of the final sample show that alumni were most often in their mid to late twenties when graduating from the VCPs, and about 46% have started one or more businesses after graduation, whereas 19% have started two or more businesses. Like entrepreneurship in general, there is a gender bias among the VCP alumni representing 29.5% females. However, the gender bias has been reduced in the more recent VCP cohorts. Details about the sample and respondents are presented in Table 1 below.

3.3 Measures

3.3.1 Dependent variables

Based on previous literature and research on entrepreneurial university ecosystems (e.g. Breznitz et al., 2019; Meyer et al., 2020; Wright et al., 2017), we utilise two dependent variables corresponding to functional roles associated with alumni engagement: *ecosystem provider* and *ecosystem connector*. Both dependent variables are generated from answers to the following question: 'Please indicate to what extent you are engaged with [the name of the entrepreneurship education programme]?' using the following five items (a) 'As a guest lecturer', (b) 'As a mentor', (c) 'By showcasing my company for the students as a live case', (d) 'As a network connection to potential customers' and (e) 'As a network connection to potential investors'. Each item was measured on a 4-point scale with the options '1. Never', '2. Once', '3. Several times' and '4. On a regular basis'. The variable ecosystem provider is generated as the average

Table 1 Sample and respondents from the three VCPs

	VCP 1	VCP 2	VCP 3	All VCPs
<i>Year of the first cohort</i>	2007	1997	2003	–
<i>No. of graduates</i>	339	505	265	1109
<i>No. of female graduates (%)</i>	100 (29.5%)	155 (30.7%)	73 (27.5%)	328 (29.5%)
<i>No. of responses (%)</i>	141 (41.6%)	240 (47.5%)	174 (65.7%)	555 (50%)
<i>No. of female respondents (%)</i>	39 (27.7%)	53 (22.1%)	53 (30.5%)	145 (26.1%)
<i>No. of responses—final sample (%)</i>	141 (41.6%)	195 (38.6%)	157 (59.2%)	493 (44.5%)
<i>No. of female respondents—final sample (%)</i>	39 (27.7%)	52 (30.3%)	48 (30.6%)	139 (28.2%)

of three items: (a) to (c) and with a Chronbach's alpha of 0.68. The variable ecosystem connector is generated as the average of two items (d) and (e) and with a Chronbach's alpha of 0.83.

3.3.2 Independent variables and controls

Importance of peers was developed based on previous research on the importance of peers for entrepreneurial practice and learning (Falck et al., 2012; Meyer et al., 2020). To measure this variable, we asked the respondents 'Please indicate to what extent the following contacts are important for your professional career' using two items: (a) 'Graduates from your class' and (b) 'Graduates from different years'. Each item was measured using a 5-point Likert scale ranging from 1 = not important to 5 = very important. The variable was generated using the average of the two items (a) and (b), and with a Chronbach's alpha of 0.67.

Importance of professionals was developed based on previous research pinpointing how professional actors in and around entrepreneurial universities are important for entrepreneurial practice and learning (Ozgen & Baron, 2007; Rigg & O'Dwyer, 2012; Sullivan, 2000). The variable was measured by asking the respondents 'Please indicate to what extent the following contacts are important for your professional career' using three items: (a) 'Faculty, including professors, lecturers and administrative staff'; (b) 'Mentors' and (c) 'Other individuals related to support organisations (listing examples of such organisations at the university in question)'. Each item was measured using a 5-point Likert

scale ranging from 1 = not important to 5 = very important. The variable was generated using the average of the items (a) to (c), and with a Chronbach's alpha of 0.89.

Start-up after graduation is a dichotomous variable that is given a value of 1 if the respondent has started a least one new business as a founder/co-founder after graduation, and a value of 0 if the respondent has not started up any new businesses post-graduation (e.g. Eesley & Lee, 2021).

Educational experience was developed based on conceptual and empirical works in the field of entrepreneurship education and educational literature focusing on learning outcomes associated with entrepreneurship education and practice (DeTienne & Chandler, 2004; Jones et al., 2017; Martin et al., 2013; Mwasalwiba, 2010; Sarasvathy, 2001). The variable was measured by using 14 items along three dimensions: (1) knowledge and skills related to the entrepreneurial process, (2) judgmental ability and decision-making related to entrepreneurial action and (3) social skills and networking abilities. The first dimension includes six items covering general skills related to the entrepreneurial process such as opportunity recognition, business modelling, marketing and financing. The second dimension includes three items covering judgment abilities in entrepreneurship, such as opportunity evaluation and decision-making under uncertainty. The third dimension includes five items capturing interpersonal skills such as communication and promotion of a product/service and collaboration in venture teams. The 14 items were combined into one multi-item scale with a Chronbach's alpha of 0.90.

Entrepreneurial passion was measured using the 13-item scale developed and validated by Cardon et al. (2013) consisting of three multi-item subscales, each of which measures one of the three domains of entrepreneurial passion: (1) passion for inventing, 5 items; (2) passion for founding, 4 items; and (3) passion for developing, 4 items. Each subscale measures two dimensions: (a) positive intense feelings towards tasks and entrepreneurial activities associated with one of the three entrepreneurial domains (3–4 items), and (b) the identity centrality of the role (1 item). The 13 items were rated using a 7-point Likert scale ranging from 1 = strongly disagree to 7 = strongly agree. All composite measures had acceptable internal consistency, with Chronbach's alphas of 0.84 for inventing, 0.85 for founding and 0.78 for developing. For this study, we followed the suggestions by Cardon et al. (2013) by treating passion as a multiplicative interaction between intense positive feelings towards a certain type of entrepreneurial activity and the identity centrality of the entrepreneur thus obtaining a weighted score for each passion domain by averaging the feelings items into a composite measure and then multiplying it by the identity centrality item. Next, to calculate the overall score for entrepreneurial passion, we followed Türk et al. (2020) and averaged the scores of each passion domain into a final construct for entrepreneurial passion.

We included two control variables. First, we control for the *gender* of the respondents as extensive literature emphasises entrepreneurship to be a male-dominated activity (Elam et al., 2021) where males also are more likely to be invited to contexts

which open up for alumni engagement (Hägg et al., 2023). Gender was measured as a dichotomous variable, indicating if the respondent was a man (= 1) or a women (= 0). Second, we control for how long the respondent has been an alumni as we assume it influences the opportunity to be connected to the university ecosystem (El-Awad et al., 2022). The variable was measured as the *number of years since graduation* (as of 2018).

3.4 Data analysis

The questionnaire responses were imported to STATA/MP version 16.1 for statistical analysis. We conducted ordinary least-squares linear (OLS) regression analyses in two steps for each of the two dependent variables. The first step included only the control variables while the second step included all independent and control variables. Before running our analyses, we carefully checked our dataset for potential problems of multicollinearity by examining the correlation matrix in Table 2 as well as the variance inflation factors (VIF) for each explanatory variable in the regression analyses. As can be seen in Table 1, all correlation are less than $r=0.70$, which is the standard threshold used to determine high correlation (Nunally, 1978). Moreover, all explanatory variables in the regression analyses show VIF factors below the thresholds levels suggested by Hair et al. (1998). This leads us to conclude that there were no problems of multicollinearity in our data.

Table 2 Pairwise correlations and descriptive statistics

Variables	1	2	3	4	5	6	7	8	9	Min	Max	Means	Std.dev
1 Ecosystem provider	1.00									1	4	1.39	.61
2 Ecosystem connector	.51**	1.00								1	4	1.41	.75
3 Importance of peers	.14**	.12**	1.00							1	5	3.19	1.14
4 Importance of professionals	.07	-.03	.43**	1.00						1	5	3.26	1.38
5 Startup after graduation	.19**	.09*	-.06	.11*	1.00					0	1	.46	.50
6 Educational experience	.09	.04	.20**	.24**	.02	1.00				1.86	7	5.31	.87
7 Entrepreneurial passion	.16**	.15**	.17**	.11*	.33**	.22**	1.00			11.67	163.33	109.42	31.26
8 Years since graduation	.16**	-.00	.03	.22**	.19**	.03	-.00	1.00		0	21	5.82	4.58
9 Gender	.16**	.12**	-.06	-.02	.20**	-.06	.17*	.22*	1.00	0	1	.72	.45

* $p < .05$, ** $p < .01$

3.5 Non-response analysis

Although the survey response rate of this study was relatively high (50%), there is always a risk of response bias in the sample. A non-response analysis was performed to assess whether the results from the sample can be generalised to the total population of 1109 VCP alumni who were given the opportunity to respond to the survey. We conducted chi-square tests with regard to graduation year and gender. We found a significant bias ($p < 0.000$) in the sample with respect to graduation year showing a higher number of responses among graduates from three graduation years (2015–2017). This is not surprising, as alumni who graduated in more recent years can be expected to have stronger connection to the study programme and thus be more likely to respond to the survey. Apart from this, no major statistically significant response bias was detected with regards to gender in the final sample.

4 Empirical results

Table 2 below presents pairwise correlations between the variables and descriptive statistics. There is a strong correlation ($b = 0.51$, $p < 0.01$) between the two types of alumni engagement: ecosystem provider and ecosystem connector. Gender is correlated with both types of alumni engagement and with

years since graduation, indicating that the gender balance in the three VCPs has changed during their years in operation. Entrepreneurial passion is also correlated with both types of alumni engagement. Furthermore, we find that educational experience is correlated ($b > 0.20$, $p < 0.01$) with both the importance of peers and professionals. However, we find that only importance of peers is correlated with the two types of alumni engagement, while importance of professionals is correlated with years since graduation. Also, importance of peers and importance of professionals are correlated with each other ($b = 0.43$, $p < 0.01$). Finally, not surprisingly, we find that start-up activity after graduation is correlated with alumni engagement, entrepreneurial passion and educational experience, since graduates who have been active in entrepreneurship post-graduation also contribute in the ecosystem, they have passion for it and they are satisfied with their entrepreneurship education. Also, we find that start-up after graduation is correlated with male gender, and intuitively, that the likelihood of starting up after graduation increases with the number of years after graduation.

4.1 Multivariate results

The results from the statistical analysis using linear regression are presented in Table 3 below.

Our findings show that perceived importance of peers is important for alumni's engagement with the

Table 3 Results from multivariate regression analysis

Step	Variables	Ecosystem provider					Ecosystem connector				
		β	R^2	ΔR^2	F (sign)	VIF	β	R^2	ΔR^2	F (sign)	VIF
1	Control										
	Years since graduation	.12*				1.05	-.03				1.05
	Gender	.14**	.04	-	9.41**	1.05	.13**	.02	-	3.80*	1.05
2	Control										
	Years since graduation	.11*				1.15	-.01				1.16
	Gender	.11*				1.11	.11*				1.10
	Independent										
	Importance of peers	.17**				1.28	.18**				1.28
	Importance of professionals	-.07				1.35	-.12*				1.36
	Start-up after graduation	.13*				1.26	.06				1.26
	Educational experience	.04				1.13	.01				1.38
Entrepreneurial passion	.08	.10	.06	6.80**	1.25	.12*	.07	.05	4.50**	1.26	

The table reports β (partial standardised coefficients), R^2 , ΔR^2 , F (sign), VIF and significance level * $p < .05$, ** $p < .01$

entrepreneurial ecosystem, both when it comes to their roles as a resource *provider* ($\beta=0.17$) and as a network *connector* ($\beta=0.18$). The importance of peers shows a strong and highly significant impact on both types of alumni engagement ($p<0.01$). These findings highlight that graduates who value peers from the programme as important contacts for their professional career are significantly more likely to engage with the ecosystems surrounding their entrepreneurial universities. The importance of interpersonal relationships developed between peers seems to persist over time and thus encourages alumni to nurture valuable relationships by connecting back to the entrepreneurial universities. This by engaging as guest lecturers, mentors or showcasing their companies to students, in acting as *providers*—but also by bridging contacts between ecosystem actors and new students, thus serving as *connectors*. Hence, the study programme seems to create a sense of ‘we’ that remains long after the studies have ended. However, the perceived importance of professionals related to the programme such as faculty, mentors and actors working in support organisations did not have any significant impact on their roles as providers. Interestingly, the results indicate that perceived importance of professionals related to the programme seems to negatively affect alumni’s ecosystem engagement when it comes to their roles as connectors ($\beta=-0.12$, $p<0.05$).

Moreover, entrepreneurial passion seems to be an important driver when it comes to the connector role ($\beta=0.12$, $p<0.05$) and having a start-up post-graduation is significantly important for acting as an ecosystem provider ($\beta=0.13$, $p<0.05$). Contrary, passion as an affective dimension’s effect on alumni engagement through acting as an ecosystem provider shows no significant effect. The same is true for the behavioural driver through start-up activity, and its effect on alumni acting as a network connector, as well as the effect of the cognitive driver, through educational experience on both types of alumni engagement. These latter non-significant findings mean that perceived educational experience does not have any significant impact on graduates’ tendency to become engaged as alumni in the entrepreneurial university ecosystem. Neither can we draw inferences about alumni’s start-up activities and the following impact on acting as a connector, or graduates’ entrepreneurial

passion and their subsequent engagement in acting as an ecosystem provider.

As control variables, gender showed a significant effect on both types of alumni engagement, implying that males in general are more likely to engage as alumni in the entrepreneurial university ecosystem. Noticeably, number of years since graduation was significantly important for acting as a provider while it impacted negatively, although not significantly, on the connector-function. Hence, it seems that some informal relationships in the entrepreneurial university ecosystem seem to have an expiration date. Table 4 below summarises whether the results support the hypotheses or not.

5 Discussion

In this study, we undertake an investigation into the factors that motivate graduates of entrepreneurship programmes to actively participate as alumni within the entrepreneurial university ecosystem. The insights derived from our research offer valuable contributions to re-view the significance of entrepreneurship graduates as co-creators of the resources and competencies that constitute and invigorate the entrepreneurial university. Rooted in a stakeholder theory perspective, we develop and assess a comprehensive framework that delineates the social, behavioural, cognitive and affective drivers influencing alumni engagement among entrepreneurship graduates. Below, we discuss the implications of our findings.

Our theoretical framework elucidates two pivotal functions of alumni engagement that fortify and invigorate the entrepreneurial university. Accordingly, the findings underscore the significance of the behavioural driver in fostering the providing function, wherein alumni contribute as valuable resources for current students through roles such as guest lecturers, mentors or showcasing their start-ups. Moreover, our results affirm the trend observed in previous studies, indicating that entrepreneurs tend to contribute back to their alma mater (e.g. Ollila & Williams-Middleton, 2011; Lackéus & Williams Middleton, 2015), thus enriching the university with valuable resources about entrepreneurship and innovation (Acs & Braunerhjelm, 2005; Matlay, 2009).

Furthermore, our study suggests that graduates actively involved in start-up endeavours tend to

Table 4 Results for each of the hypotheses

Hypotheses—key drivers of alumni engagement	β -values, significance levels	Finding
Social driver		
H1a Higher perceived importance of peers is associated with higher engagement as an <i>ecosystem provider</i>	0.17**	Supported
H1b Higher perceived importance of peers is associated with higher engagement as an <i>ecosystem connector</i>	0.18**	Supported
H1c Higher perceived importance of professionals is associated with higher engagement as an <i>ecosystem provider</i>	-0.07	Not supported
H1d Higher perceived importance of professionals is associated with higher engagement as an <i>ecosystem connector</i>	-0.12*	Not supported, but significant
Behavioural driver		
H2a Involvement in start-up activity after graduation is associated with higher engagement as an <i>ecosystem provider</i>	0.13*	Supported
H2b Involvement in start-up activity after graduation is associated with higher engagement as an <i>ecosystem connector</i>	0.06	Not supported
Cognitive driver		
H3a Higher perceived educational experience is associated with higher engagement as an <i>ecosystem provider</i>	0.04	Not supported
H3b Higher perceived educational experience is associated with higher engagement as an <i>ecosystem connector</i>	0.01	Not supported
Affective driver		
H4a Higher entrepreneurial passion among alumni is associated with higher engagement as an <i>ecosystem provider</i>	0.08	Not supported
H4b Higher entrepreneurial passion among alumni is associated with higher engagement as an <i>ecosystem connector</i>	0.12*	Supported

The table reports significance level * $p < 0.05$ and ** $p < 0.01$

develop experiential skills and entrepreneurial competencies that render them highly effective as mentors, coaches, role models or guest lecturers (e.g. Colombo & Piva, 2020; Wright et al., 2017). Additionally, our findings complement prior research by revealing that having a start-up is not the sole determinant of acting as a connector. While social networks may be an outcome of entrepreneurial activity (Engel et al., 2017; Kerr & Coviello, 2019), the possession of networks appears to be a resource more driven by factors other than entrepreneurial engagement. El-Awad et al. (2022) also contend in their study that graduates involved in start-up activities are more inclined towards instrumental alumni engagement, linked to proximity and compatible resources. In contrast, emotional alumni engagement is associated with social conventions. However, they acknowledge the need for further

investigation regarding how the behavioural driver influences different forms of alumni engagement.

Additionally, our findings demonstrate that entrepreneurial passion positively influences the connecting function, where alumni play an integral role as insiders in regional networks that actively foster and sustain new ventures by linking students to valuable stakeholders. Conversely, higher perceived importance of professionals has a negative impact on the connecting function. These results suggest that alumni who rely less on contacts from professionals within the university's ecosystem perceive a disparity between their career and venture aspirations and the local resources and capabilities offered by the ecosystem. The observation that entrepreneurial passion positively influences acting as a connector aligns with the hypothesis that different drivers underpin engaging as a connector compared to a provider.

This outcome underscores that drivers for engaging as a connector appear to be more intertwined with social and emotional aspects than solely resource compatibility.

The perceived importance of peers is a pivotal factor driving providing and connecting alumni engagement functions. Our findings underscore the critical role of the social aspect in fostering alumni engagement. This observation contributes to the existing literature on entrepreneurial universities, emphasising the significance of social networks (Brush et al., 2001) and entrepreneurial communities (Brush, 2014; Wright et al., 2017) in promoting entrepreneurship and maximising the contributions of entrepreneurial universities. While social networks and entrepreneurial communities encompass social aspects, their roles as resource providers have been primarily emphasised and developed. In contrast, nurturing the importance of peers carries an even more profound social element by creating a sense of cohesion among students, alumni and between the two groups.

Moreover, the study highlights the centrality of entrepreneurship pursued through venture creation activity (Lackéus & Williams Middleton, 2015) as the primary focal point for students and alumni alike. Student ventures within Venture Creation Programs (VCPs) serve as the ‘reasons to engage’, as alumni actively support the ongoing ventures within the VCP. Therefore, real ventures offer unique opportunities for alumni engagement that may not be as feasible in the context of limited-time entrepreneurial projects, despite both options serving as effective learning vehicles. A crucial step in expanding alumni engagement within an entrepreneurial university involves prioritising study programmes and courses incorporating real ventures. While the sense of solidarity and the perceived importance of peers can be fostered across various study programmes, future research should identify the specific ‘reasons to engage’ in those programmes.

Regarding the reevaluation of the entrepreneurial university for a more comprehensive understanding of alumni engagement’s role and impact, we advocate studying the engagement of both students and alumni to enhance the contributions of entrepreneurial universities. Prior entrepreneurial university literature has largely overlooked students’ involvement and engagement, primarily viewing them as potential resources for commercialisation (Lahikainen

et al., 2021). By considering alumni involvement and engagement, the entrepreneurial university literature will encompass an often-neglected stakeholder within the entrepreneurial university ecosystem.

Including alumni engagement alters the perspective on entrepreneurs by recognising them as an integral part of the entrepreneurial university, facilitating the development of industry-related skills through experience sharing and networking with current students. An effective entrepreneurial university education should prepare and promote alumni engagement, encouraging boundary-spanning activities (cf. Klofsten et al., 2019) with the surrounding ecosystem. In this context, we recommend future studies focus on how entrepreneurship education and university managers can better prepare students to become engaged alumni, highlighting the significance of peers and real ventures.

This acknowledgement presents opportunities for alumni to expand and intensify their search efforts beyond the local ecosystem. They connect the university with relevant networks, fostering knowledge spillovers and facilitating idea transmission among ecosystem stakeholders (Acs et al., 2013). Expanding search efforts may also motivate alumni to further engage as ecosystem connectors, providing students with valuable network connections to access specific resources and capabilities not readily available within the ecosystem. Consequently, the role and impact of alumni engagement as connectors fulfil a crucial complementary function to the viability of the entrepreneurial university’s ecosystem.

University leaders and entrepreneurship educators should focus on targeting, recruiting, nurturing and facilitating alumni groups most inclined to engage with the entrepreneurial university. The study identifies a specific group of alumni characterised by their establishment of valuable relationships with peers. These alumni are more likely to connect back to the entrepreneurial university by acting as brokers of contacts between new students and potential customers, collaborators and investors. Additionally, their strong relationships with peers make them ideal candidates to serve as guest lecturers, engage in mentorship with new students and utilise their start-ups as live cases for current students’ learning experiences.

For university managers directly interacting with entrepreneurship alumni, it is essential to increase awareness among this group about their instrumental

role in constructing and sustaining the entrepreneurial education ecosystem surrounding the university. Acknowledging the altruistic motives of paying it forward, the university should commend the efforts of the alumni in helping current Venture Creation Program (VCP) students. Such recognition can inspire the alumni to continue their efforts in supporting and guiding current VCP students.

While the study provides valuable insights, certain limitations must be acknowledged regarding its replicability. The data was collected from three different VCPs, all situated in Scandinavia, where the entrepreneurial ecosystems are shaped by Nordic norms and values, potentially influencing the findings. The three VCPs in the study exhibit certain differences, but the results suggest that aspects such as start-ups and the VCP culture of community contribution and the sense of ‘we’ are particularly critical dimensions for replicating similar outcomes in how entrepreneurship alumni contribute to entrepreneurial universities in other contexts.

In conclusion, this study’s implications offer guidance to entrepreneurial universities and managers on effectively engaging with alumni, harnessing their potential to enrich the entrepreneurial education ecosystem and create a more cohesive and thriving environment for current students. Nonetheless, the study also acknowledges the contextual considerations that may influence the findings’ applicability in diverse settings beyond the examined Scandinavian entrepreneurial ecosystems.

This study proposes several implications for practice. As implications for entrepreneurial universities, our study suggests university leaders and entrepreneurship educators can target, recruit, nurture and facilitate groups of alumni most likely to engage with the entrepreneurial university. In this study, we identify this group to be those who have established what they see as valuable relationships with peers and, therefore, would like to connect back to the entrepreneurial university by serving as a brokerage of contacts between new students and potential customers, collaborators and investors. In addition, these alumni’s relationships with their peers make them more likely to act as guest lecturers, engage in mentorship with new students and use their start-ups as live cases from which current students can learn.

Finally, as implications for entrepreneurial university managers in direct contact with entrepreneurship alumni, it is suggested that this student group is made

more aware of their contributing role in building and maintaining the entrepreneurial education ecosystem around the university. As even the altruistic motive of paying it forward has been linked to egoistic values in feeling good about helping others, the alumni group should be commended for their efforts by the entrepreneurial university, thus being able to inspire them a continued effort to help current VCP students.

We acknowledge some limitations related to potential replicability of the study. Even though the data is collected from three different VCPs, they are all located in Scandinavia, where the entrepreneurial ecosystems are embedded in Nordic norms and values regarding how alumni support universities which could have influenced the findings. The three VCPs in this study are not entirely similar to each other. Still, from the results, it seems that, in particular, the start-up culture within the VCPs (cf. Haneberg & Aadland, 2020) are critical dimensions of the programmes to replicate the same results regarding how entrepreneurship alumni contribute to the entrepreneurial university in other contexts.

6 Conclusion

There is a growing societal interest in the university’s enhanced relevance to technology transfer, firm formation and regional renewal. In this study, we focus on what encourages graduates from entrepreneurship programmes to engage as alumni in the ecosystem of entrepreneurial universities. Our theorising and findings suggest that alumni engagement is multifaceted—encompassing providing and connecting functions. Furthermore, the analysis identifies social, behavioural and affective drivers of alumni engagement. Overall, our theory and results highlight the value of developing meaningful and longer-lasting alumni relationships with entrepreneurship graduates to strengthen and vitalise the third mission of entrepreneurial universities.

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