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Building innovation capability in SMEs through university-business collaboration

Desarrollando la capacidad de innovación en las PYMEs a través de la colaboración universidad-empresa

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ABSTRACT

Small and medium-sized enterprises (SMEs) often struggle with company innovation, compared to their larger counterparts. A university-business collaboration (UBC) programme in the north of the Netherlands attempts to increase the innovation capabilities of regional SMEs with the support of graduating bachelor students. The 18-months long Hanze Innovation Traineeship Programme (HITP) combines the graduation phase with a consecutive 12-months traineeship, during which students are meant to implement an innovation at the company. We measure the innovation capacity of the participating SMEs at the beginning of the programme and identify strong and weak points within the organisations. We discuss the outcomes of the HITP for SME innovation and further evaluate the programme's suitability on the intended student learning outcomes.

Keywords. innovation, innovation capability, intrapreneurship, education, intrapreneurial skills

RESUMEN

Las pequeñas y medianas empresas (PYMEs) a menudo enfrentan dificultades en cuanto a la innovación empresarial, en comparación con sus contrapartes más grandes. Un programa de colaboración universidad-empresa (CUE) en el norte de los Países Bajos busca aumentar la capacidad de innovación de las PYMEs regionales con el apoyo de estudiantes de grado que están por finalizar sus estudios. El Programa de Prácticas de Innovación Hanze (HITP, por sus siglas en inglés), que dura 18 meses, combina la fase de graduación con 12 meses consecutivos de prácticas, durante los cuales los estudiantes deben implementar una innovación en la empresa. Medimos la capacidad de innovación de las PYMEs participantes al inicio del programa e identificamos puntos fuertes y débiles dentro de las organizaciones. Discutimos los resultados del HITP en cuanto a la innovación en las PYMEs y evaluamos la adecuación del programa respecto a los resultados de aprendizaje previstos para los estudiantes.

Palabras clave. Innovación, capacidad de innovación, intraemprendimiento, educación, habilidades intraemprendedoras

INTRODUCTION

This article introduces a university-business collaboration (UBC) programme at a university of applied sciences in the north of the Netherlands and the programme's impact on innovation capability, at both business operational and university programme responsibility level. The 'Hanze Innovation Traineeship Programme' (HITP) is a pilot programme that aims to explore the effectiveness of this university-business collaboration (UBC) by using a "student-in-the-middle" approach (Starov et al., 2014). The "student-in-the-middle" approach prioritizes students' needs, experiences, and learning styles, emphasizing practical, hands-on learning. It focuses on engaging students in real-world challenges and providing continuous feedback to enhance their learning outcomes. UBCs may form important instruments at Dutch universities of applied sciences because they help to fulfil the requirements of practice oriented learning typical at such institutions. For their final thesis, graduating bachelor students from three different study programmes work on innovation questions together with local SMEs. After completion of the thesis the students continue with a one-year traineeship, with the goal of fostering or implementing the innovation at the company. The design of this UBC contributes to the student learning of actual problems and further emphasizes the importance of innovation for both researcher and practitioner.

At the start of the programme, providing baseline input, university researchers measure the innovation capability within the participating companies using a self-reflective questionnaire – a so-

called ‘Innovation Health Check’ (Enterprise Ireland, 2016). Based on the European Innovation Scoreboard 2022 and the Regional Innovation Scoreboard 2021, the Netherlands as a whole emerges as an innovation leader as a whole. However, the country is subdivided into 12 regions, three of the regions in the north of the Netherlands show different outcomes within the Regional Innovation Scoreboard: while the provinces Drenthe and Friesland are classified as moderate innovators, the province of Groningen is rated a strong innovator (EIS, 2022). The programme includes SMEs active in all three provinces.

In this paper, we first describe the design of the HITP programme. Then, relevant theory and concepts and the Innovation Health Check methodology are introduced, followed by a presentation and analysis of the company interviews conducted using this methodology. The paper concludes with a discussion of how the HITP programme could contribute to the innovation capability of the sampled SMEs and evaluates the programme’s contributions and limitations in this respect. With the student at the interface between university and business, the HITP programme may serve as a framework for future UBC programmes at the university and other institutions.

THE HITP PROGRAMME

The Hanze Innovation Traineeship Programme (HITP) connects ambitious students to small and medium-sized enterprises (SMEs). With a challenging graduation programme and a cohesive traineeship, HITP offers a unique opportunity to successfully innovate SMEs and develop young professionals. Graduating students with an entrepreneurial attitude and knowledge and expertise in the field of organisation, marketing, communication, game design or ICT started with the graduation programme in February 2021 and continued from July 2021 until July 2022 with their traineeship programme.

The innovation traineeship project is an initiative of the Dutch Ministry of Economic Affairs and Climate (EZK), the country’s so-called Top Sectors in Chemistry, Agriculture and Food, and Logistics, the Association of Universities of Applied Sciences (Vereniging Hogescholen) and Central Agency SIA (Regieorgaan SIA). Regieorgaan SIA is responsible to enhance practice oriented research at Dutch universities of applied sciences and co-financed the programme at the Hanze University of Applied Sciences Groningen (HUAS). HITP is an initiative of four research groups at HUAS: International Business; Marketing & Entrepreneurship; New Business & ICT; and User Centred Design.

During the traineeship, the participating SME provides the trainee with a paid annual contract for at least 32 hours per week. Throughout the programme, the student is supervised by the research groups (professorships) of HUAS. As a staff member, the trainee conducts research on innovation or participates in the development or implementation of innovation projects. The supervision from the research groups fosters a closer relationship between HUAS and the SME, which can be crucial for SMEs to gain better access to new knowledge and high-potential talent, both in the short and long term. This collaboration is meant to enable the companies to systematically enhance their innovation capabilities.

Trainees meet monthly at a joint Community of Learners meeting for peer feedback and supervision. Additionally, they are assigned their own instructor from the research groups for individual coaching. During the traineeship period, workshops and masterclasses are organised to develop the trainees' skills. Themes of the workshops and masterclasses focus on the successful development and implementation of innovation, entrepreneurship and personal development, and management skills. Furthermore, other employees from the SMEs are invited, to share knowledge and create more impact. The traineeships take place in the northern part of the Netherlands, at SMEs with fewer than 250 employees and a maximum turnover of 50 million euros. The participating SMEs cover the following sectors: civil engineering (1), software development and

implementation services (1), retail and rent (1), manufacturing (1) and wholesale (4) with in addition repair services (1 of 4), medical specialist advice (1 of 4) and certification (1 of 4).

In summary, the intended benefits of the HITP are aimed at different stakeholders. As SMEs represent the backbone of the Dutch economy, bringing forth their innovation capacity is the first priority. SMEs also gain direct access to graduating students which could help them in their human resources development. Secondly, the graduating students who participate in the programme gain firsthand experience with real business problems and also can practice how to implement the newly gained research insights. Their professional prospects improve also either through new job opportunities directly with the SME or by increasing their employability. Lastly, for the university researchers who guide the students and mentor the SMEs, the programme offers an opportunity to relate theory to practice and vice-versa. This university-business collaboration therefore supports the institution's mission of making regional impact and involving students in this effort.

THEORY AND RELEVANT CONCEPTS

This section introduces the main theoretical concepts, namely Innovation, Innovation Capacity, Intrapreneurship, the role of Innovation Education, and Intrapreneurial Skills. The goal of this section is to show the relationships between these concepts and use these as a foundation for understanding and interpreting the data collected by the instrument and for the discussion section. The focus is on intrapreneurship and innovation capacity in particular since the intention in this educational context is to unlock the innovation capacity of SMEs by fostering the intrapreneurial mind- and skillset of (future) business professionals.

In the Knowledge Economy, the triple-helix model (universities, business, and government) is the main driver for speeding up the development of innovative processes and technological innovation (Mascarenhas et al., 2018; Viktorova et al., 2019). Innovation is one of the key elements for companies to improve their performance and maintain their competitiveness, through better products, services, and ways of working (Mendoza-Silva, 2020). Firms need to organise themselves in such a way that they can manage and create innovation in the long term, the so-called innovation capability (IC) (Mendoza-Silva, 2020). A strong relationship exists between entrepreneurial behaviour by employees (known as intrapreneurship) and innovation (Staub, et al., 2019). Intrapreneurship has been defined by many scholars as a process of renewal and strategic development that allows organisations to develop new ideas and create new products, services, and activities (González-Tejero and Molina, 2022).

It used to be that top management was the driving force behind corporate venturing and other entrepreneurial initiatives (Deprez et al., 2021). Nowadays, intrapreneurial employees are an important factor for starting innovation and therefore the competitive advantage of firms (Blanka, 2018). Organisations need to provide a suitable environment that makes intrapreneurship possible and initialises intrapreneurial activities on the part of employees. Further, organisations should also focus on advancing employees' intrapreneurial skills (Blanka, 2018). Middle-level managers play an important role in connecting the top managements' visions to the intrapreneurial activities executed by employees. It is therefore crucial to recruit middle-level managers that possess intrapreneurial skills and innovative behaviour and adapt training sessions to bring these capabilities to a higher level. Blanka (2018) further concludes that "the reciprocal connection between recognising business opportunities, behaving entrepreneurially and receiving feedback affords an increase in the self-efficacy of employees".

Deprez et al. (2021) researched the development of intrapreneurial self-efficacy through internships. Young graduates will need to have developed intrapreneurial skills in higher education as these skills are vital for good career prospects and future relevance. Based on an exploratory study of the teaching content and methods used in innovation education in business schools, Kars-Unluoglu (2016) observed that innovation teachers know that traditional teaching, such as lectures

and case studies, are by themselves not effective in giving the students the knowledge needed for learning innovation. Chandra and collaborators (2021) further recommended for innovation education programmes to instigate project-based experiential learning programmes with interdisciplinary teams. Finally, the work context at the internship company can influence the start and development of intrapreneurial self-efficacy in students; creating awareness of relevant agency factors – knowledge, autonomy and attitude – is a good starting point for being intrapreneurial (Deprez et al., 2020). Hence, while not explicitly in the constellation of a UBC, literature does confirm that internship environments may foster innovation capacity when meeting certain conditions that can be established in a UBC setup.

Based on a skill profile for intrapreneurs by Hayton and Kelley (2006), and research from Bjornali and Støren (2012) and van Wetten et al. (2020), three intrapreneurial skills are identified: creative skills (being creative and recognising opportunities), brokering skills (accessing and disseminating new knowledge), and championing skills (being convincing to people in the organisation of the potential impact of innovative projects, and facilitating these). While firms are under-utilising intrapreneurial skills, designers of curricula in higher education can try to increase the innovative potential of students by advancing their creativity and their championing, and brokering skills (van Wetten et al., 2020).

The importance of intrapreneurship on innovation capacity is vital for SMEs and their competitiveness (Carrier, 1994). This importance is highlighted and taught in many study programmes where entrepreneurial and intrapreneurial skills and behaviour have gained prominent curriculum relevancy (Cerro-Urcelay, et al. 2024; Sendra-Pons et al. 2022). How innovation and innovation capacity in the SME are measured in this pilot programme is part of the next section.

THE INNOVATION HEALTH CHECK INSTRUMENT (IHC)

The Innovation Health Check instrument (IHC) "looks at how the process operates from the outset, capturing customer needs (stated and un-stated), idea generation, concept development, product/service development up to the commercial realisation stage and all steps in between. The Innovation benchmark will explore how this process is impacted by company culture, business strategy & structure, the company capability & resources and the level of innovative processes that are in place." (Enterprise Ireland, 2016). The tool was developed by Enterprise Ireland, which is the economic development agency of the Irish government. Funded by the European Union as part of the Enterprise Europe Network (EEN), the tool is widely used among European SMEs, that seek support in organisational innovation capacity by EEN. Enterprise Ireland collects data from completed IHCs which is also used for benchmarking purposes. To the best knowledge of the authors, it is the most comprehensive and widely used tool, to measure organisational innovativeness. The IHC consists of six categories of assessment, spread over two sections:

Innovative Business section

Culture: is there a supportive culture in place? Without a supportive culture it is difficult to implement and sustain a proactive innovative approach to company growth.

Understanding the business: is there a clear understanding on all aspects of the business, and how they impact on performance?

Strategy: is there a clear view of how the company/the business will grow, and how to focus its resources to maximise its return?

Innovative Environment section

Structure: is the company structured in an appropriate way to achieve its strategic goals?

Capability & resources: are there sufficient financial resources, the capability to achieve its goals, identify gaps and establish appropriate skills?

Processes: is there a structured innovation process, enabling evaluating outcomes in a timely manner?

All six categories are checked, totalling 52 items, with Likert-scale 1-5 scores, divided into 39 'practice' and 13 'performance' questions. In the Innovative Business section there are 18 'practice' questions and eight 'performance' questions. In the Innovative Environment section there are 21 practice questions and five performance questions. The instrument's key assumptions are: 1) good practice leads to good performance, and 2) holding a good average and balance across all segments is better than being very strong in one or two segments.

EMPIRICAL STUDY

Making use of the IHC, we collected data from eight companies in the north of the Netherlands. Apart from one, all companies can be considered as SMEs, with fewer than 250 employees and turnover below – in a few cases just above - 30 million euros (i.e. well within the benchmark of 50 million). From one non-SME, data was collected from a relatively independent department with a size that would suit the definition of a SME. Each SME was paired with one student who was about to graduate (hence a total of eight students were included in the programme). The 'successful effort' for establishing a lasting 'match' between SME and student served as an additional criterium for participation in the programme for both SME and student.

Overall, the initial innovation capacity of the eight companies is below average when compared to the IHC benchmark data (Enterprise Ireland, 2022; Table 1). Only in IHC category 3 (Strategy) four of the eight companies score ten or more percent-points above average, in all other categories two to four companies out of eight in total score ten or more percent-points below average.

Table 1. SME participants against IHC benchmark

Companies 1-8								Benchmark			IHC
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**weak**	**average**	**strong**	**catg.**
37	60	72	50	67	77	70	83	45	73	97	**1**
68	62	84	48	64	86	58	66	41	71	95	**2**
80	42	77	55	72	85	65	80	36	67	92	**3**
57	43	40	31	64	83	57	74	32	63	92	**4**
68	46	51	46	63	63	57	77	38	68	93	**5**
68	43	42	47	75	87	46	60	34	64	91	**6**

Scores of eight participating SMEs against IHC benchmark data (in percentages; marked with colours at 10 or more percent-point difference from average score; positive difference and negative difference; source: Enterprise Ireland, 2022)

The Innovative Business section (26 items; Cronbach's alpha (α) = .88; mean score (M) = 3.36) contains the scale with the highest average score: Strategy (8 items; α = .76; M = 3.48). Likewise, the other two scales have sufficient inter-item reliability and relatively high average scores: Innovative Culture (8 items; α = .82; M = 3.23) and Understanding the Business (10 items; α = .79; M = 3.35).

The Innovative Environment section (26 items; α = .91; M = 2.82) contains both the weakest scale, Capability & Resources (7 items; α = .50; M = 2.95) as well as the scale with the lowest average score, namely Structure (7 items; α = 82; M = 2.75). The third scale in this section is Processes (12 items; α = .84; M = 2.93), the scale with the highest number of items.

The Performance questions (13 items; α = .75; M = 2.9), on average, score lower than the Practice questions (39 items; α = .92; M = 3.15).

For the key tool assumption that good practice leads to good performance, we found a positive significant correlation (r (6) = .909, p < .01) which does not necessarily imply that the relation is also one of causality. The second tool assumption, that holding a good average and balance in all segments is better than being very strong in one or two segments, cannot be confirmed; the variance in both item- and scale scores is high (item score variation: 1.57 – 4.33; scale score variation: 31 – 87 when expressed in percentage scores).

Strongest aspects

The overall strong aspects of innovation capacity at the eight SMEs are identified by selecting the one item per category with the highest average scores (M) and the smallest spread in answers (SD), namely: openness and attitude to change (item 1.05; M = 3.88; SD = .99), meaning that issues are discussed and solutions found with everyone involved; service innovation (item 2.10; M = 4; SD = .75), meaning that commercial return is maximised with a service offer matched to customer needs; innovation strategy in business plan (item 3.05; M = 4.25; SD = .89), meaning that the business plan recognises and invests in innovation as an important element of the company's strategy; organisation of resources (item 4.03; M = 3; SD = .76), meaning that the organisation is structured with defined staff roles matched to delivering the business model; developed responsibility for small projects (item 5.06; M = 4; SD = .76), meaning that product development systems are flexible which allows fast tracking of small projects when appropriate; and continuous improvement (item 6.06; M = 4.25; SD = .71), meaning that new ways of doing things are regularly evaluated to seek improvement in business outcomes.

Weakest aspects

The overall weak aspects are identified with the same procedure as above, yet, instead of the highest we looked for the lowest average scores per category with relatively limited spread in answers (plus in brackets the number of times the item was identified as 'needs improvement' for one of the eight companies): employee recognition (item 1.08; M = 2.37; SD = 1.06), meaning that a reward system is in place for all employees (2x); capturing customer feedback (item 2.03; M = 2.37; SD = .91), meaning that feedback is actively solicited and used for planned product & service improvement (4x); commitment to ideas generation (item 3.07; M = 2.25; SD = 1.16), meaning that ideas from all sources are recorded and captured for current and future use (4x); intellectual property management (item 4.07; M = 2.14 - the second to lowest average score of all items; SD = 1.57), meaning that the IP policy is rigorously implemented and regularly reviewed (2x); staff innovation skills (item 5.01; M = 2.25; SD = 1.16), meaning that the company harnesses existing staff innovation skills (2x); and idea management system (item 6.10; M = 2.12 - the lowest average score of all items; SD = 1.55), meaning that ideas are evaluated in a structured way (3x).

DISCUSSION

Of the six categories or scales, strategy scores highest, structure scores lowest, yet, arguably, capability & resources presents the weakest aspect (Table 2). For structure one score is missing (N=7, not 8), but more importantly, the spread in scores for structure is the highest (SD = .93) where the spread of the scores for capability & resources is the lowest (SD = .56). Moreover, with 3.86, the maximum score is lowest of all six categories. Then again, some caution is required: capability & resources is the weakest scale (see above).

Table 2. IHC scores per category

Category		N	Min. score	Max. score	Mean	Std.Dev.
1	culture	8	1.88	4.13	3.23	.74
2	understanding	8	2.40	4.30	3.35	.63
3	strategy	8	2.13	4.25	3.48	.73
4	structure	7	1.57	4.14	2.75	.93
5	capability	8	2.29	3.86	2.95	.56
6	process	8	2.08	4.33	2.93	.84

Minimum and maximum score, per scale, plus mean score and standard deviation for all six categories of the IHC, collected at eight participating SMEs.

Another indication that capability & resources appears as the weakest aspect comes from comparing our empirical data with the data of the IHC benchmark database (Enterprise Ireland, 2022; Table 1). The most unfavourable comparison between our eight companies and the benchmark concerns this particular category (only one SME scores above the average score in the benchmark; four considerably below).

Our findings of limited employee empowerment and involvement seem to resonate with the literature, in particular with Blanka (2018), namely that much is expected of 'middle management' when it comes to fostering self-efficacy of employees, yet, compared to other aspects of innovation capability, SMEs are particularly holding back on investments in people, practices and tools when the return on investment is not immediately clear (Table 3). Further, the general lack of allocation of sufficient financial resources in order to establish the appropriate (read innovative) skills, seems to contradict the observation in literature that entrepreneurial, and more so intrapreneurial behaviour, is crucial for renewal and strategic development that allows organisations to develop new ideas and create new products, services and activities (e.g., González-Tejero and Molina, 2022).

Table 3. Innovation capacity of SMEs

strong	weak
openness and attitude to change issues are discussed and solutions found with everyone involved *service innovation* commercial return is maximised with a service offer matched to customer needs *innovation strategy in business plan* the business plan recognises and invests in innovation as an important element of the company's strategy *organisation of resources* the organisation is structured with defined staff roles matched to delivering the business model *developed responsibility for small projects* product development systems are flexible which allows fast tracking of small projects when appropriate *continuous improvement* new ways of doing things are regularly evaluated to seek improvement in business outcomes.	*employee recognition* a reward system is not in place for all employees *capturing customer feedback* feedback is not actively solicited and used for planned product & service improvement *commitment to ideas generation* ideas from all sources are not recorded and captured for current and future use *intellectual property management* the IP policy is not rigorously implemented and regularly reviewed *staff innovation skills* the company does not harness existing staff innovation skills *idea management system* ideas are not evaluated in a structured way

Summary of strong and weak aspects of innovation capacity of SMEs, based on highest and lowest average item score with relatively limited spread in answers, per category, in the IHC.

We tentatively observe that our HITP programme may serve as the suggested project-based experiential learning environment (Chandra et al., 2020), where the work context at the internship company will foster the start and development of intrapreneurial self-efficacy in students (Deprez et al., 2020). Since IB programme graduates typically take up middle-management positions in small or medium sized companies, the required skill level for innovation may become available to SMEs rather through traineeship and recruitment than by internal budget allocation and targeted career development. In line with observations made by Deprez et al. (2020), this puts a responsibility on both companies and universities to further develop university-business cooperation (Blanco-González, et al 2024).

Students who participated through to the traineeship-phase reported that their learning was more effective by witnessing the implementation of theoretical problems in the practical settings. The hands-on experience enhanced their understanding, as they saw abstract concepts applied in the organisation they first researched for and then worked in.

CONCLUSION

Based on the descriptive statistics we observe that the categories 1-3 (section innovative business) scores better than categories 4-6 (section innovative environment); in particular, the highest scale score concerns strategy (category 3) and the lowest scale score concerns structure (category 4). Based on the strong points, we observe a relatively open, service (as product) oriented, targeted and flexibly structured, hands-on authority- and improvement-focused approach. The strength generally comes across as pragmatic, driven by commercial interest and opportunity.

A closer look at the low scores reveals that not structure but capability & resources is the weakest aspect. We observe a limited employee empowerment and involvement, limited customer involvement, as well as limited use of skill development, tools and instruments, for generating, capturing and protecting new ideas. The weakness generally comes across as holding back on investments – in people, practices and tools - when the return on investment is not immediately clear.

RECOMMENDATIONS

Rooted in the strong points we observed, namely that SMEs are pragmatic, predominantly driven by commercial interest and opportunity, yet not all that strong in proactively seeking and supporting intrapreneurial skills at employee level, we recommend in line with Wetten et al. (2020), that education, and business schools in particular, assist SMEs in having (greater) access to innovation capacity by advancing students' signalling, disseminating and convincing skills. If SMEs do not allocate attention and budget for internal facilitation of intrapreneurial skills, then SMEs are best helped with the possibility to recruit graduates who do have the required skills. Yet, (see Blanka, 2018), SMEs would need to avail themselves as 'the suitable environment' for co-developing this.

Hence, during their study programme, which ideally includes a UBC, (business) students develop self-efficacy in identifying opportunities for innovation (Deprez et al., 2020). Moreover, students learn how to broker innovative ideas within the organisation and learn how to lead projects that foster or implement innovative solutions. Anecdotal feedback from both participating SMEs and students confirmed that a hands-on experiential learning environment best supports these objectives.

Based on the evaluations shared at the end of our programme, we further recommend pairing experiential learning with regular opportunities for relevant knowledge input (e.g., masterclasses

and workshops), professional feedback (i.e., treating the student as an employee) and a form of mentoring or 'intervision' (i.e., guided ways of students hearing and learning from each other).

A limitation of this study is the data on innovation capacity. It was collected in the northern part of the Netherlands and the scope therefore lacks geographical representation. There is no industry type or cultural differentiation possible, and the small sample furthermore limits the study's generalisability. Future research might investigate the educational programmes' impact on the learning outcomes, and in particular the intrapreneurial skills of participating students. Pre- and post-innovation measurement may reveal the student's contribution and learning as much as the impact of the programme on certain innovation activities and/or the general innovation capability of the participating SME.

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