



Making the whole university entrepreneurial – decades of legitimacy-building through Chalmers School of Entrepreneurship

Downloaded from: <https://research.chalmers.se>, 2024-04-10 19:26 UTC

Citation for the original published paper (version of record):

Lundqvist, M., Williams Middleton, K. (2024). Making the whole university entrepreneurial – decades of legitimacy-building through Chalmers School of Entrepreneurship. *Technovation*, 132.
<http://dx.doi.org/10.1016/j.technovation.2024.102993>

N.B. When citing this work, cite the original published paper.



Making the whole university entrepreneurial – decades of legitimacy-building through Chalmers School of Entrepreneurship

Mats Lundqvist^{*}, Karen Williams-Middleton

Chalmers University of Technology, Gothenburg, Sweden

ARTICLE INFO

Keywords:

Entrepreneurial university
Entrepreneurial activities
Legitimacy-building
University spinoffs
Intrapreneurial capabilities

ABSTRACT

This article investigates how more than 25 years of combined entrepreneurial activities have not only developed the third mission of an entrepreneurial university but also improved the first and second missions of education and research. The case, Chalmers School of Entrepreneurship, displays how faculty and annual cohorts of student surrogate entrepreneurs taking on university spinoffs, champion pragmatic and moral legitimacy eventually resulting in cognitive legitimacy within the university and beyond. The effects have not only been commercial, making Chalmers University of Technology into a leading European incubation environment, but have also stimulated education and research to become more entrepreneurial. The article introduces an intrapreneurial capability approach to transforming entrepreneurial universities where legitimacy-building over decades around a new entrepreneurial model complements an incrementalist understanding of university development.

1. Introduction

The entrepreneurial university is an elusive concept (Cerver Romero et al., 2021). Decades of discussion have debated if there is one ideal entrepreneurial university to strive towards or whether the concept embraces a variety of idiosyncratic developments (Philpott et al., 2011). Research has made sense of entrepreneurial universities by studying different entrepreneurial activities, such as technology transfer (Good et al., 2019), incubators (McAdam et al., 2016), academic entrepreneurs (Hayter et al., 2018), academic engagement (Perkmann et al., 2013), or entrepreneurial education (Guerrero et al., 2020). However, the specificity of such studies mostly lacks consideration of how activities might combine with one another, such as when technology transfer of university-based research also can constitute action-based entrepreneurship education (Lundqvist, 2014; Rasmussen and Sørheim, 2006). If such combinations over time result in more university-wide improvements, that would offer valuable insights.

The purpose of this article is to demonstrate a way in which combined entrepreneurial activities built up over decades improves all three missions of a university in generalizable ways. Instead of doing or studying entrepreneurial activities in isolation, this article investigates how entrepreneurial activities, carried out by faculty, students and venture creation professionals, contribute to all three missions of a university: education, research and the third mission. Specifically, the

gradual legitimization of entrepreneurial activities is accounted for through a case study spanning more than 25 years of a master-level education built around university spinoffs.

The paper builds on Burgelman's (1983) intrapreneurial perspective on strategy-making through bottom-up corporate entrepreneurship. Such a perspective has been found relevant for entrepreneurial university developments in acknowledging that the "impetus for entrepreneurial activity must originate from the individual as opposed to the institution" (Philpott et al., 2011, pg. 168). Being skeptical to entrepreneurial activity as something managed top-down, an intrapreneurial perspective opens up for developments on a more collegial level, as captured by Clark in his study of how entrepreneurial universities are created: "... groups, large and small – central or departmental – of faculty and administrators (and sometimes students!) can fashion new structures, processes and orientations whereby a university becomes biased towards adaptive change." (Clark, 1998, pg. 4). As indicated in the citation, Clark advocates an incrementalist "muddling through" view (Lindblom, 1959, 1979) of university development. Such a view also resonates with contemporary understandings of intrapreneurial capabilities understood as "the organization's ability to react quickly and innovatively to internal/environmental changes in order to adapt to and shape new environments." (Klofsten et al., 2021, pg. 1). The main question asked in this article then is: how can adaptive intrapreneurial capabilities be achieved in universities, not just locally, such as in entrepreneurial research groups (Etzkowitz, 2003),

^{*} Corresponding author.

E-mail addresses: mats.lundqvist@chalmers.se (M. Lundqvist), karen.williams@chalmers.se (K. Williams-Middleton).

<https://doi.org/10.1016/j.technovation.2024.102993>

Received 15 April 2023; Received in revised form 26 February 2024; Accepted 4 March 2024

Available online 13 March 2024

0166-4972/© 2024 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

but university-wide? We investigate this question through a 25-year longitudinal study of combined entrepreneurial activity development. The study applies a framework of legitimacy-building (Suchman, 1995) demonstrating ways in which entrepreneurial activities over decades can help universities to build intrapreneurial capabilities.

Chalmers University of Technology is one of five cases in Clark's (1998) study on how entrepreneurial universities evolved 1980–1995 (notably, the time period preceding the current study in this article). Clark describes the mid-1990s Chalmers as encompassing recognized entrepreneurial activities (Louis et al., 1989; Klofsten and Jones-Evans, 2000; Philpott et al., 2011), including pursuing large competitive grants, doing contract research, consultancy, university spinoffs, and running technology parks. However, at that time, more commercial activities (labelled “hard” by Philpott et al. (2011)) were expected to occur outside the academic heartland of education and research of Chalmers. Faculty and students starting ventures had to do so outside of their roles as faculty or students, with little if any interface with education and research. Such a perspective on entrepreneurial activities being fragmented is common-ground even today (Wood, 2011; Schmitz et al., 2017).

Although entrepreneurship education has been added to the list of entrepreneurial activities that entrepreneurial universities do (Klofsten et al., 2019), such education is normally not seen as combining with, for instance, technology transfer, incubation, or spinoff activity at the university. The focal case provided here – Chalmers School of Entrepreneurship – was deliberately started in 1997 as both a master-level education as well as a new technology transfer mechanism, connecting student surrogate entrepreneurs with academic inventors when forming university spinoffs. The vision was to add entrepreneurial driving force (with students engaging in learning through entrepreneurship) to early-stage inventions, thereby also increasing incentives for more faculty to engage into new venture creation. The case study accounts for key stages within which the school has continuously helped improve intrapreneurial capabilities, through legitimacy-building.

The article proceeds as follows. The literature review recounts entrepreneurial university research. Previous research mostly studies entrepreneurial activity in isolation, or in relation to one of three universities missions. In a few instances, research has explored entrepreneurial activities in combination contributing to multiple missions. Suchman's (1995) framework for understanding legitimacy is then adapted to be applied to entrepreneurial activities in the context of the three missions of universities. The method section discusses how a 25-year intrinsic and revelatory case study is useful and credible. The case study is depicted in four stages. The discussion and conclusion sections examine the legitimization of entrepreneurial activities within the current case, while carving out generalizable insights about how new intrapreneurial capabilities can be built.

2. Literature review

Forty years of research into entrepreneurial universities has produced understandings that are still recognized as fragmented. Only a few studies identify benefits in entrepreneurial activities integrating with university missions. A legitimacy framework is introduced to help understand how entrepreneurial activities can affect intrapreneurial capabilities, long term.

2.1. Entrepreneurial activities constituting entrepreneurial universities

Many reviews of literature addressing the concept of the entrepreneurial university highlight the importance and role of different entrepreneurial activities (Rothaermel et al., 2007; Guerrero et al., 2016, 2020; Klofsten et al., 2019). One could therefore consider entrepreneurial universities as entities that include an array of entrepreneurial activities, including competitive grants, contract research and consultancy, patenting, licensing and university spinoffs (Louis et al., 1989;

Clark, 1998; Klofsten and Jones-Evans, 2000; Philpott et al., 2011).

However, there are also more holistic definitions of the entrepreneurial university, such as having “the ability to innovate, recognize and create opportunities, work in teams, take risks and respond to challenges, on its own, seek to work out a substantial shift in organizational character so as to arrive at a more promising posture for the future. In other words, is a natural incubator that provides support structures for teachers and students to initiate new ventures: intellectual, commercial and conjoint.” (Guerrero-Cano et al., 2006, pg. 5). This definition captures the adaptive change (Clark, 1998), innovating and teamworking (Kirby, 2003), and venturing aspects (Etzkowitz, 2003) of entrepreneurial universities. A more holistic understanding of entrepreneurial abilities is also captured in practical frameworks, such as HEInnovate (Hofer and Kaffka, 2018), used by university actors and others, to explore the innovative potential of a university. Comprehensive understandings of entrepreneurial universities also emphasize not only formal entrepreneurial activities, as previously depicted, but also informal factors, such as faculty and student attitudes, entrepreneurial culture and reward systems (Kirby et al., 2011; Klofsten et al., 2019). Taken together, these formal and informal factors could be seen as constituting intrapreneurial capabilities (Klofsten et al., 2021).

For the most part, entrepreneurial activities are associated with only one of three university missions, shown as follows, spanning from what Philpott et al. (2011) labels softer into harder (commercial) forms.

1. Competitive grants (Research)
2. Contract research (Research)
3. Faculty consultancy (Research)
4. Entrepreneurship education (Education)
5. Student entrepreneurship and innovation resulting in new firms or other social and environmental innovation (Third mission)
6. Patenting, licensing, incubation and seed investments (done through university technology transfer offices and incubators) (Third mission)
7. University spinoffs, including engaging others (surrogate entrepreneurship) (Third mission)

The first four (softer) entrepreneurial activities affect the mission of research (1–3) or education (4), whereas the latter harder commercial entrepreneurial activities (5–7) naturally occur within a more nascent third mission of economic and societal impact (Compagnucci and Spigarelli, 2020). Five of these activities (1, 2, 3, 6 and 7) have consistently prevailed for more than three decades (Louis et al., 1989; Klofsten and Jones-Evans, 2000; Philpott et al., 2011), whereas two, those specifically addressing students (4 and 5), were identified more recently (Klofsten et al., 2019; Guerrero et al., 2020; Åstebro et al., 2012). Student activities have signified a rethink among scholars, in which students are deemed as more important for economic and societal impact than faculty and faculty inventions (Åstebro et al., 2012; Siegel and Wright, 2015). Such a shift of perspective is reinforced when considering subsequent entrepreneurial careers of graduates, whether as entrepreneurs or intrapreneurs (Alsos et al., 2022). However, this shift of perspective from faculty to students continues to miss out on how all three missions can be affected by entrepreneurial activities, particularly when combined.

Surrogate entrepreneurs (Franklin et al., 2001) have been added to university spinoff activity (7) to include not only externals, such as alumni, but also students as surrogate entrepreneurs (Lundqvist, 2014). The current study specifically explores how student surrogate entrepreneurs contribute to research-based university spinoffs (7), as the main part of their entrepreneurial education (4), while then acting as student entrepreneurs (5) connecting with incubation and seed-investment (6). In doing so, it breaks with the previously stated singular view of entrepreneurial activity and instead investigates how combined entrepreneurial activities can affect all three university missions. Informal entrepreneurial factors, such as faculty and student

attitudes, entrepreneurial culture, and reward systems (Kirby et al., 2011) are then potentially, over time, evolving and constitute new intrapreneurial capabilities (Klofsten et al., 2021) affecting “the rules of the game” (North, 1990).

2.2. Entrepreneurial activities affecting multiple university missions

There are a few studies addressing how entrepreneurial activities in combination can integrate with more than one mission of the university. Faculty often face tensions between the role as a researcher and the role as startup entrepreneur, something which can be made even more challenging through top-down intervention (Philpott et al., 2011). For example, faculty choosing to be academic entrepreneurs may be required to keep parallel but separate work, situated in different spaces, with different repositories of data, etc., in order to adhere to institutional requirements (Bousfiha, 2020). Some universities when engaging surrogate entrepreneurs into university spinoffs, potentially allow faculty to stay more within their research role, rather than having to become lead entrepreneurs (Franklin et al., 2001). However, surrogate entrepreneurs also introduce challenges in building venture teams where technical and commercial expertise can have difficulties to bond (Clarysse and Moray, 2004). Hence, harder entrepreneurial activities (activities 5 through 7), especially through university spinoffs, constitute real challenges in gaining wide faculty acceptance and appreciation (Philpott et al., 2011; Louis et al., 1989).

Embedding entrepreneurial activities within the missions of education and research, generates challenges. Meyer et al. (2011) in studying a technology commercialization program, identified conflicts between learning, freedom of discovery and commercial success. Lack of incentives for researchers acting within a “publish or perish” scientific paradigm to do spinoffs is also a prevalent observation (Ndonzuau et al., 2002; Brown, 1985). Among the top ten highest ranked barriers for universities becoming more entrepreneurial were educational traditions, clashes with educational and research objectives, and the promotion system (Kirby et al., 2011).

Involving students in spinoffs has been found to surmount barriers. A study of academic entrepreneurship in Sweden and the U.S., found that student surrogate entrepreneurs could bridge tensions between research and the running of university spinoffs (Lundqvist and Williams-Middleton, 2013). Hence, having students rather than experienced business professionals as surrogate entrepreneurs, allowed more experimentation, more learning and lowered risks of tensions between academic- and business-culture, as found in other studies (Clarysse and Moray, 2004). A study of Swedish incubated tech ventures, found that student surrogate entrepreneurs from Chalmers School of Entrepreneurship explained why incubated technology ventures at Chalmers performed four times better than the second best performing incubation environment in Sweden, in terms of venture growth (Lundqvist, 2014).

Students situated as entrepreneurs while being in an education can create potential identity conflicts, particularly when entrepreneurial activities are situated as extra-curricular (Nielsen and Gartner, 2017). Students testing the role of ‘entrepreneur’ in parallel with or embedded in university studies are seen to benefit from support in learning how to manage multiple identities, especially when part of designed pedagogy (Raible and Williams-Middleton, 2021). Action-based entrepreneurship education (Rasmussen and Sørheim, 2006) offers learning-through entrepreneurship while also then allowing students to realize and incubate real ventures (Ollila and Williams-Middleton, 2011). Research has argued that not enough attention is placed towards the role that entrepreneurship can have on the university mission of education (Schmitz et al., 2017; Lackeus et al., 2016). While universities can design spaces to support entrepreneurship education and entrepreneurial activities, there is still much to learn about how such spaces may be embedded into university environments, and how they may be designed to serve multiple actors and multiple purposes (Pittaway et al., 2019). Entrepreneurial activities need to be seen as acceptable and appropriate

to university interests if they are to be normalized within the academic heartland. To help understand how entrepreneurial activities can integrate with different missions, a legitimacy framework is introduced.

2.3. Legitimizing processes

Reviewing strategic and institutional approaches to organizational legitimacy, Suchman defines legitimacy as “a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions” (Suchman 1995, pg. 574). Although Suchman does not address legitimacy specifically for universities, others have used his framework for this context (Jain and George, 2007). Suchman’s framework can serve a purpose to investigate how entrepreneurial activities at universities can be legitimized from the perspective of three university missions and will be introduced here.

Legitimacy accounts for the acceptable behavior of a group acting or representing a whole (organization and/or institution) and may be counter to an individual’s perception of behavior, or even in part to collective reservations. Acceptance can be both active as well as passive support. Suchman then specifies three main forms of legitimacy: pragmatic legitimacy, seen as behaviors reflecting the self-interests of the current set of constituents; moral legitimacy, seen as normative behavior that follows ‘the right thing to do’; and cognitive legitimacy, seen as acceptance of behaviors that are coherent and understandable, as well as taken-for-granted in the sense that alternatives are unthinkable.

This framing also accounts for ways in which legitimacy is gained, maintained over time, as well as repaired in instances where legitimacy is questioned or lost (see for example p. 600 in Suchman, 1995). In general, gaining legitimacy is achieved through either conforming to, selecting or manipulating the environment; the last of which being the most difficult to achieve. To conform using different forms of legitimacy means to conform to demands (pragmatic), ideals (moral), or models (cognitive). Gaining legitimacy through selection strategies involves either choosing friendly audiences (pragmatic), or defining goals (moral), or becoming certified (cognitive). Manipulation carries a potentially harsh connotation, but it involves either openly advertising activity (pragmatic), being persuasive through demonstrated success (moral), or persisting through demonstrated and ultimately standardized models as a means of institutionalization (cognitive). Generally, legitimacy is maintained through staying aware of changes while simultaneously protecting accomplishments.

2.4. Legitimacy in relation to entrepreneurial activities

Entrepreneurial universities relate to the different forms of legitimacy. As institutions, we expect universities, and their associated actors to conduct research in a specific manner and to admit and treat students fairly throughout their education. These behaviors have evolved over time and can be considered cognitively and morally legitimate, i.e. taken-for-granted and seen as appropriate. When engaging into commercial entrepreneurial activities, universities are also adhering to more pragmatic legitimacy, ultimately satisfying a specific market demand.

However, there are apparent tensions between different legitimacies. For instance, to grade student learning from entrepreneurial activities exclusively based on market success would for most be seen as unreasonable and inappropriate. Most would say that student examination should be based upon competencies gained, not whether the student succeeds economically or not. This and many other situations where norms of education, research and commercialization might not mix easily, are hence worthy of investigation, especially if there are balances found that are seen as generalizable and thus legitimate over time.

Suchman’s typology is used to frame how entrepreneurial activities can be legitimized within a university context, relative to university missions. Entrepreneurial activities often require pragmatic legitimacy to deal with the liability of newness (Stinchcombe, 1965) experienced

by most ventures before gaining market acceptance. When entrepreneurial activities are embedded in curricular courses and programs, the criteria outlining educational practice and evaluation place emphasis on moral legitimacy. All enlisted students need to experience reasonable paths towards examination and receiving a degree, even when learning is facilitated through uncertain venture creation. Whereas pragmatic and moral legitimacy can be dealt with on a case-by-case basis (what Suchman (1995) calls episodic), by teachers or coaches, over time there would be expectations of continual legitimate practice. For acceptance of more entrepreneurial activities in the academic heartland of education and research, models need to be in place that, over time, generate cognitive legitimacy of actions, such that entrepreneurial activities are assumed as appropriate and taken-for-granted.

3. Method

As indicated, Chalmers exemplifies more than 25 years of combined entrepreneurial activities through Chalmers School of Entrepreneurship. Here, the choice of the current case is motivated as a relatively unique opportunity to better understand how combined entrepreneurial activities can improve all three missions. The context of the case is qualified to enable generalization beyond the specific case study. Finally, the methodological approach of a single case study across more than 25 years of development through a legitimization framework is discussed.

3.1. Research design

The current case – Chalmers School of Entrepreneurship – was selected based on two criteria. Firstly, the chosen case needs to include entrepreneurial activities spanning all three missions of the university. There are multiple studies of academic entrepreneurship spanning research and entrepreneurship. However, such examples are often local and institutional effects on university missions are either not accounted for, or have disparity between local and institutional impact (Grimaldi et al., 2011; Fini et al., 2011).

Instead, the current case was selected from a small population of master-level educations having real venture creation as the prime mechanism for learning: defined as venture creation programs (Lackeus and Williams Middleton, 2015). Such curricular one- or two-year long programs are arguably world-leading in residing advanced entrepreneurial activity within a curricular university-wide structure, far beyond single elective entrepreneurial courses. In the study of these programs, using snowballing technique, 18 venture-creation programs were identified in the world. Of these, only Chalmers School of Entrepreneurship was found to integrate with tech-transfer, incubation and seed-financing, hence constituting an advanced example of integration between the third mission and the mission of education (Lackeus and Williams Middleton, 2015). Added to this, the current case together with at least two other programs also have had integration with research on their curricular entrepreneurial activity (Alsos et al., 2022; Aadland et al., 2024). Chalmers School of Entrepreneurship was thus identified as uniquely integrating with all three missions of the university.

Secondly, the authors of the current study have had privileged access to main decisions made across the longitudinal span of the case. This access includes insight into how decisions were appreciated by all main stakeholders, including students, research faculty at the university, third-mission actors, entrepreneurial ecosystem actors, regional and national government and financing agencies, and faculty from other universities with specific interest in venture creation programs. Access is not only experiential but also extensively (and independent to the authors) documented, allowing for triangulation, exemplified in section 3.3.

Longitudinality is important. Conclusions regarding the more than 25-year case study would be quite different if investigated only at distinct points, or across a more limited time interval. The choice of adopting a longitudinal analysis aligns with the legitimacy framework

selected, as the authors have been positioned to not only recognize episodic instances of legitimacy, but also continual legitimization, in accordance with Suchman (1995). Temporal distinctions enable detection not only of pragmatic and moral legitimacy, but also of legitimacy maintenance (and repair) connecting to cognitive legitimacy within the university and beyond.

The unique nature of the case and the privileged access to data, motivates labelling the case as intrinsic (Stake, 1995). Given that the authors have played major decisive roles in this study since 1996 the method can also be labelled enactive (Johannisson, 2007; Steyaert and Landström, 2011). The main thrust of such a method is to be revelatory (Yin, 2008): describing and analyzing a phenomenon previously inaccessible to scientific investigation, and, when and where possible, making analytic generalizations (Flyvbjerg, 2006). Generalizations are then based upon the case convincingly describing alternative ways of building intrapreneurial capabilities.

3.2. Generalizing from the chosen case

To enable generalization, the case needs to be related to a broader understanding of entrepreneurial universities and the national environments in which they operate. The history of Chalmers as an entrepreneurial university has been described more in depth elsewhere (Clark, 1998; Lundqvist, 2015). Chalmers was founded in 1829 based upon a donation from the Swedish East India company director William Chalmers. It remained private until 1937, when it became a state university with PhD rights. While considered entrepreneurial since its founding (Jacob et al., 2003), Chalmers' modern entrepreneurial history started in the 1960s with electronics professor Torkel Wallmark returning to Sweden after gaining experience from Bell Labs in the United States and then starting to promote academic entrepreneurship through faculty starting their own companies based upon their inventions (McQueen and Wallmark, 1982, 1984). From 1994, as a government initiative, Chalmers, as the only large research university in Sweden, became private while still having the government contractually financing free education for EU citizens as well as parts of its research (labelled fixed funding). From this point, Chalmers could be seen as able to act with significant autonomy regarding how it deals with innovation and entrepreneurship.

Following the enactment of the Bayh-Dole Act in the United States in 1980, most of the world has implemented policies for university ownership of intellectual property (IP). As an exception, Sweden retained a teacher's exemption, allowing faculty to own IP generated from research conducted at the university, if not otherwise agreed upon. Swedish universities to this day do not generally commercialize IP in the form of licensing. Rather the focus, as in the current case, has been on university spin-offs. Chalmers' model of contractually agreeing with faculty to create university spinoffs basically then emulates common practice of universities around the globe: tech-transfer professionals provide innovation advice, incubation, and seed financing, similar to other national contexts. As the case study describes, Chalmers involves faculty and even students in a professional university spinoff process. Given Swedish policy regarding IP ownership, academic inventors then need to voluntarily engage in contractual agreements where they transfer their IP rights to a venture jointly owned with Chalmers, co-founding students and others, which formally is not the case when universities own IP. However, most TTO's having formal IP ownership want academic inventors to be engaged and "on-board", which is the same premise at Chalmers.

3.3. Data collection and verification

The access to vast secondary data, such as curricular developments, course evaluations, university policies, and external reviews, has allowed triangulation, facilitating accuracy and eliminating alternative explanations (Denzin, 2009). For instance, all changes in the curriculum,

including yearly reviews of program design and specific course evaluations are part of university required documentation. Venture creation associated activities such as board meeting protocols from the incubator/seed-investor, and collaboration agreements have also been accessed. Published peer-reviewed research, both external (to the school) (Rasmussen and Sørheim, 2006; Lindholm Dahlstrand and Berggren, 2010; Berggren, 2011; Åstebro et al., 2012) and internal (i.e. academic faculty and doctoral students at the school) (Lundqvist, 2014, 2015; Fogelberg and Lundqvist, 2013; Ollila and Williams-Middleton, 2011; Williams-Middleton, 2010; Williams-Middleton et al., 2021; Jacob et al., 2003) has independently studied aspects of Chalmers School of Entrepreneurship and the Chalmers entrepreneurial ecosystem. The school has undergone two major external evaluations: one by Björnsson and Wahlbin in 2005, unpublished but available on request; and one publicly available (Fayolle et al., 2009). All this secondary data, consulted throughout the case-writing process, has been used to provide grounding and insight.

A longitudinal single-case study approach that illustrates institutional developments is advocated by Clark as follows: “*System analysis misses key aspects of university development, particularly the organic nature of university change. It readily loses its way in the swirling fog of national policy statements and the iron cages of categorical state steering. Institutional studies are better grounded. In short, institutional case studies allow us to identify instructive exemplars of successful university adaptability under a wide range of and cultural conditions in various societies.*” (Clark, 2005, pg. 2). The intrinsic approach of the current study gives access to the organic nature of university change in regards how intrapreneurial capabilities have been developed, not just through incrementalist “muddling through” as suggested by Clark but primarily through continual legitimacy-building.

4. The case: Chalmers school of entrepreneurship

The case of Chalmers School of Entrepreneurship spans more than 25 years (and is on-going). The case is presented in four main stages. Each stage distinguishes new developments and associated stakeholders in order to address how combined entrepreneurial activities are legitimized and help build intrapreneurial capabilities.

4.1. Stage 1: 1996–1998 initiation of a new tech-transfer mechanism, including education, and a team-based student surrogate approach

At its inception, Chalmers School of Entrepreneurship was positioned as a technology transfer mechanism helping to bridge the “Valley of Death” between research and the market. The idea was that many promising invention disclosures remained unrealized due to lack of entrepreneurial drive. Designing a master-level education that allowed students to learn through early-stage venture creation stemming from invention disclosures could increase the amount of university-associated innovation transcending the Valley of Death. Before starting the school, two goals were formulated: to develop future entrepreneurs and to develop new technology ventures. The two faculty founders went to the president of Chalmers with these two objectives and asked for permission to start a school of entrepreneurship as a final year of a master degree, open for all Chalmers engineering programs (structured as half a year of project-based courses and a half year of master thesis work).

Experiential and peer learning were part of the design from the start. Students were required to work in teams and asked to focus their attention and energy on building a venture, together with the inventors of the disclosed invention. Attracting these key stakeholders included a special student recruitment process, involving tests and interviews, and a special recruitment of inventors and their invention disclosures. To attract students, the founding faculty made a brochure that among other things included statements made by leading entrepreneurs and industrialists. To attract inventors (from the academic environment), the founding faculty utilized their networks and connections across the

university, to generate buy-in towards the new education.

The action-based education offered courses covering product development, marketing, financing, teamwork, etc., which linked theories and skill development with the experiential learning embedded in the venture creation process. In addition, extensive and iterative coaching of teams and individual students was provided, along with steering groups for ventures, where faculty and staff met with the student teams and inventors together. The first class of twelve students was organized into four teams and ultimately resulted in three incorporated ventures. Two of these are still active firms: one selling R&D instruments measuring viscoelasticity (Q-Sense) and one using nanoparticles to improve the properties of paint for wooden floors (Arboritec). Importantly, all twelve students were able to produce academic results in assignments and master thesis work, allowing them to graduate with Master of Science degrees.

The second class of 1998 was initiated as a repetition of the first class, given the overall positive experiences gained by everyone from the founding year. However, the new iteration gave some new learning experiences (particularly for the faculty). The bottom-up team- and project-matching process proved more challenging compared to the first year. Although openness and fair play was encouraged, some students gamed the system to secure desired team design, creating resentment with others in the class. Other students, playing fair without admonishing the gaming behavior, ended up taking on team roles they later regretted. Faculty became concerned with these long-lasting negative effects and had to take on more team formation responsibility, thereby breaking with the common view that entrepreneurship should be about self-selection. Finding a new set of promising invention disclosures and committed inventors also proved challenging, resulting in less commercially viable ideas, and some inventors not willing to share ownership rights with hard working students, once the education was completed.

Some of the stated challenges, such as venture team formation, were resolved for future classes, with satisfactory outcome. Since 1999, teams have been appointed by faculty, but based on motivated interests and preferences provided by each student, and with an option for redistribution. Other challenges, such as having a more stringently structured agreement between inventors, students and the school did not happen until 2001. In all, this first phase demonstrated that all students were able to meet educational criteria for graduation, and that student-led university spinoffs were possible to start, based upon invention disclosures that would have otherwise remained ‘stuck’ in the laboratory. Added to this, the school won the newly started award “Entrepreneurship education of the year” in Sweden, with renowned entrepreneurship professor Bengt Johannisson on the jury. IKEA founder Ingvar Kamprad and many other Swedish entrepreneurs also visited the school.

4.2. Stage 2: 1999–2005 becoming transdisciplinary: beyond engineering, adding IP management at the core, and starting an incubator

Near the end of the class of 1999, an informal project group formed, including faculty/staff and volunteering students. The group discussed key issues to be dealt with in the years to come. Firstly, there was a discussion around who should be admitted to the school. The recruitment base being only Chalmers engineering students was considered too narrow. If the education could be three semesters (instead of two), then it could work as a MSc-program to be applied to from all over Sweden, also allowing other backgrounds of students, such as business administration, law, design, life science, etc. Secondly, given a new three semester structure, the education was designed to have one semester of more preparatory courses before students were put into venture teams and connected with an academic inventor. This was assumed to offer the students a smoother adaptation to the radical new pedagogy and context.

The faculty also became more interdisciplinary. Faculty in organizational behavior (OB) helped form the more structured venture team

formation process described above. The OB colleagues vitalized coaching and developed teaching around teamwork. A collaboration was also established with law scholars at the University of Gothenburg, focusing on intellectual property. This collaboration widened the perspective on venture creation. A more engineering-based perspective of making inventions work and finding a user/customer, was now complemented with a more legal perspective focused on securitizing company assets. In 2002 the school embraced this techno-legal core competence through adding a second parallel track focused on intellectual property and capital management in different contexts. The Intellectual Capital Management (ICM) track complemented the original university spinoff-centered venture creation track of the school, by providing a more analytical framing of how intellectual assets may be packaged and used, if to be commercialized.

In 2000, Chalmers seed-investor Chalmersinvest benefitted from a major exit from a venture (Altitud) within fiberoptics in the telecom industry. The exit allowed for new investments into the Chalmers School of Entrepreneurship annual batch of ventures. A new incubator was founded to handle recruitment of inventions, including establishing a standard collaboration agreement for venture formation and subsequent incorporation, should the venture prove viable. The name of the incubator eventually became “Encubator”, capturing both “entrepreneurship education” and “incubator” in its name. It was the first of its kind in Sweden, taking a significant operating role before and during venture incorporation, and thus was also identified under the new term “pre-incubator”.

During this second stage, the school at first benefitted from the emerging IT bubble, which then burst in 2000, causing students and ventures to navigate in a more challenging economic climate. The class of 2001 constituted the main transitional year. The students applied in early 2000, when the IT bubble was peaking, but quickly found themselves in a much tougher environment. However, thanks to the 2001 class being the first class within the new Encubator and being supported by new regional soft loans for startups in 2002, six technology ventures were incorporated, of which four are still operating. Thus, the school, supported by Chalmers and regional investments, could persevere in a period when most private venture initiatives were terminated, and entrepreneurship was out of fashion. This new version of the school was then relatively stable up until 2007, although new dialogues eventually enacted in a third stage (as follows) were initiated already in 2005.

During Stage 2, Chalmers appointed its first vice-president for innovation and utilization (the third mission of the university). School faculty worked closely with this new function helping with policy-writing, doing research (Jacob et al., 2003; Lundqvist and Petrusson, 2002; Petrusson, 2004; Lundqvist, 2004) and participating in national dialogues. This resulted in, among other things, a national program of verification grants for early-stage innovation, and an eight-year long governmental agency program where selected universities, including Chalmers, developed their third missions. Faculty at the school received confirmation from idea partners regarding the benefits of the model, captured in this citation of an academic entrepreneur (and two-time idea partner): *“I am more the type that like to understand different areas possible to be combined into something no one has thought about before. [...] Sometimes there is a solution. Had I only focused on an academic career then that would have been faster. However, now the quality is much higher. [...] The spinoffs have benefited from contact with the university and vice versa.”* (Interview May 13, 2004).

4.3. Stage 3: 2006–2013 focusing on sustainability and gender balance, integrating administrative routines, and becoming a clinical research lab

In 2005, the school received extra funding and initiated a new track, specializing on bioscience-based venture creation. Providing and promoting the bioscience emphasis in entrepreneurship made the education more attractive to female applicants improving the gender balance of the student body. In 2007, the school also followed the university

adaptation towards integration across Europe (called the “Bologna process”), first by becoming an international program (with English as the official language), and then in 2008 shifting to a two-year Master of Science (MSc) format. The shift added an additional semester to the first year of the education, allowing students to take elective courses. The school created a new compulsory elective course: idea evaluation. This course became a testbed for student-researcher collaborations, where students took on an advisory role towards the future potential of research ideas, based on substantiated findings from evaluation tools, while also integrating a societal sustainability perspective. An anthology was written around sustainable business creation, including frameworks by faculty and case studies by alumni from the school (Alänge and Lundqvist, 2014). Adapting to the two-year MSc program format was an important step towards integrating with university-wide administrative routines.

During this stage, one of the main teachers began doctoral studies, having the school context (including the combined entrepreneurial activities) as the key research object. Through the doctoral research, the educational environment of the school also became a ‘clinical lab’. The school had already been the object of external investigation, but the embeddedness of faculty studying the environment allowed for longitudinal studies and triangulation of different factors contributing to a systems perspective. The doctoral studies connected to EU and nationally funded projects addressing research commercialization and entrepreneurial ecosystems. This facilitated connection between theoretical and practitioner perspectives, again reinforcing the school environment acting as a ‘clinical lab’. Research outputs were directed not only towards academic conferences and journals, but also to practitioner-oriented conferences addressing university commercialization, such as Association of University Technology Managers (AUTM). This allowed for qualification of research commercialization not only involving technology transfer officers, but also engaging research faculty and students, working together in venture creation activities.

At this point, the school had championed more than a decade of entrepreneurial activities, while also increasing evaluation and legitimization through research publications and policy work. In 2009, the school was ranked as a top entrepreneurship education by the Swedish government after an international peer-review, and awarded substantial fixed government funding for the following decade (Fayolle et al., 2009). This recognition and new funding stipulated the importance of continued collaboration between technology and law (and thus the partnership with University of Gothenburg), as well as recommendation of increased research productivity, to be qualified through academic channels. From 2009 through 2019, the funding allowed the building of more normalized routines around the education and more relevant PhD training to occur, producing more qualified entrepreneurship educators and researchers.

Aspects of how the school combined entrepreneurial activities and connected to university missions were discussed on policy and practice levels. Examples include university management and regional development discourses at arenas, such as the Triple Helix conference, as well as regional and national events. The investigation of students as surrogate entrepreneurs in a master program, and the novel contributions to entrepreneurship education, entrepreneurial behavior and venture creation research was presented and discussed at entrepreneurship research conferences such as ACERE, BCERC and AOM; and also shared across the academic research community through peer reviewed publications (Williams Middleton, 2010; Donnellon et al., 2014; Lundqvist, 2014; Lackeus, 2016; Lundqvist and Williams-Middleton, 2013; Agogue et al., 2015; Lundqvist et al., 2015).

Encubator underwent various transitions during Stage 3, shifting from primarily Chalmers associated funding towards more external funding from both the region and a national incubator program. Even independent private funding was considered. This caused a Chalmers reaction resulting in a reformed Encubator, in which Chalmers committed to partly fund the annual investment into the school’s ventures.

In 2007, students also took the initiative of a societally oriented class-wide project, traveling to another country to establish a solar powered incubation space for the local community. This social mission-grounded entrepreneurial initiative evolved to different regions and other specific projects, where the students eventually founded a non-profit organization to support these activities. This had the additional effect of the sustainable business development anthology adopted to other programs e.g. Sweden, Norway and Japan (Alänge and Lundqvist, 2014). Throughout Stage 3, the school's entrepreneurial activities moved beyond a focus on sustainable economic development into caring much more also about ecologic and social sustainable development.

4.4. Stage 4: 2014–2022 translating the model to other settings and consolidating the venture creation system (including circularity and deep-tech focus)

In 2014, the vice-president of education at Chalmers initiated what was called the “ENG project” to add more entrepreneurial dimensions into engineering education widely at Chalmers using new formats. This project was largely run from Chalmers School of Entrepreneurship and involved defining what Chalmers meant by entrepreneurial education within the setting of engineering, as well as identifying and enhancing examples of such education. Basically, ENG focused on learning from entrepreneurial experiences. This meant expanding a typical engineering inventive approach into also becoming “value-creative”, asking and answering “for whom is this knowledge valuable and how” (Lackéus, 2016). Such learning through value-creation implied shorter and more flexible formats, allowing deviations from the sophisticated technology transfer mechanism and learning through venture creation embraced at the school. In parallel with the university-side expansion came the creation of a new track at the school. The Corporate Entrepreneurship track followed the same venturing model as the original Technology Venture Creation track, but was situated in a corporate context, where companies reside sponsored student-driven corporate entrepreneurship projects, aimed both at developing new business opportunities, as well as also stimulating corporate renewal.

The faculty and staff at the school were increasingly asked to help develop new formats and content for entrepreneurial education and activity at Chalmers, within European universities, and in countries, such as Japan and Thailand. One such concrete development was helping to formulate Chalmers' new criteria for faculty promotion. Here, third mission merits around innovation and societal interaction could be valued on the level of research and education for e.g. a professorship, if asked for in the position. Since these criteria were enacted by Chalmers 2022, the chair and the deputy chair of the Faculty Appointment Committee, estimate that third mission qualifications have had a decisive importance in 5% of all faculty appointments and promotions, and in 10% of all tenure track assistant professor recruitments. Perhaps more importantly, third mission qualifications and ambitions are now always investigated and discussed by the committee when doing a holistic evaluation of merits around research, education, academic citizenship and third mission.

Four additional PhDs were produced during this stage, all with deep insights into the school pedagogy and how it can be translated into different contexts and formats (Henricson Briggs, 2016; Lackéus, 2016; Nowell, 2021; Hagvall Svensson et al., 2019). In 2020, Chalmers formulated a strategy around entrepreneurial education for the first time. At the core was research and developments from the school, now spread into other formats at Chalmers. The strategy, among other things, had a focus on offering entrepreneurial experiences on different levels, including Chalmers School of Entrepreneurship, positioned as the most advanced and comprehensive level. In 2021, Chalmers created a chaired professorship in “entrepreneurship didactics” situated at the school, and to date one of the first (if not the first) in the world. Also, two of the school's faculty in 2022 received the European Entrepreneurship Educator Award, based upon their work at Chalmers School of

Entrepreneurship, including contributions to entrepreneurial education research, theory and practice.

On the venture creation side, a major transition was initiated in 2014. Representatives from the school, the two Chalmers incubators (including Encubator) and the seed-financier Chalmersinvest discussed increased consolidation and approached the university president. The president responded quickly and initiated developments resulting in a consolidated daughter company – Chalmers Ventures – responsible for all incubation and seed-investments activities under the Chalmers name. Chalmers decided to finance Chalmers Ventures over ten years for a total of more than 40 million Euros (of which one-third was allocated for operations and two-thirds were allocated for equity-investments). What had been Encubator now became one of several incubation processes of Chalmers Ventures. Instead of having a “school incubator”, students at the school now needed to adjust to being one component (called “encubation”) of a larger incubator, which resulted in the school having to re-adjust its relationship. To ensure the maintenance of balances between educational and commercial missions, a framework-agreement was formulated and signed between the school, its home department, Chalmers Ventures and Chalmers vice-president for utilization (third mission). Over some years, the new relationship stabilized in part due to communication emphasizing a ‘one Chalmers’ perspective showing how different parts contribute to an aligned objective. This understanding was also enabled by Chalmers Ventures in 2022 becoming an evergreen structure in which exits from ventures will be recycled back to Chalmers.

5. Case analysis and discussion

The Chalmers School of Entrepreneurship case covers more than 25 years of combined entrepreneurial activities, which is also still ongoing. Each year a new cohort of master students works with invention disclosures, resulting in three to five new university spinoffs, signifying a substantial engagement from students, faculty, staff, and academic inventors. Importantly, (almost) all students have graduated with a master's degree and a proven ability to apply entrepreneurial competence (Alsos et al., 2022; Aadland et al., 2024). At the start in 1997, Chalmers School of Entrepreneurship had the two goals of developing future entrepreneurs and new technology ventures. Since the start, the school has allowed inventive faculty to co-create university spinoffs with students, thereby striking better balances between their research ambitions and engagement in entrepreneurial activity. From Stage 3, the school consistently produced research in entrepreneurship. Importantly, the research builds upon empirical insights gained through collective entrepreneurial activities occurring at the school, paving the way for a novel “clinical lab” approach to entrepreneurship research, and entrepreneurial education in particular. During this stage, it became clear that the original two goals (develop future entrepreneurs and ventures) needed to be transformed into primarily an objective of developing (and examining) entrepreneurial competencies, relevant not only for startup careers but also for intrapreneurial careers (Alsos et al., 2022).

The case demonstrates how faculty partaking in university spinoffs have become increasingly legitimized in three ways. Firstly, Chalmers School of Entrepreneurship and its connected incubation support has lowered the barriers of entry for faculty, alleviating them from having to engage centrally in all the aspects of new venture creation, such as product development, financing, sales, or dealing with human resources. Instead, faculty (and also doctoral candidates) have been allowed to focus on being the technological expert and sometimes the CTO of the venture; a part-time engagement having better alignment with other academic research and teaching duties.

Secondly, as captured in the interview citation from a serial academic entrepreneur, there can be an increase of research quality that comes from creating spinoffs that apply technology into different contexts. The entrepreneurial activity of commercializing a technology, feeds new knowledge back into the research base.

Thirdly, with the third mission (including university spinoffs) being a

clarified criteria for faculty promotion, many researchers now are incentivized to pursue such opportunities. Promotion is not possible based on entrepreneurial activities alone. The change is that entrepreneurial activities now can be valued at an equivalent level to that of research and education for promotions and faculty recruitments. All three exemplify entrepreneurial activity integrated within and across university missions, such that they blend more formal actions with established institutional norms and culture. These effects demonstrate how the “scientific paradigm” and the “publish and perish” norm still so prevalent within the research mission of most universities (Ndonzuau et al., 2002; Kirby et al., 2011), can evolve into also embracing entrepreneurial experiences from applying discoveries and inventions.

As the case illustrates, the development of the academic heartland (Clark, 1998) has gone hand in hand with developing the third mission around professional venture creation from university spinoffs. Hence, there is today a seamlessness between early-stage innovation and research, and later stage venture development. The Chalmers School of Entrepreneurship has become a role-model for inviting students to co-create with academic inventors while supported by school faculty and venture professionals.

The school exemplifies how a focus on entrepreneurial competence development (achieving the educational mission) can also deliver third mission objectives as well as knowledge and insight to research. The framework agreement signed by the school, its home department, a vice-president and the newly started Chalmers Ventures in 2015, captured the balances gained between the missions and that had become institutionalized. The new “rules of the game” developed through the school, were that students gain entrepreneurial learning and credits and sometimes also continue as co-founders of a promising venture, initiated through the education. Having curricular entrepreneurial education, including students doing venture creation, has allowed students to gain entrepreneurial competence even when experiencing venture failure. Reflective learning practices, and academic credits connected to documented learning, has allowed for competence development, not only for students, but also other stakeholders involved. This capability to integrate research commercialization with delivery of education, is in stark contrast to prevalent extra-curricular venture activity at universities, where economic success or failure is the main “examiner”. Importantly, the gained entrepreneurial competence then also helps to launch sustained entrepreneurial careers (Alsos et al., 2022), as competence related to a particular learning event can be applied to additional, new entrepreneurial activities.

In Table 1, the different main legitimization effects of Chalmers School of Entrepreneurship are accounted for in relation to university missions. The school being educationally centric from the start has been critical. It has not been obvious that a university spinoff mechanism can or should be integrated with an educational format – not when a key output expectation has been commercial success of university spinoffs. There are still prevalent notions that academic inventors should become lead entrepreneurs or that surrogate entrepreneurs should be experienced businesspersons (Franklin et al., 2001). Nevertheless, pragmatic legitimacy was achieved around students as surrogate entrepreneurs already in Stage 1 through producing concrete business results.

Today, there is more cognitive legitimacy around the model, and not then necessarily around the notion that student entrepreneurs are the main solution for university spinoff success. Rather there is an understanding that the model is about senior experienced persons on both the academic and business side appreciating co-creating with motivated students, who then carry out most of the early-stage high-risk experimentation and effectuation. The students do so under the promise of gaining entrepreneurial experiences and a valuable degree, while occasionally also becoming co-founders. The large potential of this model is still to be realized in most aspiring entrepreneurial universities, which indicates a lack of intrapreneurial capabilities, including how to finance and incentivize faculty, students and others to commit to the model (Lackeus et al., 2011).

Table 1
Legitimacy achieved in each stage of the case.

Stages	Main pragmatic (P), moral (M) and cognitive (C) legitimacy achieved
Stage 1: 1996–1998 Initiation of a new tech-transfer mechanism, including education, and a team-based student surrogate approach.	Most inventors satisfied, even when venture terminated (P). Succeeding with viable university spinoffs (P). Students satisfied/appreciative of experience and everyone graduating (M). Episodic recognition of a new model (C).
Stage 2: 1999–2005 Becoming transdisciplinary: beyond engineering, adding IP management at the core, and starting an incubator.	Succeeding with pre-incubator – Encubator (P). Establishing MSc program beyond engineering (M). Expanding subject area, including e.g. IP management (C).
Stage 3: 2006–2013 Focusing on sustainability and gender balance, integrating administrative routines, and becoming a clinical research lab.	Gender balance (M) and normalizing routines (C). Developing third mission at Chalmers and nationally (C). Top-ranked school with extra funding (C). Research from the “Clinical lab” published (C).
Stage 4: 2014–2022 Translating the model to other settings and consolidating the venture creation system (including circularity and deep-tech focus).	Enabling consolidation through Chalmers Ventures (C). Translating model to other formats and settings (C). Award-winning school and faculty (C). Chalmers continuously offering extra financing (C). Affecting criteria for faculty promotion, including also third mission merits (C).

Stage 2 developed the core model into what it is today. This implied both educational development and venture creation (third mission) development. Educationally, the school expanded student admissions to include more varied backgrounds, while also including more core faculty, especially from law and intellectual property management. Third mission developments included the formation and professionalization of the new Encubator investing in annual batches of university spinoffs. These developments were intrinsic, stemming from needs identified by teachers and students, and building on pragmatic and moral grounds.

However, in Stage 2, initial financing was lost and there was no internal platform financing available to cover extra costs around either education or venture creation. At the end of Stage 2 and the start of Stage 3, the school needed to attract regional and national development money while also making good use of the seed investments coming from Chalmers. Although Chalmers School of Entrepreneurship was appreciated by actors within Chalmers, it was still not embraced at Chalmers and did not carry ‘taken-for-granted’ cognitive legitimacy that would have secured its position. Importantly, in Stage 3, the entrepreneurship research of the entrepreneurial activities situated in a university context, made the school into a ‘clinical lab’. This was achieved through synergy with the various external funding structures, aimed not only at research and education, but also at regional development and innovation. Financial stability was eventually achieved in Stage 3 by being top-ranked by an international peer review in 2009 (Fayolle et al., 2009) and then receiving sustained government support. When the Swedish government terminated this support (without any evaluation or motivation), Chalmers offered discretionary, and then after a few years, fixed, specialized educational financing of the model. For progressive universities and governments, this could potentially happen more efficiently, now that Chalmers and select other venture creation programs have pioneered cognitive legitimacy of the model (Lackeus and Williams Middleton, 2015).

Especially from Stage 3, sustained government funding requested research studies conducted by faculty and PhD students. By that time also researchers outside of Chalmers chose to investigate the environment. Aspects of the design, process, pedagogy and outcomes of the school were thereby justified through published research. The spread of arenas in which the research was presented also generated pragmatic

legitimacy among the various stakeholder groups – from practitioner-oriented conferences to research conferences. Overall, the clinical lab research around the school and similar schools helped ‘getting the model right’: in other words, refining and expanding components of the model eventually achieving cognitive legitimacy with all stakeholders and in a larger international community of faculty and others.

Stage 4 was qualitatively different than previous stages. Now Chalmers centrally, through consolidating its venture creation system into Chalmers Ventures, took the initiative. The school was put in a process of re-relating to this development while assuring that students were on board. Commercial venture creation results from the school remained important to obtain and were articulated more explicitly relative to receiving investments from Chalmers Ventures. Also, a Chalmers-level project (ENG) explored and developed a variety of formats for entrepreneurial education throughout Chalmers. Initially, the school was at the core of these developments but after a while they were more distributed throughout Chalmers, allowing the school to focus on its core mission.

So, while the first three stages were about championing school developments, Stage 4 re-related the school to Chalmers as a whole, who then broadened its entrepreneurial activities. With the school finally receiving internal platform financing for education (from 2022) and a chaired professor installed in entrepreneurship didactics, Stage 4 also signified the school becoming established and cognitively legitimized at Chalmers. Focus for the future will be more about “train-the-trainer” programs based upon clinical research, not just at Chalmers but also with collaborating universities.

The time factor required for the university-wide effect occurring in Stage 4 needs to be acknowledged. The current case study could not have been written after ten or even twenty years of development. The outcome would have been different, missing out on key university-wide effects, stemming from prior stages of continual (rather than episodic) legitimization. In Stage 4, these university-wide effects were direct, through the school being part of broadening entrepreneurship education (the ENG-project) and partaking in writing new criteria for promotion of faculty. However, effects have also been indirect since the start. Faculty, having had one venture project with the school or heard a colleague talk about it, increasingly have chosen to initiate entrepreneurial activities linked not only to the third mission but also to education and research. They can do so, assured by the cognitive legitimacy achieved through Chalmers School of Entrepreneurship, and thereby they display intra-preneurial capabilities.

Can development of entrepreneurial universities and their intra-preneurial capabilities happen in ways other than those displayed in the Chalmers case? The answer is probably yes, and partly that is because Chalmers now has demonstrated how intra-preneurial capabilities can affect all missions of the university. However, there is nothing in the current case indicating that entrepreneurial developments should be top-down, thereby confirming earlier previous research into entrepreneurial universities (Philpott et al., 2011) referencing Burgelman (1983). Rather, the case demonstrates that the legitimacy created by the school across 25-plus years has enabled more horizontal translation of integrated activities (especially more experiential entrepreneurial courses) as an intra-preneurial capability of the university. Today, entrepreneurial activities occur in a much more legitimized and benevolent context, than ten or more years ago.

The case study not only confirms Clark’s (1998) collegial incrementalist (Lindblom, 1959) understanding of how adaptive intra-preneurial capabilities can evolve in entrepreneurial universities. It also adds the importance of legitimacy-building over time. Legitimized, combined and continuous entrepreneurial activities affect the rules-of-the-game in all university missions, including informal cultural and attitudinal factors.

6. Conclusions and implications

The purpose of this article is to demonstrate a way in which combined entrepreneurial activities built up over decades improves all three missions of a university in generalizable ways. From the start, Chalmers School of Entrepreneurship was situated as a curricular master-level program within the departmental faculty-structure of Chalmers. The university spinoff activity that the school orchestrated has had one leg in the development of third mission support structures, including spinoff formation, incubation, and seed-financing. However, the other leg of the school has always been situated in the missions of education and research, making the case relatively unique.

The longitudinal case demonstrates generalizable improvements into each university mission. Firstly, the school has helped incentivize more faculty to do university spinoffs. Faculty can choose levels of engagement into a university spinoff, not having to sacrifice research or teaching. Faculty appreciate the increased quality of research stemming from their technology being applied in various contexts through the university spinoff. The school also helped develop new criteria for promotion of faculty, that recognizes such entrepreneurial activity.

Secondly, the school has legitimized that Chalmers education appreciates and evaluates entrepreneurial experiences as a main ground of gaining entrepreneurial competencies. Positive career effects from such entrepreneurial competence development are most apparent from the school’s master program (Alsos et al., 2022). However, the adaptation of these learnings and insights into other shorter and simpler curricular formats, allow for a broader reach across the university, so that the majority of students are given opportunity to recognize and participate in entrepreneurial learning experiences.

A third generalization from the current case is that the third mission, for example engaging in university spinoffs, benefits from student and faculty involvement. The student surrogate entrepreneur model of the school has been shown as explanatory to why there is four times more university spinoff growth stemming from Chalmers than from any other Swedish academic actor (Lundqvist, 2014). Hence, important academic inventions requiring entrepreneurial driving force have a much larger chance of reaching the market through the Chalmers model than relying on academic entrepreneurs only. The co-creation approach around the school balances expertise of inventing academics and experienced business persons with student teams committed to learning, thereby often reducing the tension and even conflict between academic and business culture, identified as a key challenge for successful university spinoffs (Clarysse and Moray, 2004). An exclusive focus on (successful) venture creation is bound to have pitfalls, given the natural occurrence of failed ventures. Therefore, the emphasis on curricular entrepreneurial competence development through venturing, where the upside of a successful venture is possible but not necessary, secures a key academic objective, namely competence developed for use in society.

These demonstrated improvements done over more than 25 years are far from how Chalmers was historically recognized as an entrepreneurial university prior to these developments. Entrepreneurial activities focusing on university spinoffs were not something integrated and continuous but instead something episodic and done at the periphery or externally to the university. Judging from current research, most entrepreneurial universities are still run in this fragmented non-integrated way (Schmitz et al., 2017; Guenther and Wagner, 2008; Wood, 2011). They then do not realize the potential in having more synergized entrepreneurial activities, as in the current case: missing out on an arguably large potential in building human capital, knowledge capital, and entrepreneurship capital (Guerrero et al., 2015), systematically and in combination.

This study offers theoretical insights into how an already recognized entrepreneurial university transitioned into a new version. The study confirms an incrementalist understanding (Clark, 1998) of how universities evolve, in the sense that “muddling through” (Lindblom, 1959) has been critical throughout the case and involved faculty, students,

management and professional support. However, the persistent refinement and legitimization of a model combining multiple entrepreneurial activities over decades, add new understandings of how universities can evolve: when cognitive legitimacy around a new model eventually is achieved and appreciated widely, it has effects far beyond the original setting, and it enables university-wide bottom-up and horizontally inspired developments in and between all three missions. In short, the case thereby demonstrates how new intrapreneurial capabilities are established.

While this longitudinal understanding fills a research gap, it also opens up for further questions. How can universities which are not currently recognized as entrepreneurial take steps towards becoming more entrepreneurial? Should other universities focus on shorter and simpler formats, now that there are legitimized examples spanning between education and successful economic venture creation? How can university spinoff activity be enabled through not only student surrogate entrepreneurs (as in the current case) but also through entrepreneurial training of faculty, postdocs, PhD students, alumni, etc.? The current case has offered some specific answers to these questions. Through future university developments and research more answers can be provided.

The article provides several implications for policy and university practice. Firstly, entrepreneurial activities within universities benefit from being curricular. When curricular focus is on the development of entrepreneurial competence, it allows actual sustainable innovation to occur more broadly and with less uncertainty. Hence, curricular entrepreneurial learning outcomes motivate students to handle and learn from uncertainty, thereby broadening universities as testbeds of sustainable innovation, while students gain critical skills and attitudes for their future careers. This implication is not generalizable to all curricular education. Large parts of university education will still be carried out without synergies between the three missions and with a focus on productivity, through scale and conformity. However, for most educational programs there should be some means for more personalized entrepreneurial learning through students taking on real-life entrepreneurial or innovative tasks, while also contributing more sustainable innovation and societal interaction.

Secondly, there are strong arguments for entrepreneurial activities being in the heartland of universities, rather than in the periphery. This implies that intermediary structures (science parks, incubators, etc.) need to motivate themselves in relation to not just the third mission of universities but also in relation to education and research. If they cannot do so, then universities should receive direct public financing for sustainable innovation and entrepreneurial competence development. This implication aligns with the HEInnovate initiative (Hofer and Kaffka, 2018) allowing managers, faculty and others to evaluate the innovation potential of a university. The HEInnovate framework makes you respond to important questions around e.g. entrepreneurial learning and competences, incentives for faculty, and startup support. The current study reinforces and exemplifies why and how such questions stimulate entrepreneurial developments within universities.

Finally, policy and university collaboration should benefit more from the clinical research around entrepreneurial universities, such as the example provided here, being in the forefront of entrepreneurial developments, including then also sustainable development. The entrepreneurial university of the future is not just integrating between its missions, as demonstrated in the current study. In doing so, it also plays a key role enabling and legitimizing sustainability transitions, expected to be at the core not only of entrepreneurial universities but society enlarge for decades to come (Rendtorff, 2020).

CRediT authorship contribution statement

Mats Lundqvist: Writing – review & editing, Writing – original draft, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Karen Williams-Middleton:** Writing

– review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Data availability

Data will be made available on request.

References

- Aadland, T., Hägg, G., Lundqvist, M.A., Stockhaus, M., Williams Middleton, K., 2024. Mitigating the lack of prior entrepreneurial experience and exposure through entrepreneurship education programs. *Int. J. Entrepreneurial Behav. Res.* 30, 19–44.
- Agogué, M., Lundqvist, M., Williams-Middleton, K., 2015. Mindful deviation through combining causation and effectuation: a design theory-based study of technology entrepreneurship. *Creativ. Innovat. Manag.* 24, 629–644.
- Alänge, S., Lundqvist, M., 2014. Sustainable Business Development: Frameworks for Idea Evaluation and Cases of Realized Ideas. Chalmers University of Technology, Göteborg, Sweden.
- Alsos, G., Hägg, G., Lundqvist, M., Politis, D., Stockhaus, M., Williams-Middleton, K., Djupdal, K., 2022. Graduates of venture creation programs—where do they apply their entrepreneurial competencies? *Small Bus. Econ.* 1–23.
- Åstebro, T., Bazzazian, N., Braguinsky, S., 2012. Startups by recent university graduates and their faculty: implications for university entrepreneurship policy. *Res. Pol.* 41, 663–677.
- Berggren, E., 2011. The entrepreneurial university's influence on commercialisation of academic research - the illustrative case of Chalmers University of Technology. *Int. J. Entrepren. Small Bus.* 12, 429–444.
- Bousfiha, M., 2020. The Lived Experience of Academic Entrepreneurship: the Interplay between Practice, Identity, and Context. Chalmers Tekniska Hogskola, Sweden.
- Brown, W.S., 1985. A proposed mechanism for commercializing university technology. *Technovation* 3, 19–25.
- Burgelman, R.A., 1983. Corporate entrepreneurship and strategic management: insights from a process study. *Manag. Sci.* 29, 1349–1364.
- Cerver Romero, E., Ferreira, J.J., Fernandes, C.I., 2021. The multiple faces of the entrepreneurial university: a review of the prevailing theoretical approaches. *J. Technol. Tran.* 46, 1173–1195.
- Clark, B.R., 1998. Creating Entrepreneurial Universities: Organizational Pathways of Transformation. Pergamon Press, New York.
- Clark, B.R., 2005. The character of the entrepreneurial university. *Int. High. Edu.* 2–3.
- Clarysse, B., Moray, N., 2004. A process study of entrepreneurial team formation: the case of a research-based spin-off. *J. Bus. Ventur.* 19, 55–79.
- Compagnucci, L., Spigarelli, F., 2020. The Third Mission of the university: a systematic literature review on potentials and constraints. *Technol. Forecast. Soc. Change* 161, 120284.
- Denzin, N.K., 2009. The Research Act: A Theoretical Introduction to Sociological Methods. Transaction Publishers, New Brunswick, NJ.
- Donnellon, A., Olila, S., Williams-Middleton, K., 2014. Constructing entrepreneurial identity in entrepreneurship education. *Int. J. Manag. Educ.* 12, 490–499.
- Etzkowitz, H., 2003. Research groups as 'quasi-firms': the invention of the entrepreneurial university. *Res. Pol.* 32, 109–121.
- Fayolle, A., Hjorth, D., Kyrö, P., Serio, L., 2009. Appraisals of Swedish Entrepreneurship Education Proposals. Swedish National Agency for Higher Education, Ministry of Education and Research, Stockholm. Reg.nr 69-5683-08.
- Fini, R., Grimaldi, R., Santoni, S., Sobrero, M., 2011. Complements of substitutes? The role of universities and local context in supporting the creation of academic spin-offs. *Res. Pol.* 40, 2011.
- Flyvbjerg, B., 2006. Five misunderstandings about case-study research. *Qual. Inq.* 12, 219–245.
- Fogelberg, H., Lundqvist, M.A., 2013. Integration of academic and entrepreneurial roles: the case of nanotechnology research at Chalmers University of Technology. *Sci. Publ. Pol.* 40, 127–139.
- Franklin, S., Wright, M., Lockett, A., 2001. Academic and surrogate entrepreneurs in university spinout companies. *J. Technol. Tran.* 26, 127–141.
- Good, M., Knockaert, M., Soppe, B., Wright, M., 2019. The technology transfer ecosystem in academia. An organizational design perspective. *Technovation* 82, 35–50.
- Grimaldi, R., Kenney, M., Siegel, D., Wright, M., 2011. 30 years after Bayh-Dole: reassessing academic entrepreneurship. *Res. Pol.* 40, 1045–1057.
- Guenther, J., Wagner, K., 2008. Getting out of the ivory tower—new perspectives on the entrepreneurial university. *Eur. J. Int. Manag.* 2, 400–417.
- Guerrero, M., Cunningham, J.A., Urbano, D., 2015. Economic impact of entrepreneurial universities' activities: an exploratory study of the United Kingdom. *Res. Pol.* 44, 748–764.
- Guerrero, M., Urbano, D., Fayolle, A., Klofsten, M., Mian, S., 2016. Entrepreneurial universities: emerging models in the new social and economic landscape. *Small Bus. Econ.* 47, 551–563.
- Guerrero, M., Urbano, D., Gajón, E., 2020. Entrepreneurial university ecosystems and graduates' career patterns: do entrepreneurship education programmes and university business incubators matter? *J. Manag. Dev.* 39, 753–775.
- Guerrero-Cano, M., Urbano, D., Kirby, D., 2006. A Literature Review on Entrepreneurial Universities: an Institutional Approach.
- Hagvall Svensson, O., Adawi, T., Lundqvist, M., Williams Middleton, K., 2019. Entrepreneurial engineering pedagogy: models, tradeoffs and discourses. *Eur. J. Eng. Educ.* 1–20.

- Hayter, C.S., Nelson, A.J., Zayed, S., O'Connor, A.C., 2018. Conceptualizing academic entrepreneurship ecosystems: a review, analysis and extension of the literature. *J. Technol. Tran.* 43, 1039–1082.
- Henricson Briggs, K., 2016. *Travels Of Business Incubators*. Doctoral Dissertation. Chalmers University of Technology.
- Hofer, A.-R., Kaffka, G., 2018. HEInnovate: Facilitating Change in Higher Education. Entrepreneurial Universities: Collaboration, Education and Policies Cheltenham, pp. 135–152. Edward Elgar Publishing.
- Jacob, M., Lundqvist, M., Hellsmark, H., 2003. Entrepreneurial transformations in the Swedish university system: the case of Chalmers university of technology. *Res. Pol.* 32, 1555–1568.
- Jain, S., George, G., 2007. Technology transfer offices as institutional entrepreneurs: the case of Wisconsin Alumni Research Foundation and human embryonic stem cells. *Ind. Corp. Change* 16, 535–567.
- Johannisson, B., 2007. Enacting local economic development - theoretical and methodological challenges. *J. Enterpris. Comm.* 1, 7–26.
- Kirby, D., 2003. *Entrepreneurship*. McGraw-Hill Education, Maidenhead, UK.
- Kirby, D.A., Guerrero, M., Urbano, D., 2011. Making universities more entrepreneurial: development of a model. *Can. J. Adm. Sci. Rev. Canad. Sci. Adm.* 28, 302–316.
- Klofsten, M., Jones-Evans, D., 2000. Comparing academic entrepreneurship in Europe-the case of Sweden and Ireland. *Small Bus. Econ.* 14, 299–309.
- Klofsten, M., Payolle, A., Guerrero, M., Mian, S., Urbano, D., Wright, M., 2019. The entrepreneurial university as driver for economic growth and social change-Key strategic challenges. *Technol. Forecast. Soc. Change* 141, 149–158.
- Klofsten, M., Urbano, D., Heaton, S., 2021. Managing intrapreneurial capabilities: an overview. *Technovation* 99, 102177.
- Lackéus, M., 2016. *Value Creation As Educational Practice - towards a New Educational Philosophy Grounded in Entrepreneurship?* PhD Kappa. Chalmers University of Technology.
- Lackéus, M., Williams Middleton, K., 2015. Venture creation programs: bridging entrepreneurship education and technology transfer. *Edu. Training* 57, 48–73.
- Lackéus, M., Lundqvist, M., Williams Middleton, K., 2011. Obstacles to Establishing Venture Creation Based Entrepreneurship Education Programs. *Nordic Academy of Management (NFF)*, Stockholm, Sweden.
- Lackéus, M., Lundqvist, M., Williams-Middleton, K., 2016. Bridging the traditional-progressive education rift through entrepreneurship. *Int. J. Entrepreneurial Behav. Res.* 22, 777–803.
- Lindblom, C.E., 1959. The science of "muddling through". *Publ. Adm. Rev.* 19, 79–88.
- Lindblom, C.E., 1979. Still muddling, not yet through. *Publ. Adm. Rev.* 39, 517–526.
- Lindholm Dahlstrand, Å., Berggren, E., 2010. Linking innovation and entrepreneurship in higher education: a study of Swedish schools of entrepreneurship. In: O'KEY, R., GROEN, A., COOK, G., VAN DER SLJDE, P. (Eds.), *New Technology Based Firms in the New Millennium - Funding: an Enduring Problem*. Emerald Group Publishing Ltd.
- Louis, K.S., Blumenthal, D., Gluck, M.E., Stoto, M.A., 1989. Entrepreneurs in academe: an exploration of behaviors among life scientists. *Adm. Sci. Q.* 34, 110–131.
- Lundqvist, M., 2004. Entrepreneurial Roles in the University – Exploring an Infrastructure for an Intellectualized Economy. CIP Symposium, Gothenburg.
- Lundqvist, M.A., 2014. The importance of surrogate entrepreneurship for incubated Swedish technology ventures. *Technovation* 34, 93–100.
- Lundqvist, M., 2015. Chalmers - an entrepreneurial university institutionalizing the entrepreneurial? In: FOSS, L., GIBSON, D. (Eds.), *The Entrepreneurial University: Context and Institutional Change*. Routledge, New York, NY USA.
- Lundqvist, M.A., Petrusson, U., 2002. Designing the Role of the Entrepreneur – Using a Norm Constructionist Approach at the Interface of Research, Learning and Innovation. 4th Triple-Helix conference, Copenhagen.
- Lundqvist, M., Williams-Middleton, K., 2013. Academic entrepreneurship revisited: university scientists and venture creation. *J. Small Bus. Enterprise Dev.* 20, 603–617.
- Lundqvist, M., Williams-Middleton, K., Nowell, P., 2015. Entrepreneurial identity and role expectations in nascent entrepreneurship. *Ind. High. Educ.* 29, 327–344.
- Mcadam, M., Miller, K., Mcadam, R., 2016. Situated regional university incubation: a multi-level stakeholder perspective. *Technovation* 50, 69–78.
- Mcqueen, D.H., Wallmark, J.T., 1982. Spin-off companies from Chalmers university of technology. *Technovation* 1, 305–315.
- Mcqueen, D.H., Wallmark, J.T., 1984. Innovation output and academic performance at Chalmers university of technology. *Omega* 12, 457–464.
- Meyer, A.D., Aten, K., Krause, A.J., Metzger, M.L., Holloway, S.S., 2011. Creating a university technology commercialisation programme: confronting conflicts between learning, discovery and commercialisation goals. *Int. J. Enterpren. Innovat. Manag.* 13, 179–198.
- Ndonzuau, F.N., Pirnay, F., Surlemont, B., 2002. A stage model of academic spin-off creation. *Technovation* 22, 281–289.
- Nielsen, S.L., Gartner, W.B., 2017. Am I a student and/or entrepreneur? Multiple identities in student entrepreneurship. *Educ + Train* 59, 135–154.
- North, D.C., 1990. *Institutions, Institutional Change and Economic Performance*. Cambridge university press NY, Cambridge.
- Nowell, P., 2021. *Up Close and Personal: How Relational Dynamics in Founding Teams Are Shaped by the Context of Entrepreneurship*. Chalmers Tekniska Högskola, Sweden.
- Ollila, S., Williams-Middleton, K., 2011. The venture creation approach: integrating entrepreneurial education and incubation at the university. *Int. J. Enterpren. Innovat. Manag.* 13, 161–178.
- Perkmann, M., Tartari, V., McKelvey, M., Autio, E., Broström, A., D'este, P., Fini, R., Geuna, A., Grimaldi, R., Hughes, A., 2013. Academic engagement and commercialisation: a review of the literature on university-industry relations. *Res. Pol.* 42, 423–442.
- Petrusson, U., 2004. *Intellectual Property & Entrepreneurship: Creating Wealth in an Intellectual Value Chain*. Center for Intellectual Property Studies (CIP).
- Philpott, K., Dooley, L., O'Reilly, C., Lupton, G., 2011. The entrepreneurial university: examining the underlying academic tensions. *Technovation* 31, 161–170.
- Pittaway, L., Aissauti, R., Ferrier, M., Mass, P., 2019. University spaces for entrepreneurship: a process model. *Int. J. Entrepreneurial Behav. Res.* 26, 911–936.
- Raible, S.E., Williams-Middleton, K., 2021. The relatable entrepreneur: combating stereotypes in entrepreneurship education. *Ind. High. Educ.* 35, 293–305.
- Rasmussen, E., Sørheim, R., 2006. Action-based entrepreneurship education. *Technovation* 26, 185–194.
- Rendtorff, J.D., 2020. The concept of business legitimacy: learnings from Suchman: integrating sociological, ethical and critical perspectives. *Handbook Bus. Legitim.: Respons. Ethics Soc.* 3–30.
- Rothaermel, F.T., Agung, D.S., Jiang, L., 2007. University entrepreneurship: a taxonomy of the literature. *Ind. Corp. Change* 16, 691–791.
- Schmitz, A., Urbano, D., Dandolini, G.A., De Souza, J.A., Guerrero, M., 2017. Innovation and entrepreneurship in the academic setting: a systematic literature review. *Int. Enterpren. Manag. J.* 13, 369–395.
- Siegel, D., Wright, M., 2015. Academic entrepreneurship: time for a rethink? *Br. J. Manag.* 26, 582–595.
- Stake, R.E., 1995. *The Art of Case Study Research*. sage.
- Steyaert, C., Landström, H., 2011. Enacting entrepreneurship research in a pioneering, provocative and participative way: on the work of Bengt Johannisson. *Small Bus. Econ.* 36, 123–134.
- Stinchcombe, A.J., 1965. Social structure and social organization. In: MARCH, J.G. (Ed.), *Handbook of Organizations*. Rand McNally, Chicago.
- Suchman, M.C., 1995. Managing legitimacy: strategic and institutional approaches. *Acad. Manag. Rev.* 20, 571–610.
- Williams-Middleton, K., 2010. *Developing entrepreneurial behavior: facilitating nascent entrepreneurship at the university*. Doctor of Philosophy Kappa. Chalmers University of Technology.
- Williams-Middleton, K., Lackéus, M., Lundqvist, M., 2021. Entrepreneur vs. entrepreneurial. In: DANA, L.-P. (Ed.), *World Encyclopedia of Entrepreneurship*, second ed. Edward Elgar, Cheltenham, UK.
- Wood, M.S., 2011. A process model of academic entrepreneurship. *Bus. Horiz.* 54, 153–161.
- Yin, R.K., 2008. *Case Study Research: Design and Methods*. Sage Publications, London, UK.