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The Entrepreneurial Architecture from a Researcher's Point of View

A quantitative investigation of how Swedish organisational university support affect academic researchers' entrepreneurial intentions

The official third mission of universities urges actors within higher education to contribute to social and economic development by encouraging researchers to commercialise their findings. Even so, both practical evidence and research findings are pointing toward issues within the university's management of this task. A greater understanding of how universities can affect their researchers to pursue commercialisation is therefore of relevance. At the same time, research within Academic Entrepreneurial Intentions illustrates that researchers' perception of their environment has implications for what entrepreneurial activities they pursue, where recent emphasis has been made on the importance of understanding how contextual variables in combination affect researchers' entrepreneurial intention to pursue commercialisation activities. To address these issues, the theory of Entrepreneurial Architecture is applied to gain a better understanding of how the organisational support within universities collectively can affect researchers' intentions. More specifically, its five elements – structure, systems, leadership, strategy, and culture – are investigated by looking at their combined effect on entrepreneurial intentions. To gain a deeper understanding of how university support influences, the theory's assumption of a desired balance between the elements is for the first time tested against researchers' intentions. The thesis takes a quantitative methodology by conducting a self-completing questionnaire where 615 researchers within science and engineering at five Swedish universities are surveyed. The results of the study indicate that leadership has a positive effect, strategy has a negative effect, and the remaining three have no significant effect on entrepreneurial intentions to pursue commercialisation activities. The results further suggest that a balance between the elements is not necessary to effectively impact intentions, which provides theoretical novelty to the concept and suggestions for future research. Practically, it is suggested for university management aiming for increased commercialisation to prioritise primarily support from leadership.

Keywords: entrepreneurial architecture, academic entrepreneurial intention, entrepreneurial university, commercialisation, triple helix

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List of Definitions

Researcher	This study refers to researcher as an *academic* researcher currently working at a university, who is either undergoing a PhD-education or have at least completed a PhD.
Commercialisation activities	Utilising of research findings through patenting, licensing, spin-off companies (Bercovitz & Feldman, 2006) and consulting activities (Hayter, 2011).
Entrepreneurial Architecture	A theory outlining the internal organisation of universities - including structure, systems, leadership, strategy, and culture – which needs be entrepreneurially transformed for effective third mission activities (Nelles & Vorley, 2010a).
Academic Entrepreneurial Intentions	Academic entrepreneurial intentions refer to researchers' intent to pursue commercialisation activities which explore their knowledge (Neves & Brito, 2020).
Entrepreneurial University	Universities contributing to society by simultaneously pursuing all three missions – commercialisation of knowledge, research, and teaching (Cerver Romero et al., 2021).
Incubator	An organisation through which aspiring entrepreneurs can receive support for spin-off ventures (SOU 2020:59).
Teacher Exemption	A Swedish law stipulating that all research findings and inventions belong to the originating researcher (Karlsson et al., 2015).
Third Mission	The purpose of universities, in addition to research and teaching, to spread research and knowledge to society, e.g., through different commercialisation activities (Karlsdottir et al., 2022).
Technology Transfer Office	A service function within a university or research institute, tasked with facilitating the utilisation, often through commercialisation, of outcomes arising from the activities of the respective institution (SOU 2020:59).

List of Abbreviations

EA	Entrepreneurial Architecture
AEI	Academic Entrepreneurial Intention
TTO	Technology Transfer Office

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1. Introduction

This chapter firstly introduces the concept of Entrepreneurial Universities and their third mission, as well as Academic Entrepreneurship and the theory of Entrepreneurial Architecture. Then the Swedish context is presented and connected for problematisation. Finally, the purpose is presented, leading to two research questions, delimitations, and an outlining of the thesis.

1.1 Background

The key factors which are essential for today's economic and societal growth is innovation, research, and development (Fagerberg et al., 2005; Fagerberg & Srholec, 2008). Because of this, there has been an increasing focus for decision makers to create an environment for supporting such innovation and entrepreneurship (Hasche et al., 2020). To achieve a favourable environment for this purpose, it is claimed that collaboration between university, industry and government is essential (Andrade et al., 2022). The model of Triple Helix refers to the innovation system involving these actors, whose relationships and interactions are regulated through different policies. The concept of Triple Helix further states that university as an actor has a significant role in knowledge-based societies to contribute to desired innovations by utilising research (Etzkowitz & Leydesdorff, 2000). As this knowledge society has emerged, so has a third mission of universities (Vorley & Nelles, 2009). The third mission can be explained as transferring university research and knowledge outside of its boundaries (Göransson et al., 2022), which means that researchers are now expected to contribute to social and economic development in addition to teaching and research (Addie, 2017). This movement has led to the rise of the Entrepreneurial University (Vorley & Nelles, 2009), which can be defined as "*... those that aim to maximise the potential of commercialising their knowledge while also creating value for society, without considering this as a threat to their academic values and traditional functions*" (Cerver Romero et al., 2021, p. 1175). The research interest for Entrepreneurial Universities has significantly increased the last decades, yet the subject remains fragmented (Forliano et al., 2021) and emerging (Martin et al., 2019).

The commercialising of academic research includes utilising findings for starting spin-off companies as well as patenting and licensing (Bercovitz & Feldman, 2006). A key actor within such activities is the researcher (Jain et al., 2009), which has led to an individual perspective - the research field of Academic Entrepreneurial Intentions (Guerrero & Urbano, 2014). Entrepreneurial intentions within academia are well-investigated in terms of psychological and

individualistic aspects, however, research often neglect the impact of contextual conditions (Feola et al., 2019). Even though universities are increasingly trying to stimulate entrepreneurship and commercialisation among their researchers, many still struggle to manage all three missions simultaneously (Vorley & Nelles, 2009). Traditional top-down control systems usually restrict entrepreneurship (Jones & Patton, 2020) and current performance systems tend to continue promoting traditional research and teaching (Dahlborg et al., 2017; Karlsdottir et al., 2022). Summarising, the transition towards an Entrepreneurial University takes time, where efforts are needed to alter both internal infrastructure and culture (Jacob et al., 2003). There is thus a need for more holistic management approaches to the third mission and commercialisation.

One such holistic theory for explaining this transition is the Entrepreneurial Architecture, applied and conceptualised to academic settings by Vorley and Nelles (2009) to illustrate the university's management of the third mission. According to the theory, a balance between five internal elements – structure, system, strategy, leadership, and culture – is necessary for an effective implementation and execution of the third mission. This entails that all elements are essential, and that more or less of one element can affect the remaining four negatively - as they are mutually supportive. This consequently impacts the effectiveness of the entire architecture and the commercialisation of research (Vorley & Nelles, 2009; Nelles & Vorley, 2010; 2011). Even though researchers' perception of their university environment has proven to have implications for what academic activities they pursue (Kalar & Antoncic, 2015), the theory is not traditionally combined with an individual perspective (Bazan et al., 2023). Given the power of researchers when it comes to academic commercialisation, an increased understanding of how their perception of the elements of the Entrepreneurial Architecture, and how a balance between these, affect their entrepreneurial intentions is valuable.

1.2 The Swedish Context

Historically, the triple helix has emphasised bilateral collaboration in Sweden, involving primarily industry-government (Etzkowitz & Klofsten 2005), as the third mission was not integrated into Swedish law until 1997. Since then, universities have officially been working towards stimulating commercialisation (Karlsson et al., 2015). Initially, university support for this purpose mainly consisted of incubators (Lundqvist, 2015). Other efforts concern initiatives aimed at altering researchers' attitudes towards commercialisation through communication, performance systems (awards, salary, promotion), and internal policies, as it is dependent upon

incentivising and supporting researchers. In recent years, there has also been an increased prioritisation of installing TTOs, as the Swedish State has implemented 13 TTOs (innovation offices) spread out at the 46 actors within higher education. Yet, researchers and students generated 3569 ideas for the TTOs in 2019, out of which less than 6% were transported to incubators (SOU 2020:59).

In general, the university context in Sweden is relatively unique compared other EU countries, as to this day, Sweden is the only country still employing the teacher's exemption (Lundqvist, 2015). The exemption entails that, as opposed to giving universities the right to research results, all findings and inventions belong to the originating researcher. This results in foundationally different conditions for how both government and university policies unfold and influence compared to other European countries (Karlsson et al., 2015). Thus, commercialisation of academic research in Sweden is even more dependent upon the actions and intentions of researchers. Even though there are numerous internationally recognised examples of how researchers at Swedish universities have succeeded with commercialisation efforts in the past, the teacher exemption has been criticised for causing a shortage of commercialisation activities relative to the amount of research publications (Karlsson et al., 2015).

The Swedish university context thus provides unique challenges to commercialising research and fulfilling the third mission, which is mainly due to the systems bottom-up perspective. Because of the teacher exemption, initiatives to stimulate innovation and entrepreneurship are placed at a micro-level, aiming for researchers, instead of a meso-level, targeting universities (Lundqvist, 2015). Studying the organisational theory of Entrepreneurial Architecture based on the perceptions of researchers, in a relatively unique bottom-up context, can thus provide insights into how institutionalisation of the third mission can be executed more effectively to increase researchers' entrepreneurial intentions to commercialise.

1.3 Purpose, Research Questions and Contributions

The purpose of this study is to investigate if researchers' perceptions of the current university support in Sweden impact their intentions to engage in commercialisation activities. This is done by studying the holistic theory of Entrepreneurial Architecture, and its five elements, from the researchers' point of view. More specifically, the thesis aims to answer the research questions, "*How does academic researchers' perceived support from the elements of the Entrepreneurial Architecture in Swedish Universities affect their entrepreneurial intentions*?"

and "*How does an imbalance in perceived support between the five elements affect academic researchers' entrepreneurial intentions?*". The theoretical contribution concerns 1) an increased understanding of the effect of contextual university factors by extending the Entrepreneurial Architecture in relation to Academic Entrepreneurial Intentions, and 2) validation of the Entrepreneurial Architecture's suggestion for desired balance between all elements, from a researcher's perspective of intentions. Empirically, the goal is to contribute with practical implications for how university support in Sweden can further encourage entrepreneurial intentions among academic researchers.

1.4 Delimitations

Research within Academic Entrepreneurship can be grouped into three main categories: 1) spin-offs, 2) patents and licensing, and 3) industry-university collaborations, where the former two are further categorised into commercialisation (Neves & Brito, 2020). As researchers' attitude towards academic entrepreneurship has been suggested to vary based on their desire to engage with a wider range of stakeholders (Miller et al., 2018), which may affect their intention to participate in industry-university collaborations, this thesis is limited to the scope of commercialisation. Moreover, since the thesis overall aim is to investigate how university support influence researchers' entrepreneurial intention to commercialise, it also takes a positive stance towards such activities. The thesis is thus further delimited due to its assumption that commercialisation is an essentially positive concept, which advantageously can be encouraged by the university.

1.5 Thesis Outline

The purpose of this study will be fulfilled through an explanatory quantitative analysis of university support in a Swedish context based on researchers' perceptions. In the following section of literature review, theory regarding the organisational Entrepreneurial Architecture is described in further detail and then the research field of Academic Entrepreneurial Intentions. The section is concluded with a conceptual framework combining the two aspects, with belonging hypotheses. Subsequently, the methodology is presented and justified according to its relevance for the study's purpose and research questions. As the study aims to analyse intentions of researchers and their perceived support at various universities, primary data is collected through a survey. The collected data is then coded, analysed, and presented. Finally, this research study leads to a discussion and conclusion which involves contributions of theoretical and empirical nature followed by suggestions for future research.

2 Literature Review

This chapter presents the conducted literature review and consists of four main subchapters: i) Method for developing literature review, ii) Presentation of literature findings, iii) Identified research gap, iiii) A developed conceptual framework and related hypotheses.

2.1 Method for Developing Literature Review

A thorough literature review was conducted to obtain a broad and deep understanding of the research field. Initially, a systematic literature review was conducted within the research field of triple helix. Two databases were chosen for literature search - Scopus and Web of Science - both of whom are leading research databases internationally (Zhu & Liu, 2020). Including search filters[1], the two databases provided a substantial number of search results for triple helix (1017 in Scopus, 340 in Web of Science). To ensure relevancy of results, more search words were included in combination with triple helix, delimiting the results further. The combinatory search words consisted of "commercialization", "commercialisation", "academia", "researcher", "incubator", "science parks", "knowledge transfer", "technology transfer". Articles were then overviewed and selected for further examining based on their abstract and conclusion. Relevant articles were collected in a spreadsheet with columns for title, authors, year of publication and a short summary of contribution. Based on these, the concepts of Academic Entrepreneurial Intentions, Entrepreneurial University, and Entrepreneurial Architecture were further explored through additional searches to outline previous research and suggestions for future studies for the respective concept. This resulted in a deeper understanding of the research fields which facilitated identifying relevant gaps within commercialisation of research. The identified literature consists of research published in peer-reviewed journals and published books, which provides credibility of collected literature (Collis & Hussey, 2014).

2.2 The Entrepreneurial Architecture of Universities

Vorley and Nelles (2009) take a holistic approach to universities' management of the third mission, by applying and conceptualising the theory of Entrepreneurial Architecture (EA). Originally, Burns (2005) developed this approach to illustrate the different aspects within firms

[1] Appendix 1 – Filters for literature search

which together influence entrepreneurial and innovative behaviour among employees. Through the adaptation to higher education, an organisational perspective of the Entrepreneurial University is taken by illustrating the internal design and processes towards third mission activities (Vorley & Nelles, 2009; Nelles & Vorley, 2010; 2011). Essentially, the adapted EA illustrates the university's entrepreneurial infrastructure (Martin et al., 2019) which consists of five interrelated and mutually supportive elements: structure, systems, strategy, leadership, and culture (Burns, 2005). The element of *structure* is defined as "… *the formal organisational mechanisms of knowledge exchange, usually organised into discrete offices or departments within the university"* (Vorley & Nelles, 2009, p. 289). In short, physical facilities (Martin, et al., 2019), which in practice often consists of science parks, incubators, and departments for continued learning and professional development as well as Technology Transfer Offices (TTOs). Through these instances, actors within the university communicate and exchange knowledge with internal and external actors (Vorley & Nelles, 2009) with the purpose of engaging in entrepreneurial activities (Martin et al., 2019). The impact of implemented structures depends upon their overall integration with each other and the other elements. This aspect is illustrated by *systems*, which characterises to what extent the elements for commercialisation are organisationally embedded. This concerns the internal networks for communicating and coordinating as well as norms for how to interact (Vorley & Nelles, 2009).

These two elements are further settled by *leadership*, which includes setting and communicating strategic visions and goals with the purpose of influencing towards commercialisation engagement (Martin et al., 2019). Effective leadership can be both formal or informal; central or local (Vorley & Nelles, 2009). However, the effect tends to be greater when practiced by a senior manager with a powerful position (Martin et al., 2019; Nelles & Vorley, 2010a). Strongly linked to practiced leadership as well as implemented structures and systems is the *strategy*-element. Strategies are summarised and explained in internal documents which serves to incentivise, guide, and set goals in relation to the third mission activities (Vorley & Nelles, 2009). These can include both financial and non-financial incentive systems for researchers and departments (Bazan et al., 2023). Lastly, the element of *culture* includes individual and collective attitudes towards innovation and entrepreneurship. The university culture has implications for what types of activities researchers perform and thus also the choice of strategy and structures (Vorley & Nelles, 2009). Having a shared vision of and positive attitude towards third mission activities is of great importance for achieving the desired behaviour (Martin et al., 2019). Altogether, to what extent universities manage to utilise

research depends on the entrepreneurial existence of these elements, and how well they are rooted, integrated, and aligned within the university (Nelles & Vorley, 2010a). Hence, a holistic view of organisational university support is taken by demonstrating the functioning and alignment of the five elements.

Entrepreneurial element	Meaning
Structure	Entrepreneurial infrastructure including TTO, incubators, education, etc.
Systems	Networks of communication and the configuration of linkages bewteen structures and departments, admin, etc.
Strategies	Institutional goals elaborated in planning documents, including internally determined formal structures for incentive initiatives.
Leadership	Qualification and orientation of key leaders on all levels (central and local) towards the third mission. Leaders sharing the strategic visions and goals.
Cultures	Institutional, departmental and individual attitudes and norms towards the third mission.

Table 1. Elements of the Entrepreneurial Architecture (Nelles & Vorley, 2010b, p. 169)

Since the adaptation to higher education, which has been further synthesised and elaborated by the original authors (Nelles & Vorley, 2010a; 2010b; 2011), few studies on the subject have been made. Through the literature review, only 11 published articles and one book could be found which apply the concept of EA to the university context and its Third Mission. Excluding the original authors, a majority of these are published after 2019. This implies that although the interpretation has been present for over ten years, the topic and its applicability seem to be emerging, indicating its relevancy. The scarce number of published articles also showcase a lack of empirical investigation, motivating a need for further research. This far, researchers have taken a macro perspective by analysing the contextual situation and surrounding factors influencing the EA (Foss & Gibson, 2015; Salomaa, 2019), a cultural perspective by focusing on the social aspects of EAs (Martin et al., 2019), a single case study (Pedroza-Zapata & Silva-Flores, 2020) and investigated the importance of cooperative research centres (Dolan et al., 2019). Several of these studies have applied the EA as a descriptive tool to analyse universities current state in the third mission transition, however none of them have investigated its actual effect on researchers' behaviour, the ones ultimately performing the third mission activities. This is particularly interesting, given that researcher's perception of their university' entrepreneurial engagement significantly impacts their ambitions within entrepreneurial activities (Kalar & Antonic, 2015).

Addressing this, Bazan et al., (2023) suggest the need for a quantitative approach and conduct a pre-study to construct and test a conceptual framework based on researchers' perceptions, which illustrates how the five elements of the EA indirectly affect the entrepreneurial propensity of researchers. The authors further argue that an understanding of how researchers perceive their environment provides insights for university management on how to adapt current initiatives to increasingly promote entrepreneurial activities (Bazan et al., 2023). However, the study reviews propensity, capturing whether researchers routinely scrutinise their research for commercial potential, which can be questioned as it is argued that entrepreneurial behaviour is best predicted by looking at intentions to pursue such activities (Prodan & Drnovsek, 2010; Bienkowska et al., 2016). Furthermore, Bazan et al (2023) analyse the indirect effect of the elements by including a mediator, measuring if researchers perceive the university as entrepreneurially oriented, which dismisses the understanding of whether the elements have any significant direct impact on researchers' behaviour. This demonstrates a gap in the literature, to investigate the direct impact of the EA from an individual perspective which advantageously can be done by looking at the behavioural predictor, entrepreneurial intentions.

Moreover, the originating authors of the university adapted EA argue that achieving a rewarding entrepreneurial architecture is dependent upon the balanced existence and coordination of all five elements. Absence or excessive presence of one element may affect the remaining elements negatively, and thus the entire achievement of the third mission (Nelles & Vorley, 2010a). This belief is however questioned by Foss and Gibson (2015). By analysing cross-case studies, the authors support the theorised interrelation between the elements, but they question both the need for balance to achieve an effective entrepreneurial transformation, and the assumption that all elements are equally important. Rather, the case studies illustrate that universities can successfully implement entrepreneurial architectures in different ways, depending on macro situation. How to approach the five elements might thus be dependent on the contextual conditions, making each element relatively important to prioritise for different universities. Additionally, the authors argue for the importance of culture, as it strongly influences – according to them – the conditions for the remaining elements (Foss & Gibson, 2015). However, neither their questioning nor the original authors reasoning is based on the constructs actual effect on researchers. Bazan et al.'s study (2023) provides a new, quantitative, well-grounded take on the EA by integrating the meso (university) and micro (researcher) perspective. Nevertheless, the quantitative model lacks indication to confirm both the direct

effect of the elements, and the underlying theoretical balance between the EA-elements to increase effectiveness. There is thus still a need to investigate how the elements are related to the behaviour of researchers, and if an overall balance between the elements is desirable.

2.3 Academic Entrepreneurial Intentions

The individual perspective of researchers is often investigated through the concept of Academic Entrepreneurship (Neves & Brito, 2020), referring to the overall utilisation of knowledge which students and researchers generate through patents, licences, start-ups, spin-offs, and collaborations with industry (Guerrero & Urbano, 2014). However, research distinguish the scope of commercialisation to licencing, patenting, and spin-off, thus separating it from industry collaboration (Neves & Brito, 2020). It has further been claimed that spin-off companies often are developed for consulting purposes (Hayter, 2011). There is an increased interest in research to understand the individual reseacher within third mission activities (Wright & Phan, 2018) where it has been demonstrated that knowledge transfer often is derived bottom-up, from the researcher to the university (Al-Tabbaa & Ankrah, 2019). To further understand the individual researcher, the field of Academic Entrepreneurial Intentions (AEI) explores factors that drive activities for utilisation of research (Neves & Brito, 2020). Research within entrepreneurship has even established intentions to be the most usable predictor for future entrepreneurial behaviour, both conceptually and empirically (Krueger & Carsrud, 1993; Prodan & Drnovsek, 2010; Bienkowska et al., 2016). Hence, there is a relevance in understanding the individual and its intentions in relation to the university.

Thus far, research within AEI has mainly circulated around psychological and personal factors of the individual (Feola et al., 2019). For instance, individual demographics, educational experience, and personal characteristics (Neves & Brito, 2020). It has further been found that intrinsic motivation is a key driver for entrepreneurial intentions among researchers, but that extrinsic motivation, e.g., financial incentives or recognition, often is required for actual action (Antonioli et al., 2016). Still, studies on how researchers perceive contextual factors in relation to academic entrepreneurship is scarce. Particularly, there is a lack of understanding of how a combination of contextual factors impact (Feola et al., 2019). This has been done by exploring the relationship between Triple Helix and entrepreneurial intentions, and for universities specifically, by investigating the impact of structural elements; TTO, incubator, and patent office (Feola et al., 2019) as well as monetary incentives, entrepreneurial peers, and social networks (Bijedić et al., 2023). There is thus still at rather limited picture of the university's

organisational potential for supporting academic entrepreneurial intentions regarding a combinatory of factors.

2.4 The Research Gap

Conceptual, holistic frameworks developed by researchers that connect the views of organisational university factors with the individual perspective claim to be novel contributions of theory (Feola et al., 2019; Bazan et al., 2023; Bijedić et al., 2023). This combination aligns with the literature on commercialisation, which suggests that there is a need to understand the internal policies and structures of universities to gain a nuanced indication of researchers' motivation (Miller et al., 2018). As the transfer of knowledge is claimed to be led bottom-up, an increased focus on the researcher is imperative (Al-Tabbaa & Ankrah, 2019). The EA provides a holistic perspective of the university's organising for commercialisation (Nelles & Vorley, 2010a), which has been quantitively validated in combination with researchers' entrepreneurial propensity (Bazan et al., 2023). However, the architecture's theoretical assumption of third mission effectiveness by balancing the five elements has been questioned (Foss & Gibson, 2015), but to the authors' knowledge, never been quantitatively investigated. This motivates further exploration of the EA, which can provide an additional theoretical understanding of how contextual factors in combination affect academic entrepreneurship (Feola et al., 2019). Conclusively, recent research encourages further investigation of the link between holistic organisational university support and commercialisation of research, which validates (i) a theoretical investigation of the EA combined with AEI, and (ii) an exploration of the theoretical foundation suggesting that the third mission is most effectively achieved through a balance of the five elements, from a researcher perspective.

2.5 Conceptual Model and Research Hypotheses

The theoretical framework is based upon the organisational university perspective of EA and the individual researcher perspective of AEI. The conceptual model is grounded in a quantitative perspective and will divide the variables into two parts: i) the five elements of the AE as independent variables, and ii) researchers' entrepreneurial intentions as the dependent variable. The conceptual model provides a visual representation of the theory of EA, linked to its potential effect on entrepreneurial intentions to pursue commercialisation activities of patenting and licensing, spin-off, and consulting.

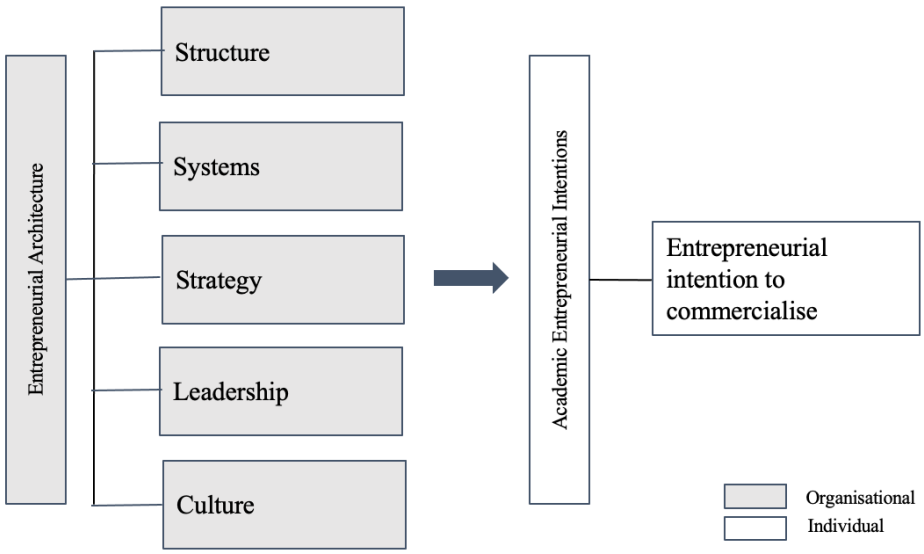

Figure 1. Visual representation of the conceptual model

2.5.1 Structure and Entrepreneurial Intention

The factors that represent the element of structure in the EA can be connected to previous research within AEI, where TTOs, incubators and entrepreneurial education are regarded as organisational support factors (Feola et al., 2019). Some researchers analysing these factors claim they are imperative for stimulating academic commercialisation activities (Bourelos et al., 2012; Brettel et al., 2013). However, the effect of TTOs specifically seems to be somewhat conflicting, as others have found it to be irrelevant to directly affect entrepreneurial intentions (Fini et al., 2009; Clarysse et al., 2011; Feola et al., 2019). Research reviewing both the indirect and direct effect of support factors find that it has a positive effect on researchers' attitude towards commercialisation which is linked to intentions but lacks direct significance for intentions independently (Feola et al., 2019). Similarly, it has been found to have a positive effect on researchers' perception of the university's entrepreneurial orientation, which in turn effect entrepreneurial propensity (Bazan et al., 2023). Summarising, the effect of the different factors within the element of structure has been individually investigated in the context of entrepreneurial intentions. Although contradictive results for TTOs, the structural mechanisms for support are suggested to facilitate for researchers which positively influences their entrepreneurial intentions.

H1a: There is a positive relationship between researcher's perceived support from structure and their entrepreneurial intentions to commercialise

2.5.2 Systems and Entrepreneurial Intention

Research regarding EA views systems as a network of actors and processes, of which effectiveness is determined by its coordination and integration (Vorley & Nelles, 2009). When reviewing the literature on entrepreneurial intentions in connection to networks specifically, research tends to group it into the external market and internal work surroundings. Regardless of internal or external focus, the network factor is found to have a positive relationship with intentions (Bijedić et al., 2023). Additionally, research has evaluated the social capital of researchers – access to individuals and organisations from whom information, resources, and overall support can be received – which has been found to positively influence researchers' intentions to pursue commercialisation activities (Aldridge & Audretsch, 2011; Wu et al., 2015; Fernández-Pérez et al., 2015). Hence, researchers who have access to a network can be connected to increased activity within commercialisation. This illustrates the relevance of systems, however, as previous research views external actors and internal networks as separate entities it fails to address the importance of integration and coordination, according to the theory of EA (Vorley & Nelles, 2009). Recent findings for processes and coordination specifically find a positive, yet indirect, effect on researchers' entrepreneurial propensity (Bazan et al., 2023). Conclusively, the empirics indicate that a well-integrated system for processes and actors can be expected to have a positive effect.

H1b: There is a positive relationship between researcher's perceived support from systems and their entrepreneurial intentions to commercialise

2.5.3 Strategy and Entrepreneurial Intention

Strategy, in the context of EA, is referred to as a way of setting clear goals and incentivising researchers (Vorley & Nelles, 2009; Bazan et al., 2023). Meanwhile, research regarding researchers' intentions review incentives as aspects of motivation and expected benefits (Ryan & Deci, 2000). Non-financial aspects, such as career enrichment and skill enhancement, has been emphasised as drivers for commercialisation activities (Hayter, 2011). Similarly, improved academic status is said to be a key factor for incentivising spin-off creation (Fini et al., 2009). The impact of financial incentives is on the other hand conflicting, as satisfaction with salary has been found to be negatively related to entrepreneurial intentions (Bijedić et al., 2023) whereas access to funding is often claimed to stimulate it (Ankrah et al., 2013). This previous research tends to investigate money as a motivation factor for entrepreneurial

intentions in general, but not whether researchers perceive the current financial incentives as relevant. As researchers' opinions of their environment can have a profound influence on their behaviour (Kalar & Antoncic, 2015), exploring the relationship between perceptions of incentives and entrepreneurial intentions can be encouraged. Regarding goal setting – the other aspect of strategy (Nelles & Vorley, 2011) – a clearly formulated strategy is found to have a significant effect on commercialisation output (Muscio et al., 2016). Similarly, strategy in general is found to indirectly effect entrepreneurial propensity positively (Bazan et al., 2023). The types of incentives provide conflicting effect on researchers' intentions which motivates the need for further investigation. However, as clear goals positively affect researchers, a clear strategy with attractive incentives is expected to increase entrepreneurial intentions.

H1c: There is a positive relationship between researcher's perceived support from strategy and their entrepreneurial intentions to commercialise

2.5.4 Leadership and Entrepreneurial Intention

Within the EA, leadership involves communicating visions and goals regarding the third mission activities to positively influence engagement (Martin et al., 2019). An effective leader role can be both formal or more informal (Vorley & Nelles, 2009), which is empirically supported within the research field of AEI. Both formal leaders and peers advocated support towards commercialisation has been found to have a positive effect on commercialisation activities (Bienkowska & Klofsten, 2012). Moreover, increased communication of information about commercialisation has been found to impact PhD-students perception of university support positively. However, the effect differs depending on attitude to commercialisation of research, where students with an initial interest seem to be more influenced (Bienkowska et al., 2016). Researchers' engagement in entrepreneurial activities has also been found to be influenced by their perception of the university department – if it is perceived as entrepreneurial, they are more likely to pursue such activities (Kalar & Antoncic, 2015). Similarly, the perception of a university's entrepreneurial orientation is positively related to entrepreneurial propensity, where leadership has an indirect effect (Bazan et al., 2023). Other research focusing on department-level has showcased its importance, as inadequate support from this level impedes the development of spin-offs, even if the process is supported by the university (Rasmussen et al., 2014). Similarly, a study found that the lower the hierarchy level, the more support for entrepreneurship was perceived among PhD-students within Science and Engineering (Bienkowska & Klofsten, 2012). Altogether, this illustrates the importance of

leaders communicating visions and goals within commercialisation of research, and it is thus hypothesised to have a positive effect on intentions.

H1d: There is a positive relationship between researcher's perceived support from leadership and their entrepreneurial intentions to commercialise

2.5.5 Culture and Entrepreneurial Intention

Within the theory of EA, Culture reflects both the individual and collective attitudes toward commercialisation (Vorley & Nelles, 2009). In terms of collective attitudes, it has been established that peers have a significant effect on the entrepreneurial intentions of individuals, as working closely to colleagues who are engaged in commercialisation activities positively influence the attitude towards such (Feola et al., 2019; Bijedić et al., 2023). Some even claim culture to have the most significant effect on researchers' commercialisation activities (Karlsson & Wigren, 2012). Research on the EA specifically, has found culture to indirectly affect researchers' propensity positively (Bazan et al., 2023). This relationship is supported in direct relation to entrepreneurial intentions and indirect through literature on EA. AEI support this relationship by reviewing peer effects, while theory of EA reviews culture holistically throughout the university. From the perspective of bottom-up, receiving support from culture throughout the university should lead to higher entrepreneurial intentions to pursue commercialisation activities.

H1e: There is a positive relationship between researcher's perceived support from culture and their entrepreneurial intentions to commercialise

2.5.6 The Balance of the Entrepreneurial Architecture and Entrepreneurial Intentions

According to the theory of EA, the execution of third mission activities is the most effective when all five elements are balanced. Insufficient or excessive presence of one element can have negative consequences for the other ones, and the overall entrepreneurial transition (Vorley & Nelles, 2009; Nelles & Vorley, 2010a). This belief has most commonly been assumed to hold true in previous research, however, Foss and Gibson (2015) question its legitimacy. The case studies they analyse illustrates that universities can start an entrepreneurial transition towards the third mission in several different ways, emphasising the individual elements to different extents. It can thus be questioned why a lack of one element could not be compensated with extra presence of another one. Or, as put by Foss and Gibson (2015), different university

contexts might be dependent on different EA elements to flourish entrepreneurially. However, Foss and Gibson's (2015) reasonings are based on more diagnostic implementations and an institutional perspective, thus, it does not necessarily consider the individual perspective of researchers. Additionally, they simply question this assumption from a qualitative reasoning, but never actually quantitively test its validity. Given that commercialisation requires the action of a researcher, it can be argued that an effective implementation of the EA should require reaching a desired effect on researchers' commercialisation behaviour. Therefore, to test the theory's underlying assumption from an individual perspective, it is accordingly hypothesised that researchers who experience a more even support from all EA-elements have higher entrepreneurial intentions to commercialise, compared to researchers who perceive a less balanced support. Additionally, based on the assumption of mutual support (Nelles & Vorley, 2010a; 2011), a balance between the elements should hypothetically also entail that the elements are perceived to be more supportive in general to reach effectiveness.

H2a: There is a negative relationship between an imbalance in perceived support from the EA-elements and researchers' entrepreneurial intentions to commercialise

H2b: There is a significant difference in entrepreneurial intentions for researchers who perceive more imbalanced support from the five EA-elements compared to researchers who report less imbalanced support

H2c: Researchers who perceive less *imbalanced* support between the five EA-elements also report *higher* levels of support from all EA-elements

Relationship	Hypothesis
EA-elements and entrepreneurial intention	H1a: There is a positive relationship between researcher's perceived support from structures and their entrepreneurial intentions to commercialise
	H1b: There is a positive relationship between researcher's perceived support from systems and their entrepreneurial intentions to commercialise
	H1c: There is a positive relationship between researcher's perceived support from strategy and their entrepreneurial intentions to commercialise
	H1d: There is a positive relationship between researcher's perceived support from leadership and their entrepreneurial intentions to commercialise
	H1e: There is a positive relationship between researcher's perceived support from culture and their entrepreneurial intentions to commercialise
Difference in perceived EA-elements and entrepreneurial intention	H2a: There is a negative relationship between an imbalance in perceived support from the EA-elements and researchers' entrepreneurial intentions to commercialise
	H2b: There is a significant difference in entrepreneurial intention for researchers who report more imbalanced support from the five EA-elements compared to researchers who report less imbalanced support
	H2c: Researchers who perceive less imbalanced support between the five EA-elements also report higher levels of support from all EA-elements

Table 2. Summary of hypotheses

3 Research Methodology

This chapter elaborates on the development of the methodology, including research design, method, and approach. Subsequently, the process of the preparatory and main study will be presented including ethical considerations and limitations. To conclude, the quality of the study will be discussed.

3.1 Research Paradigm, Methodology & Design

This study follows an explanatory nature as it aims to investigate the combined and balanced effect of perceived support from the elements of the EA on researchers' entrepreneurial intentions. The research design therefore employs a positivist paradigm, which emphasises the gathering of empirical information to provide logical reasoning for each rational assertion (Walliman, 2011), naturally grounded in the ontological position of objectivism (Bell et al., 2019). Furthermore, the conceptual theory of EA is used to observe organisational variables for researchers' entrepreneurial intentions in practice to derive new theoretical insights, implying a deductive logic of research. Conducting deductive research refers to the process of developing a theory using empirical observations (Collis & Hussey, 2014). Grounded in this, the study has outlined hypotheses derived from existing research regarding university support factors in relation to entrepreneurial intentions, which will be tested by collecting empirical data from researchers at Swedish universities. The deductive approach suggests that hypotheses failed to be falsified shall be recognised as true to reality (Bell et al., 2019). This entails gaining a further understanding to be able to develop a conclusion for a large population (Eliasson, 2018), which this study aims to do in terms of the EA and its effect on researchers' entrepreneurial intentions to commercialise.

Following the study's goals of objectivity and generalisability as well as epistemological foundation of positivism, a quantitative method is applied to measure the concepts under study (Bell et al., 2019). Recent literature on the topic of EA encourages quantitative research (Bazan et al., 2023) while a literature review on AEI concludes that most of its research is quantitative (Neves & Brito, 2020), which further signifies the approach's relevancy for the identified purpose. However, considering the humanistic element to this research study, an individual's intention, a quantitative study cannot capture novel in-depth understanding of the relationship between the variables to the same extent as a qualitative approach (Collis & Hussey, 2014). But as there is an emphasis on viewing the relations of various variables of university support

through a holistic approach, there is relevance in the objectivity of the analysis and larger sample size for reliability. Survey questionnaire is claimed to be particularly appropriate for compiling exactly this; large amounts of data (Collis & Hussey, 2014), and is therefore deemed suitable as method for the empirical data collection.

Lastly, criticism towards the quantitative approach in general should be acknowledged, which is mainly driven from its ontological and epistemological position. The critique tends to concern the aim for objectivity and thus lack of recognition for individual interpretations. Additionally, the focus on identifying relationships has been criticised due to its deficient understanding of why such relationships arise in certain circumstances (Bell et al., 2019). This critique is valid in any quantitative study, and this thesis is no exception. However, by including the option to freely answer an open-ended question regarding the survey's subject in general, additional perspectives and more nuanced perceptions from researchers are captured. As these answers are of more qualitative nature, they also provide the thesis' discussion with more subjective and elaborating interpretations of the results. Ultimately, this provided the data collection with increased robustness while also addressing some of the criticism towards the study's main research paradigm, without neglecting the quantitative results.

3.2 Preparatory Study

There are various aspects important to consider and test when developing a survey. In this study, a preparatory study was conducted with the aim of validating (i) relevance and wording of the questions, (ii) clarity of scales, and (iii) duration of the survey, to increase the reliability and validity of responses for the main study (Collis & Hussey, 2014).

Developing a questionnaire generally require numerous versions before the final study (Bell et al., 2019), in this study there were two stages of testing. As the objective of the pre-study was to gain deeper insights to the questions, clarity and duration, the pre-study was performed in a qualitative manner (Bell et al., 2019). This enabled more elaborating feedback on the content of the survey, to ensure clarity and relevance. Firstly, the pilot survey was sent over email to the supervisor of this thesis to revise survey questions thoroughly (Collis & Hussey, 2014). This involved sending a document with 27 prepared questions that was intended for the main survey, resulting in qualitative feedback, and enabling of iteration to confirm the formation of questions. This led to some changing of formulations to clarify and better capture researchers' perceptions. Once the questions were revised, they were used as a draft for the pilot survey. In

the second stage, the draft of questions was prepared in the online survey software Qualtrics. This was for the participants to have a clear idea of the clarity of scales and duration of the survey (Saunders et al., 2009). The pilot survey was performed by three researchers, which were provided with the Qualtrics survey and a word-document with questions to answer regarding the survey questions.[2] The respondents consisted of academic researchers working actively in Sweden, as the purpose was to gain perspective from participants as close to the main sample as possible to ensure understanding of terminology and context of study (Collis & Hussey, 2014). The pilot-survey was in English, while the questions to answer in the word-document were in the participants own language, Swedish. This was to be able to lower the language barrier and get deeper insight to the opinions about the pilot survey. The results from the pre-study gave insight to clarity of terminology and wording of questions. It also provided an estimated time for the survey of 6 minutes.

3.3 Main Study

The main study was developed based on the results from the pre-study. Methodologically, it involves (i) defining sample, (ii) designing the survey and (iii) collecting and processing data.

3.3.1 Survey Sample

Sweden has been explored in previous studies on entrepreneurial intentions, demonstrating its relevance within the research field. However, due to a smaller number of cases compared to many other countries, there is still potential to gain further insights (Neves & Brito, 2020). Since the thesis' aim to investigate not only entrepreneurial intentions, but how these are related to university support, the sample is firstly limited to researchers currently employed at Swedish universities. Moreover, the Swedish State has identified technology and medicine as research fields with significant potential for commercialisation (SOU 2020:59), indicating their relevance for investigation. To obtain a more concrete understanding of how researchers' perception of the *university support* effect intentions to commercialise, one of these research fields is chosen for the sampling. This is to limit the risk of technical differences in the commercialisation process or other field-based differences in attitude towards commercialising impacting the results. Therefore, institutes within engineering were chosen for sampling, as previous research has identified these researchers as more likely to pursue entrepreneurial

[2] Appendix 2 - Interview questions for pre-study participants

activities compared to researchers within health (Abreu & Grinevich, 2013). Further, the sample is limited to accurately capture elements of the EA. As the study measures support factors of TTO and incubator (Vorley & Nelles, 2009), these functions need to be present at the universities included in the study. Similarly, as the EA measures leadership on all levels of hierarchy (Vorley & Nelles, 2009), researchers with a management position is not included as they represent an aspect of the concept under study. In conclusion, three sample criteria were identified: researchers i) within fields of technology and science, ii) with access to TTO and incubator, and iii) not holding a title indicating management responsibilities.

Considering the distribution of the survey to targeted researchers, the option of utilising university management for distribution was considered but ultimately dismissed due to the potential risk of biasing responses through perceived involvement. Instead, manual distribution by collecting emails from the universities' official websites was determined as the preferred alternative, as it allows for accurate targeting of the survey sample and reduces the potential for misunderstandings. The practical limitations of contacting manually within the given time frame for this study led to the decision to contact researchers at five well-established universities. Within the five selected universities, all researchers within the technology and science field with officially published e-mail addresses were contacted. All researchers within the identified research fields at these universities thus had equal probability to participate in the survey. Including all Swedish universities fulfilling the identified sample criteria would have been desired, as the study aims to generalise the findings, but because of the practical limitations a sample of 7 874 researchers was deemed sufficient.

Although sampling criteria were initially employed to assure sample relevance, the final selection of five universities followed a non-probability approach. Specifically, convenience sampling was applied by assessing time efficiency in accessibility to contact details at the websites. Some limitations to convenience sampling as a method should be recognised, as it has been criticised for limiting generalisability due to a lack of representativeness of the population (Bell et al., 2019). However, it should be noted that this limitation was partly mitigated by initially applying relevant sampling criteria to ensure appropriate selection.

3.3.2 Survey Design

The survey was developed based on four modules; i) nine questions to capture demographics and experience in commercialisation activities, ii) three questions to capture the commercialisation intention, iii) fifteen questions for the EA-elements, iv) two optional questions to capture the attention span and gain deeper insights from participants.[3] In total, the self-completion questionnaire included 29 questions, out of which 27 were critical to the study and thus mandatory.

The content of the survey was fully in English. Despite the sample being Swedish universities, employees could still be of different nationalities. Conducting the survey in English also avoided impacting the validity, reliability, or replicability by translating the original wordings of concepts. As there are risks of misinterpretations (Eliasson, 2018), non-native English speakers were included in the pre-testing to validate the understanding of the wordings of the survey questions. The logic of the survey design was funnelling, starting with general questions to specific ones. The purpose of creating a clear context throughout the questionnaire was to make the respondent feel comfortable enough to reflect on specific questions (Collis & Hussey, 2014). The survey aimed to balance asking enough questions to be able to answer the hypotheses, but at the same time prevent the risk of respondent fatigue. To avoid such risk, the pre-study evaluated the length and relevance of questions to validate the content and length of the main study (Bell et al., 2019).

3.3.2.1 Classification Questions

The initial module included nine classification questions which served to describe and characterise the respondents (Collis & Hussey, 2014). Firstly, questions regarding place of employment and department were included ensuring correct sampling. As many individual aspects have proven to influence commercialisation behaviour among researchers, five additional questions captured such aspects to ensure avoidance of bias in responses due to an unusual distribution of these aspects. Age is deemed to affect commercialisation activities in different ways due to its connection to skills and network (Parker, 2018) as well as risk taking (Wickstrøm et al., 2022). Research experience was further captured, as knowledge is suggested to effect entrepreneurial behaviour (Rasmussen et al., 2011). This was coded by using an open

[3] Appendix 3 – Overview of questionnaire and coding of questions

text box which enabled creating optimal groups based on the responses. Previous experience in commercialisation activities can affect the attitude towards such, therefore questions captured the experiences of spin-off creation, consulting, patenting, and licensing. Lastly, ambition to commercialise before becoming a researching was included to further indicate attitude (Bourelos et al., 2012), measured though binary variables (yes=1, no=0).

3.3.2.2 Dependent Variables

In the second module, there were three questions measuring the intentions researchers had towards commercialisation to reflect the dependent variable in the conceptual framework. During this module, the study's definition of commercialisation activities was included to provide clarity and measuring of the correct concept. The questions were based on previous measures consistently and commonly applied to measure intention towards a behaviour within the literature of AEI. The three items asked for interest, determination, and probability of commercialisation (Krueger et al., 2000; Ajzen 2002; Obschonka et al., 2015). The items are each coded on a seven-point Likert scale ranging from "Not at all" to "Very", where high scores reflect increased commercialisation intentions.

3.3.2.3 Independent Variables

The third module included fifteen questions, with three questions for each of the five elements in the conceptual framework. The quantitative measures within this area of research could be using "Yes/No" (Bijedić et al., 2023) or Likert scale (Feola et al., 2019; Bazan et al., 2023; Bourelos et al., 2012). As the objective is to gain nuanced insight into how organisation factors are perceived to support researchers, a Likert-scale helps capture the attitude towards the independent variables representing EA. Ordinal values were therefore used in a seven-point Likert scale.

The content, and particularly the wording and structure of each question, is mainly derived from Bazan et al (2023) as this is the initial quantitative study connecting EA to researchers' perceptions. However, the questions were adapted based on the literature review of EA (Vorley & Nelles, 2009; Nelles & Vorley, 2010a; Martin et al., 2019) and somewhat influenced by literature on AEI (Feola et al, 2019; Bijedić et al., 2023).[4] The questions connected to structure,

[4] Appendix 4 – Table displaying the authors and literature each question was adapted from

leadership, and strategy were adapted to enhance their tangibility and distinctiveness for the respondents. In contrast to Bazan et al (2023), questions connected to the structure element were more specified, from "mechanisms" to TTO, incubator and education, e.g., "*My university's technology transfer office/innovation office simplifies the commercialisation of research*". This was adapted based on distinguishments both in the framework of EA and research on AEI (Vorley & Nelles, 2009; Feola et al., 2019). Questions within the element of strategy separate types of incentives, eg. "*My university provides attractive financial incentives to commercialising research (e.g., in wage determination, monetary awards)",* as research regarding AEI found different effects and distinguishment in monetary and non-monetary incentives (Bijedić et al., 2023). Further, leadership was adapted to measure different levels of hierarchy e.g., "*The executive management clearly motivates the strategic importance of commercialisation of research*", as research on EA highlights key leaders on all levels (Vorley & Nelles, 2009). All questions were designed to measure perception, rather than knowledge, of the specific factors within the elements. For instance, asking whether the TTO *simplifies*, and not whether the researcher is aware of its existence. This was due to the study's purpose of understanding the relationship between how researchers perceive their university context and their commercialisation intentions.

A choice was made to not include "no opinion" or "I don't know" as a response, as previous studies have shown that people generally do hold opinions, however providing them with an option to not answer encourages them to choose it anyway (Krosnick et al., 2002). Since the topic of research might not be frequently analysed by the respondents otherwise, it was considered that respondents might be prone to answering "no opinion" simply to be time efficient. To avoid this, such an option was therefore not included. However, a limitation to consider when requiring an opinion is the risk of reducing the representativeness of the data. To mitigate this, respondents had the opportunity to elaborate their opinions in an open-ended field at the end, or even quit the survey. Additionally, to avoid biased answers due to "respondent fatigue" (Bell et al., 2019), the order of the independent variables (elements in the EA) and their corresponding three questions were randomised.

3.3.2.4 Open-ended

By providing a self-completion questionnaire, respondents are less affected by the social desirability compared to an interview. This creates increased consistency in questions, as it limits the bias and allows more time to reflect on responses (Bell et al., 2019). However,

questions are then more subject to interpretation (Eliasson, 2018). To increasingly gain the perception of researchers, the final module included an optional open question with an opportunity for the respondent to answer freely regarding the topic (Collis & Hussey, 2014).

3.3.2.5 Control Question

A control question was included in the last module to ensure that the participants were paying attention to the content of the survey. The control question was formulated "To make sure you are paying attention answer 7" giving options "seven" and "six" in text to require reading and additional thinking (Bell et al., 2019). The right answer was placed as the last answer for less convenience. This was used to exclude any invalid answers in the data collection process.

3.3.3 Survey Collection & Process

The main survey was created and shared using the online survey software Qualtrics. Same as previous studies in this area of research, the survey was shared via work emails which were collected from the website of the universities (Bijedić et al., 2023; Kalar & Antoncic, 2015). As there was a limit on outlook to send 1000 emails daily per sender, emails were sent out to 7874 new potential respondents between 21st and 24th of March 2023. All receivers had a week to partake in the survey. A limitation in collecting the data through direct email is the possibility of email being received as junk mail, or relevant email addresses not being updated on the public website. Measures were taken to decrease this risk by sending emails with less receivers in an even time span. To increase response rate (Bell et al., 2019), a final reminder was sent the day before deadline between 27th to 30th of March 2023. The respondents received the same information in all forms of outreach to ensure comparability. This also ensured that the participants were aware of the purpose of the study to avoid bias. As the purpose of the study is to gain an understanding of how the university support is perceived, ensuring neutral and honest responses was important. Therefore, it was clarified that the study was done independently from the university, to avoid any bias in questions.

Out of the 7874 contacted researchers, the number of recorded responses was 841. This meant an initial response rate of 10.7 percent. Some responses were however excluded due to respondents belonging to departments other than technology and science, other universities than sampled, and failing to pass the control question. The final number of usable responses therefore turned out to be 615. This is an acceptable number given the population size (Krejcie & Morgan, 1970), and since similar studies have useable respondent numbers varying between

213-5998 (Feola et al., 2019; Bienkowska et al., 2016; Bijedić et al., 2023). Additionally, when surveying more homogenic populations, such as people within the same occupation, less variance is anticipated which allows for a smaller sample (Bell et al., 2019).

Respondents	(N)	(%)
University		
1	195	31,7
2	138	22,4
3	124	20,2
4	111	18,0
5	47	7,6
Department		
Technology	452	73,5
Science	163	26,5
Gender		
Male	471	76,6
Female	138	22,4
Other	6	1,0
Age		
<30	142	23,1
31-35	125	20,3
36-41	104	16,9
42-52	126	20,5
53<	118	19,2
Years of research experience		
<4	141	22,9
5-8	119	19,3
9-15	139	22,6
16-25	117	19,0
26+	99	16,1
Number of commercialisation experience		
0	244	39,7
1	155	25,2
2	134	21,8
3	82	13,3

Table 3. Sample demographics

This led to a usable response rate of 7.8 percent, which could be considered low in behavioural science generally (Baruch, 1999). However, studies performed using the same outreach and sample have also reported generally lower response rates (Feola et al., 2019; Bijedić et al., 2023), which could indicate the availability of the participants rather than the quality of the questionnaire. Additionally, the chosen method for distributing the survey entails several risks for less actual recipients compared to number of sent emails, e.g., due to automatic replies, spam mail filters and not updated email addresses on the official websites. Summarising, this entails that the actual number of survey recipients is lower than 7874, and thus also indicating a higher true response rate.

3.3.4 Ethical Considerations

To conduct research ethically there is a need to consider the code of conduct based on moral values in the manner of collecting, processing, and presenting both findings and results (Collis & Hussey, 2014). To provide transparency, the contacted participants were informed of the purpose of the study to then decide voluntarily to participate. This was to ensure a neutral perspective and avoid biased results. By explaining the purpose and use of the study, participants could have a clear understanding. To ensure privacy, participants were informed that the replies would be analysed at an aggregated level, avoiding invading any specific university. Confidentiality of the research data was considered by informing of GDPR in the pilot and main survey.[5] Participants were informed to then consent to the collection of data. This involved ensuring anonymity in the collection of data by not collecting data in the survey that could trace the answer to the participant. The data was ensured to be deleted upon completion of the study and kept confidential from any third parties. During the research process, the integrity of participants was ensured by informing participants of where the email addresses were collected and that all email addresses would neither be saved nor shared. The emailing was also sent under blind copy to ensure participants were kept anonymous from one another.

3.4 Quality of Data

The methodological rigour of the quantitative data was ensured through reliability, validity, and replicability (Bell et al., 2019), which is further elaborated on in the following sections.

3.4.1 Reliability

Stability

Ensuring reliability regarding stability entails that it holds steady within the time frame and context it is expected to hold (Bell et al., 2019). Ultimately, if conducting an additional test in the same sample on a later occasion in the same contextual setting, it should yield little variation in the responses for the measure to be stable. As entrepreneurial intention is a personal objective to perform a certain behaviour (Neves & Brito, 2020), it could slightly vary over extensive periods of time. Yet, as commercialisation activities require a rather long-term investment in

[5] Appendix 5 – GDPR information shared with respondents

terms of time and effort from the researcher, it is likely that the measurement holds consistent given a set same sample and context. Generally, as EA reflects a university setting, a new initiative could be made by university to any of the five elements. Hence, changes of EA could arise within a given timeframe and the contextual setting might then be perceived differently.

Internal Reliability

The concept of internal reliability, assuring that all indicators are linked to the same concept being measured, is especially applicable in this study, as both the score of all five elements in the EA as well as the entrepreneurial intentions were aggregated based on three question items to represent each variable. To test the internal reliability, Cronbach's Alpha is usually employed, where a score between 0.7-0.8 is deemed as sufficient (Bell et al., 2019). Applying this test to the measures above gave resulting alpha scores between 0.8-0.94 for all, indicating an acceptable internal reliability.[6]

Inter-rater Reliability

This aspect concerns avoidance of subjective judgement, which is especially risky when i) data collection consists of observations, ii) data must be categorised, and iii) these are performed by more than one person (Bell et al., 2019). As no observations were made, and the main data collection consists of a questionnaire with closed-end questions directly related to investigated measures, it is possible to argue for an acceptable inter-rater reliability. To avoid inconsistency in the categorisation of answers to the single open-ended question, this procedure was conducted in collaboration and agreement. Additionally, the open-ended question was not specifically related to any measurements, rather, it was supposed to provide the analysis and discussion with a qualitative depth.

3.4.2 Validity

Measurement Validity

The aspect of measurement validity concern whether the selected measurement correctly captures the chosen concept of investigation (Bell et al., 2019). The concept of entrepreneurial intentions has been tested extensively through quantitative methods (Neves & Brito, 2020). Hence, the measurement based on Ajzen (2002) is widely used, confirming its ability to capture

[6] Table 4 – Reliability of recoded variables (p.37)

the variable of intention. However, developing quantitative measurements to capture the EA is less established in the context of university. The previous developed measurements argue to have validity (Bazan et al., 2023), however, complete measurement validity is less assured due to the stage of research. The study took this into consideration by including measures that previously have been consistent in research regarding AEI but still can be related to the concept of EA, such as TTOs within structures (Feola et al., 2019).

Internal Validity

According to Bell et al., (2019), this aspect of validation concerns a discussion about the causality, and whether the identified relationship between the independent and the dependent variable can be asserted as true, and not be explained by an entirely different variable. As clarified by the authors (p. 47), "…*how confident can we be that the independent variable really is at least partly responsible for the variation that has been identified in the dependent variable*?". An attempt to limit variations due to other aspects has been made by restricting the sample of researchers to Swedish Universities within the scientific field of technology and science. This hopefully decrease the risk of intentions varying because of conditional differences in terms of national culture and regulations as well as research field-related opportunities. Nonetheless, research within AEI argue that intentions are affected by various, complex factors (Neves & Brito, 2020). The identified relationships thus showcase a connection between the variables; however, there are limitations in detection of causality.

External Validity

The external validity incorporates the element of generalisability, and whether the findings of a study can be applicable in other contexts than the one being researched. The main aspect to consider in such an evaluation is the sampling method (Bell et al., 2019). Considering the chosen sampling method of providing all available researchers within technology and engineering at the chosen universities the same possibility to answer, it can be argued that the findings are generalisable to other university departments within technology and engineering as well. At the same time, the research topic is highly context dependent in terms of regulations and culture (e.g., ownership of research findings) which might limit the transferability in settings with vast differences from Sweden. Additionally, the sample is limited to researchers within technology and engineering, implying that different findings could be found within other scientific disciplines, thus also potentially limiting the generalisability.

Ecological Validity

The last validation aspect to consider, is whether the findings are true to real life. Meaning, if the research results are representative for portraying reality. Research results can be theoretically validated in terms of technicalities, but not always valid for explaining the real world. In general, questionnaires can be questioned in this aspect, as the circumstances when answering are too distant from reality. Nevertheless, questionnaires are a common form of practice within quantitative research (Bell et al., 2019). Additionally, the questionnaire was sent to respondents work emails during work hours, increasing the chances of it being completed within the setting and mode being investigated.

3.4.3 Replicability

Replicability concerns the extent to which a study can be replicated by others to validate the findings. A prerequisite for replicability is a clear and detailed explanation of the pursued method and process (Bell et al., 2019). This study can thus be argued to be replicable, as all steps within sample selection, data collection and data analysis are distinctly and transparently outlined.

4 Empirical Analysis & Results

This chapter analyses the empirically collected data to support or disprove the hypotheses formulated based on the purpose of this study, i) investigating the effect of EA on entrepreneurial intention, and ii) evaluating the theoretical need for balance between elements based on a researcher perspective. Before presenting the results, the chapter opens with a presentation of the analytical tools used and the coding process for all variables.

4.1 Tools for Analysis

As previously outlined, Qualtrics was used for collecting data. The data was then transferred from Qualtrics to the analytical software IBM SPSS Statistics, which is a commonly employed statistical software tool within social sciences (Bell et al., 2019). The frequency of usage within the field of research underlines its relevance and validity for the purpose. To analyse the group of data in more detail, the SPSS data was also exported to excel to validate hypothesis H2c.

4.2 Recoding of Variables

Cronbach Alpha

Both the dependent variable; intentions, and the independent variables; structure, systems, strategy, leadership, and culture were based on grouped three-item questions. All questions consisted of a Likert-scale, ranging from 1 (not at all/strongly disagree) to 7 (very/strongly agree). Recoding each variable, the mean of their respective three-item questions was calculated. To assure the reliability of this practice, the internal consistency was calculated using Cronbach's alpha (Bonett & Wright, 2015), which assured an acceptable level above 0,8 for all variables (Bell et al., 2019).

	Survey Questions	Cronbach's Alpha
Intentions	Q10, Q11, Q12	0.906
Structure	Q13, Q14, Q15	0.865
Systems	Q16, Q17, Q18	0.925
Strategy	Q19, Q20, Q21	0.809
Leadership	Q22, Q23, Q24	0.875
Culture	Q25, Q26, Q27	0.829
EA	Q13-Q27	0.939

Table 4. Reliability of recoded variables

Factor Analysis

To assess the validity of the variables and their underlying structure, factor analysis was performed. The findings further ensure the validity and reliability of the questionnaire (Bell et al., 2019). The rotated component matrix obtained from the PCA shows the factor loadings of 15 items on five factors extracted from the data. Overall, the results indicate that there are five distinct factors that align with the five elements that represent the EA. This suggests that the factors are generally well-defined and can be meaningfully interpreted given the high average correlation (r=0.698-0.806) (Pallant, 2016). However, there are some deviations to consider. Factors within *Structure*, which measure the perception of TTO (structure1) and incubators (structure2) tend to moderately load onto the variable for system. The *strategy* factor measuring university goals (strategy1) has both a lower correlation (r=461) with the factor and loads onto factors for structure and systems. *Culture* has the widest correlation across all factors and the items that measure university culture (culture 2-3) have the most frequent overlap with r>0.3. As a factor loading of 0.3 or higher is generally considered to be a reasonably weak cut-off for determining whether a variable is loading onto a factor (Ximenez, 2016), this shows that culture has a significant tendency to measure the same construct as other variables.[7]

Variable for Imbalance

According to theory, the EA is the most effective when there is a balance between its five elements (Nelles & Vorley, 2010a; 2011). To capture the imbalance – perceived variation – between the five independent variables, researchers perceived support of each element is collected, and then the dispersion measurement of standard deviation is used to capture the amount of variation between all data values (Anderson et al., 2018). The relevance in analysing variety in responses is common for research on employee perceptions of policies, practices, and procedures to ensure consistent balance of perception (Roberson et al., 2007). This thesis conducts a similar analysis but in a university context which confirms that applying the same dispersion measure of standard deviation is appropriate. However, despite standard deviation being an established measurement, limitations do exist. The measurement is sensitive to outliers as these can be magnified. Further, low sample size or uneven distribution of groups tends to make standards deviation less stable (Roberson et al., 2007). Measures are taken by

[7] Appendix 6 – Results from factor analysis

collecting a large sample size and ensure equal sizes of groups as well as the elimination of large outliers.

When recoding the variable for imbalance, firstly internal reliability for all five independent variables was ensured using Cronbach's alpha.[8] To capture each researcher's variation in perceived support from the five elements, the individual standard deviation of the five independent variables (elements) was calculated and computed into a *new* variable. Which means, the new variable represented each respondent's standard deviation from the mean of perceived support from the five independent variables. To answer H2b-c, the new variable representing *imbalance between EA-elements* was used to split the respondents into two groups, one with "low standard deviation" (less imbalance in perceived support) and one with "high standard deviation" (more imbalance in perceived support) for a t-test and comparison of the means. To achieve a normal distribution, the groups were split based on the mean (M=0.95) (Pallant, 2016). To add further robustness to the t-test, the standard deviation variable was further computed to create groups which distinguish even higher and lower imbalance. This was done by transforming the variable through visual binning and dividing to three equal groups (33.3%). The highest and the lowest groups were then used in an additional t-test.

4.3 Coding Open-ended Questions

The survey included one open-ended question providing participants the opportunity to give input of choice to the subject. Given the extent of open-ended responses and their insightful reflections on the topic, the additional, more qualitative insights were decided to be utilised in the thesis to deepen the discussion. A total of 78 open-ended responses were collected, and by excluding the ones not aligning with the sample criteria or topic, 55 remained to be categorised and analysed. Noteworthy, the open-ended question was not constructed to derive data connected to any of the other survey questions specifically, rather, it was created openly and generally to provide additional perspectives to the topic. Hence, the content of the responses from the open-ended question varied greatly. Because of this, the coding was conducted using thematic analysis by categorising according to emerging themes in the data. To increase the inter-reliability, the coding was performed in agreement between the two authors (Bell et al.,

[8] Table 4 - Reliability of recoded variables (p.37)

2019). Quotations included in the thesis were translated from Swedish to English and corrected from any spelling mistakes if needed.

4.4 Results from Testing Hypotheses

To present a logical sequence of testing, the hypotheses are divided and presented based on the structure of the conceptual framework. The applied tests include a multilinear linear regression, t-tests, and mean comparisons. Finally, quotes from the open-ended questions with additional aspects are presented in a thematic analysis to provide further depth.

4.4.1 The EA-elements Effect on Entrepreneurial Intentions (H1a-e)

A correlation measure was included to gain an initial understanding of the strength and direction of the relationships (Cohen, 1988) both between the EA-elements and its effect on researchers' entrepreneurial intentions. The Pearson correlation showed that all five independent variables had a significant positive correlation with intentions. Based on Cohen's (1988) reference, a strong correlation was found between leadership and intentions ($r = .312$, $p < .001$). The other independent variables also had significant positive correlations with intentions, with culture having the second-highest correlation ($r = .226$, $p < .001$), followed by structure ($r = .190$, $p < .001$), systems ($r = .176$, $p < .001$) strategy ($r = .115$, $p = .004$). These are however considered moderate to weak correlations (Cohen, 1988).

Furthermore, the correlation between the five independent variables was also analysed. The results showed that all independent variables had significant positive correlations with each other. The strongest correlation was found for *systems* with structure ($r = .697$, $p < .001$), culture ($r = .639$, $p < .001$), and strategy ($r = .638$, $p < .001$). *Culture* had the highest correlation with all independent variables in general, meanwhile, leadership had the lowest. Overall, there is still no correlation greater than 0.9 which otherwise would signify multicollinearity (Pallant, 2016).

Correlations						
		Intentions	Structure	Systems	Strategy	Leadership
Intentions	Pearson Corr					
	Sig. (2-tailed)					
	N					
Structure	Pearson Corr	**.190****				
	Sig. (2-tailed	<.001				
	N	615				
Systems	Pearson Corr	**.176****	**.697****			
	Sig. (2-tailed	<.001	<.001			
	N	615	615			
Strategy	Pearson Corr	**.115****	.559**	**.638****		
	Sig. (2-tailed	.004	<.001	<.001		
	N	615	615	615		
Leadership	Pearson Corr	**.312****	.497**	.568**	**.602****	
	Sig. (2-tailed	<.001	<.001	<.001	<.001	
	N	615	615	615	615	
Culture	Pearson Corr	**.226****	.634**	.639**	.634**	**.635****
	Sig. (2-tailed	<.001	<.001	<.001	<.001	<.001
	N	615	615	615	615	615

** Correlation is significant at the 0.01 level (2-tailed).

Table 5. Pearson's correlation for the five independent variables (structure, systems, strategy, leadership, and culture) and one dependent variable (intentions)

To analyse whether the EA-elements of *structure, systems, strategy, leadership, and culture* together influence *commercialisation intentions*, hypotheses were formulated which reflect that increased perceived support from the EA-elements would reflect higher intentions. To validate the hypotheses given the conceptual framework, a multiple regression analysis was performed to examine how each of the five independent variables predicts the intentions of the researcher, while also controlling for the effects of the other variables and how they interact with each other (Pallant, 2016). To validate the use of multiple linear regression, a previous analysis was conducted confirming (i) lack of multicollinearity (VIF < 5)[9], (ii) two outliers based on the Mahalanobis distance in data output compared to chi-square distribution with the five degrees of freedom (Tabachnick & Fidell, 2013), and (iii) homoscedasticity through Breusch-Pagan test (p .758 > .05) (Pallant, 2016).

The analysis suggests that the coefficient for *structure* (β= .073) is not statistically significant at a five percent level (p= .199). Despite the weak positive coefficient, the lack of statistical significance implies that the relationship does not indicate a positive effect. H1a is not supported.

[9] Appendix 6 – Results from multilinear regression

H1a: There is a positive relationship between researcher's perceived support from structure and their entrepreneurial intentions to commercialise

NOT SUPPORTED

The coefficient for *systems* is slightly negative (β= -.004), and the relationship between systems and commercialisation intentions is not statistically significant at a five percent level (p= .953). This indicates that support from systems, when investigated with the other elements, is not relevant for commercialisation intentions. H1b is not supported.

H1b: There is a positive relationship between researcher's perceived support from systems and their entrepreneurial intentions to commercialise

NOT SUPPORTED

The coefficient for *strategy* is negative (β= -.175) but is statistically significant at a five percent level (p=.002). However, the negative coefficient for strategy indicates that commercialisation intention decreases by increase in strategy. H1c is not supported.

H1c: There is a positive relationship between researcher's perceived support from strategy and their entrepreneurial intentions to commercialise

NOT SUPPORTED*

There is a moderate positive coefficient for leadership (β= .330) which is statistically significant beyond a one percent level (p <.001), indicating that researchers who find leadership more motivating have higher entrepreneurial intentions. H1d is supported.

H1d: There is a positive relationship between researcher's perceived support from leadership and their entrepreneurial intentions to commercialise

SUPPORTED

Finally, the coefficient for *culture* (β = .083) has a weak effect on the dependent variable but is not statistically significant at the conventional five percent level (p=.160). Therefore, the relationship between the researcher's perceived support from culture and their entrepreneurial intention does not seem to be relevant in this context. H1e is not supported.

H1e: There is a positive relationship between researcher's perceived support from culture and their entrepreneurial intentions to commercialise

NOT SUPPORTED

The results from the multiple linear regression indicate that two out of the five independent variables (*leadership and strategy*) have a statistically significant relationship with *entrepreneurial intention*.[10] The Cohen (1988) perspective suggests that the coefficients for *leadership* and *strategy* can be considered as moderate effects. Overall, the model has an adjusted R2 of 0.108, generally values around 0.1 are common within the field of research as there are various factors besides university environment which can affect intentions (Bazan et al., 2023).

	β	t	p	R2	Adjusted R2	df	F	sig
Structure	0,073	1,286	0,199					
Systems	-0,004	-0,60	0,953					
Strategy	-0,175	-3,148	0,002	0,115	0,108	609	15,826	<0,001
Leadership	0,33	6,224	<0,001					
Culture	0,083	1,406	0,16					

Table 6. Multiple linear regression output

4.4.2 Imbalance in Perceived Support from the EA-elements Effect on Entrepreneurial Intentions (H2a-c)

To analyse whether imbalance, thus variations, in perceived support influenced *commercialisation intentions*, a hypothesis was formulated to reflect that increased perceived imbalance would reflect lower intentions. Since imbalance in this study is captured by high standard deviation, according to theory, this would be less effective and report a lower entrepreneurial intention to commercialise. To capture the relationship between two variables, a bivariate analysis is applicable (Bell et al., 2019), and therefore a linear regression was performed to test the hypothesis regarding imbalance and entrepreneurial intentions. The conducted linear regression showed a weak positive relationship between the standard deviation variable, thus an imbalance in perceived support from EA-elements, and commercialisation intentions (β=.084) (Cohen, 1988), which was proven to be statistically

[10] Appendix 6 – Results from multilinear regression

significant at a five percent level (p=.037). However, the statistical significance indicates a weak *positive* relationship, instead of a negative. This indicates that increased perceived imbalance between elements is related to higher intention. Hypothesis 2a is thus not supported.

H2a: There is a negative relationship between an imbalance in perceived support from the EA-elements and researchers' entrepreneurial intentions to commercialise

NOT SUPPORTED*

To further investigate the effect of imbalance in perceived support, the computed variable representing imbalance – standard deviations – was divided into two groups consisting of i) low imbalance and ii) high imbalance. When reviewing the same variables between two groups, an independent sample t-test is applicable to analyse the comparative means (Bell et al., 2019). Therefore, a t-test was conducted to test the hypothesis that evaluates the difference in commercialisation intentions between two groups that report higher or lower variation (imbalance) in responses.[11] The Lavene's test displayed a non-equal variance (F=10.254, p=.001), which indicates that there is no significant difference on a one percent level (t(568.8)=-1.378, p=.169) in the means of entrepreneurial intentions between the group with a low imbalance in perceived support from the elements (M=3.78, SD=1.60) compared the group with high imbalance (M=3.98, SD=1.82). This contradicts the hypothesis assuming a significant difference, although the mean of intentions for the group with low imbalance is slightly lower than high imbalance.

	N	Mean	Std.D	t	p
Low SD	328	3,78	1,60	-1,378	0,169
High SD	285	3,98	1,82		

Table 7. Independent sample t-test on entrepreneurial intention in low and high standard deviation groups

An additional t-test was conducted to achieve more robust results, this time with more extreme low and high (33.3%) groups. Further, Levene's test confirmed a non-equal variance (F=13.791, p<.001), suggesting no significant difference on a one percent level (t(397)=-1.221, p= .223)

[11] Appendix 6 - Results from t-test

in the means (intentions) for the group with low imbalance (M=3.88, SD=1.57) and the group with high imbalance (M=4.09, SD=1.89). This further validates the lack of difference in commercialisation intentions between the groups that perceive high or low imbalance (standard deviation) from EA-elements. H2b is not supported.

	N	Mean	Std.D	t	p
Low SD	203	3,88	1,57	-1,221	0,223
High SD	207	4,09	1,90		

Table 8. Independent sample t-test on entrepreneurial intention in extreme low (>1.13=33.3%) and high (<0.73=33.3%) groups from standard deviation.

H2b: There is a significant difference in entrepreneurial intentions for researchers who perceive more imbalanced support from the five EA-elements compared to researchers who report less imbalanced support

NOT SUPPORTED

The previous tests analyse the imbalance in relation to intentions, however, further distinguishment is required as a low standard deviation for a respondent does not necessarily equal a consistent reporting of strong support from all five (x>4), it could just as much entail consistent reporting of lower levels of support (x<4). To account for this, and further validate the importance of balance and its effectiveness, a comparison of means of each independent variable is analysed between the groups that report higher or lower imbalance in responses. Hence, hypothesis is formulated to validate that researchers who perceive less *imbalanced* support between the five EA-elements also report *higher* levels of support from all EA-elements When comparing the mean score, the group that perceives less imbalance, translated to less standard deviation in support between the EA-elements, have higher mean scores for *systems* (M 3.75 > 3.73), *strategy* (M 3,60 > 3,14) and *leadership* (M 3,57 > 2,88). Meanwhile, the group that has higher perceived imbalance, thus high standard deviation in support from the elements, reports higher mean scores for *structure* (M 4,16 < 4,79) and *culture* (M 4,26 < 4,65). As the hypothesis claims that *all* mean scores should be higher for the group with low imbalance between EA-elements, H2c is not supported.

Compare mean	Structure	Systems	Strategy	Leadership	Culture	N
Low SD	4,16	3,75	3,60	3,57	4,26	328
High SD	4,79	3,73	3,14	2,88	4,65	287
	-0,62	0,02	0,68	0,46	-0,40	

Table 9. Average means for the two groups with low and high standard deviations

H2c: Researchers who perceive less *imbalanced* support between the five EA-elements also report *higher* levels of support from all EA-elements

NOT SUPPORTED

Relationship	Hypothesis	Result
EA-elements and entrepreneurial intention	H1a: There is a positive relationship between researcher's perceived support from structures and their entrepreneurial intentions to commercialise	Not supported
	H1b: There is a positive relationship between researcher's perceived support from systems and their entrepreneurial intentions to commercialise	Not supported
	H1c: There is a positive relationship between researcher's perceived support from strategy and their entrepreneurial intentions to commercialise	Not supported*
	H1d: There is a positive relationship between researcher's perceived support from leadership and their entrepreneurial intentions to commercialise	Supported
	H1e: There is a positive relationship between researcher's perceived support from culture and their entrepreneurial intentions to commercialise	Not supported
Difference in perceived EA-elements and entrepreneurial intention	H2a: There is a negative relationship between an imbalance in perceived support from the EA-elements and researchers' entrepreneurial intentions to commercialise	Not supported*
	H2b: There is a significant difference in entrepreneurial intention for researchers who report more imbalanced support from the five EA-elements compared to researchers who report less imbalanced support	Not supported
	H2c: Researchers who perceive less imbalanced support between the five EA-elements also report higher levels of support from all EA-elements	Not supported

* Not supported but significant at the 0.05 level (2-tailed).

Table 10. Summary of hypotheses results

4.5 Analysis of Open-ended Answers

The responses to the open-ended question, "*If you have any further input on the topic, please feel free to share*", varied in terms of topic and richness due to the openness of the question. However, the authors categorising of usable answers revealed five main themes.

	Themes	Codes
1.	Differences within universities and between departments	8
2.	Individual factors have an impact	4
3.	Conflicts of interests	9
4.	Critical opinions about commercialisation	14
5.	Low interest – low awareness	20

Table 11. Thematic categorising of open-ended answers

The first theme, *Differences within universities and between departments (T1.)* concerns different aspects of university support and management, closely related to the EA. The theme indicates that there seems to be a need for alignment, both within goal setting between the university and TTO, as well as in terms of communication between departments. Regarding departments, the extent of and attitude towards commercialisation also seem to vary within a university depending on faculty.

"In my case the University has very unclear goals regarding commercialisation and sometimes against it. However, Y [innovation office] are super helpful and a strong driving force to commercialise research work. Unfortunately X [university] and Y [innovation office] does not seem to be very well aligned on this topic"

Furthermore, the importance of lower-level managers is highlighted:

"My closest boss (Professor) is a major driving force for getting research into industry. He has been involved with several start-ups/spin-offs based on his research. It is thanks to him my research now has the possibility to be commercialised. I feel that X [university name] also wants to promote commercialisation, but the problem is all the steps between my boss and the university in general, where there are a lot of "old-minded" people who still thinks that "good" research needs to be free from commercialisation interests. This is something my boss have been working to change for a long time"

Lastly, this theme also concerns reward systems, as one researcher lift the lack of rewards for commercialisation within academia.

"*For us that have made a spin-off company we know that in practice you do not have any advantage of a commercialisation when you return to the academia*"

The second theme, *Individual factors have an impact (T2.)*, reveal that sometimes university support is not sufficient – instead, individual factors are lifted as key for commercialising.

"I think our university provides really good support, but it's a matter of whether one is interested in commercialisation or not"

"*I think it is very much an issue of personality if you are willing to go into commercialisation. It is a risk that also can cost you really a lot, both economically and from the personal perspective"*

This can be further supported by Figure 2, displaying how researchers that had ambitions to commercialise before becoming a researcher report higher entrepreneurial intentions to commercialise today, compared to researchers with no such initial ambitions, who report lower intentions on the scale.

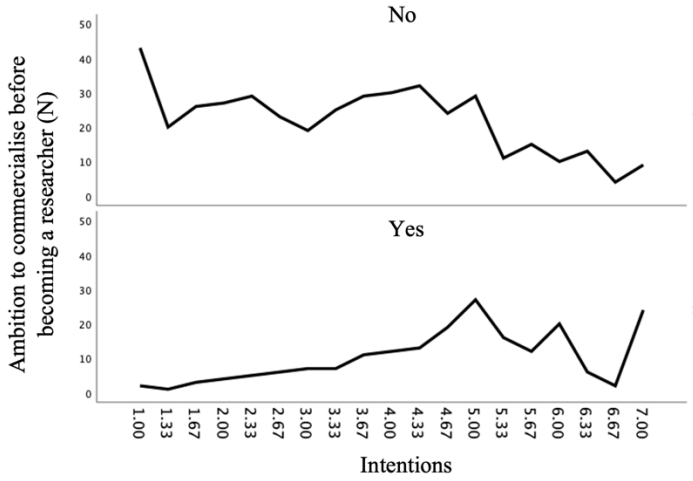

Figure 2. The linear relationship between researchers that had/had no ambitions to commercialise before becoming a researcher and current commercialisation intentions

The third theme, *Conflict of interests (T3.),* is based on three groups of codes: contradicting logic, requirements of publishing rates, and lack of time. The first two essentially entail that the activities of traditional publication of research and commercialisation of research conflict

and contradict, making it difficult for researchers to pursue both. Adding on this, there also seems to be a lack of time and resources.

"One of the major obstacles for commercialisation as an researcher is the strong focus on publication in academia which makes it difficult to "withhold" data to explore commercial opportunities. The publications are needed to survive in academia and works against commercialisation. At least if you are not a well-established researcher with a lot of funding and have sufficient resources to carry out both…"

"*I would say that the university actively discourages commercialisation due to the demands on publishing rate. There is always a major trade-off between maintaining a good enough publication record to keep being funded by external sources and the need to keep potentially patentable finding confidential. The process of getting help with patenting is too slow for this to work. If patents could be quickly filed this would not be as much of a problem"*

"Science fulfils its purpose when it's actively used by as many people as possible to solve problems. The development of science follows its own logic that drives science to new depths and breadths, building bridges among the most unexpected subjects. The commercialisation of science is essentially an obstacle to scientific development by reducing its reach"

"*The major obstacle for commercialising my research is NOT the support system in itself, it is rather the lack of time on the personal level. Having seen start-ups growing, you realise that any commercialisation takes masses of efforts, time and passion. And in a trade (research and education) that also taps the same sources (time, efforts, and passion) I find it hard to amass the needed personal resources. No matter the support system, it will take personal efforts from the inventor. My main passion etc is within the academic trades, why I choose to remain there, albeit with some regret*"

Furthermore, the theme <u>*Critical opinions about commercialisation (T4.)*</u> cover some more diverse aspects. Some mention that the commercialisation process is difficult to execute. Others take a more critical standpoint towards university's prioritisation of commercialisation in general. Similar to this, and closely related to the time constraints, the wish for entrepreneurs to take over the process is lifted.

"… the survey seems to mirror the idea that commercialising research is inherently good. There are many ways to spur innovation: to encourage already heavily overloaded university researchers to do it themselves is not necessarily the way to go"

"*Overall, I (and I think most other researchers) only care about support for the work that I do. Since I am uninterested in commercialising my research, I don't look for support for it, so I have no idea what it looks like. The only thing for me is that I want others to be able to commercialise my research without having to deal with contracts etc, just want to release them for the wind to make a better society, but there is not a lot of support for how to do that in a good way*"

"*The problem with today's system is that it is us, the researchers, who are expected to lead the commercialisation. I don't understand how this should work as we are usually better at researching. One change I would like to see is that the universities' innovation offices could become a meeting point where researchers (with ideas and new technology solutions) could meet entrepreneurs (with business thinking) and make a switch/transfer so that the entrepreneur makes use of the research and the researcher can stay in the lab*"

Lastly, *Low interest – low awareness (T5.)*, reveals that researchers who are uninterested in, or unexperienced of, commercialisation also are unaware of what support the university offers. This also resulted in several respondents reporting the usage of number 4 – the indifferent option – as "I don't know".

"*There should have been an option for "I don't know". I understand the motivation for the study, but it is not necessary for every researcher to be aware about commercialisation of research in their university. For many of the questions asked I did not know the answer because I really don't care. For me my research is about adding knowledge to existing set, and don't view it as a commercial item*"

"*For several questions about the commercialisation of the university on a higher level I missed the alternative "I do not know". Since I am not active in that area, I probably "sort out" those activities. I used 4 as my answer to be neutral*"

This could mean that the score 4, in addition to its definition of “Neither agree nor disagree” (indifferent) in the survey, has a meaning of “I don’t know” for researchers lacking interest in commercialisation. The descriptive statistics of the quantitative empirical data showed that the elements with higher comparative percentages of indifferent scores (x = 4) are structure (16.4 percent) and systems (14.5 percent).

		Structure	Systems	Strategy	Leadership	Culture
High	N	349	224	164	159	360
	%	56,7	36,4	26,7	25,9	58,5
Indifferent	N	101	89	72	72	54
	%	16,4	14,5	11,7	11,7	8,8
Low	N	165	302	379	384	201
	%	26,8	49,1	61,6	62,4	32,7
Total	N	615	615	615	615	615

x > 4 High, x = 4 Indifferent, x < 4 Low

Table 12. Distribution of the responses

5 Discussion

To discuss the findings in connection to the question of research, the following will analyse the empirical results in relation to theory regarding i) the relationship between the five elements of the EA and commercialisation intentions and ii) the theoretical assumption of the EA requiring balance between the elements to be effective.

5.1 The Elements of the Entrepreneurial Architecture and Entrepreneurial Intentions

The previous results reflect researchers' perceptions of the Swedish university support and its effect on their entrepreneurial intentions to engage in commercialisation activities. By applying the theory of EA, it reflects the direct effect of each of the five elements – structure, systems, strategy, leadership, and culture – on entrepreneurial intentions. The elements display varying results, which provides insights to how they affect intentions when investigated combined.

Structure

Out of the elements of EA, the factors of structure (TTO, incubator and education) are the most clearly linked to research within AEI. However, previous findings give conflicting implications for entrepreneurial intentions. This study's result indicates that, despite being moderately correlated with entrepreneurial intentions, structure as an element has no direct significant effect in relation to the other EA-elements. This means that the structural mechanisms of the EA facilitating commercialisation activities does not influence the intention to perform such. This further validates the recent findings of Feola et al (2019), which deviates from the findings in previous literature (Bourelos et al., 2012; Brettel et al., 2013).

When contemplating the insignificant effect, one potential explanation might be that structure received the highest frequency of indifferent opinions (x=4). As suggested by the open-ended findings within *low interest and low awareness* (T5), the indifference can also indicate unawareness of what support functions entail. Further suggested by a researcher (T4), the lack of interest in commercialisation can lead to passivity to information regarding functions facilitating such activities. Hence, having insufficient knowledge about the subject may complicate the understanding of questions, which might lead to an overall inconsistent reporting of support. This could potentially explain the lack of statistical power. Nevertheless, 56.7% of the respondents still reported high support (x<4) from the structural factors. This means that researchers can have high perceptions of TTOs, incubators and entrepreneurial

education, but it is still not significant for intentions to engage in related activities. Ultimately, this provides important insights for management of the structural element in practice, as its factors, e.g., TTOs, might be reported as rather supportive in internal surveys and similar, but with such insights alone it will not be possible to draw any conclusions on its effect on actual behaviour.

A further explanation might reside in the definition of structure, which imply that its functions facilitate the actual process of commercialising (Bazan et al., 2023) and that researchers often interact with these instances when wanting to engage in entrepreneurial activities (Martin et al., 2019). Considering this, one could contemplate whether structure does not in fact, as the results indicate, stimulate initial intention, but rather reduce barriers for actual execution once researchers already have such intentions. Support factors within the element of structure might thus facilitate the process of commercialising, but it does not make me more willing to pursue it. To summarise, it can nevertheless be concluded that perceived support from the element of structure becomes insignificant for commercialisation intentions when investigated in combination with other support factors, which is in line with recent findings (Feola et al., 2019).

Systems

Same as previous quantitative research on the EA, this study investigates *systems* by emphasising internal coordination of actors and procedures. Yet, the results deviate from previous research which claim that systematic internal coordination have an indirect relationship with researchers' entrepreneurial propensity (Bazan et al., 2023). On the contrary, this result indicates that system has no direct significant effect on entrepreneurial intentions. The insignificant direct effect could, similar to structure, be related to the uninterest in commercialisation, which is suggested to create a distance from support functions "…*Since I am uninterested in commercialising my research, I don't look for support for it…"(T4).* Considering that the system element involves the integration of actors and processes towards commercialisation (Nelles & Vorley, 2010a), it could explain the lack of effect on intentions as it is difficult to evaluate the process for commercialisation without experience. Hence, the findings suggest that internal integration and processes does not affect researchers' intention, but perhaps it might facilitate the actual activity.

Furthermore, given the emphasis on coordination of actors and processes, it is not unexpected that the results showed a strong relationship with the elements of structure, culture, and strategy.

Considering the theoretical definition in combination with the empirical results, this could indicate that adaption to system as an element is needed. An additional aspect of systems in the original EA-framework is the network of communication (Nelles & Vorley, 2010a). This can be connected to the literature on AEI, which assert that accessibility to network is found to have a positive effect on researchers perusing of commercialisation (Aldridge & Audretsch, 2011; Wu et al., 2015; Fernández-Pérez et al., 2015). Therefore, it is suggested that system as an element could be distinguished by emphasising accessibility to network, rather than integration and coordination, when conceptualised with intentions.

Strategy

A surprising, yet interesting finding is the effect of strategy. The results indicate that perceiving support from strategy has a significant, moderately negative effect on entrepreneurial intentions. The statistical relationship entails that researchers who perceive the university's commercialisation-related goals as clear and find the incentives as attractive have less entrepreneurial intentions, whereas researchers' who perceive less support from the university's strategy have more entrepreneurial intentions. This contradicts the theory of EA (Vorley & Nelles, 2009) and goes against related findings within AEI suggesting that academic status (Fini et al., 2009), career enrichment and skill enhancement (Hayter, 2011), access to funding (Ankrah et al., 2013) and clear strategies Muscio et al., 2016) are either drivers or positive for engagement in commercialisation activities.

Furthermore, the results indication of a reversed effect becomes complex when reflecting on the empirical situation. Therefore, it can be questioned whether the results reflect the researcher's attitude to prioritisation of commercialisation in strategy, or the strategy itself. The results indicate a number of critical opinions, *"…to encourage already heavily overloaded university researchers to do it themselves is not necessarily the way to go"* (T4). This shows that there is a critical attitude towards universities increased prioritisation of commercialisation. On the other hand, researchers with a positive attitude towards commercialisation activities potentially find current strategies insufficient or contradicting, e.g., "*For us that have made a spin-off company we know that in practice you do not have any advantage of a commercialisation when you return to the academia*" (T1). Researchers who are open for commercialising might thus experience the arising conflict of interests (T3) - publication logics, merits, and time constraints – which make them less satisfied with current strategies.

Nevertheless, regardless of potential explanations for the result, the fact that strategy and entrepreneurial intentions have a negative relationship remains.

Leadership

The findings indicate leadership to be of most importance for researchers' intentions to peruse commercialisation activities, as the result displayed a moderately strong, positive relationship. This result is in line with previous findings for commercialisation activities (Bienkowska & Klofsten, 2012). Given that top-down mechanisms have been claimed to hinder commercialisation (Jones & Patton, 2020), the findings indicating that the rather hierarchical element of leadership positively affect intentions provides new insights. When further reflecting on the effect of different levels of leadership, a respondent (T1) argues for the importance of support from one's closest manager, especially when commercialisation is not otherwise appreciated within the university. This is further strengthened by previous research, where support for commercialisation has been found to be especially strong in lower hierarchy levels (Bienkowska & Klofsten, 2012), and where absence of support from department-level has been proven as determinant of commercialisation outcome, regardless of support from top-management (Rasmussen et al., 2014). Additionally, one could argue that the closest manager can be thought of as more informal, and in extreme cases perhaps even more comparable to colleagues. In such case, it could be related to previous research highlighting of peers as impactful for one's attitude towards commercialisation (Bijedić et al., 2023). At the same time, research within EA argue that the effect on the third mission transition is even greater when supported by powerful positions (Martin et al., 2019).

Combing all aspects, an interesting implication could thus be the importance of perceiving support from lower-level managers for impacting academic researchers' entrepreneurial intentions. This might be due to their combination of personal relationships much like peers (Bijedić et al., 2023), while still being influential because of a formal senior position (Martin et al., 2019). The results thus reflect on the levels of leadership, highlighting how perceived support from leadership has great potential to effect entrepreneurial intentions. Based on this, university management should increasingly prioritise supportive leadership in terms of encouraging managers, clear communication of goals, and emphasising of strategic importance through top management.

Culture

Finally, culture reflects the individual and collective attitude towards commercialisation. The results indicate that culture has no significant effect on entrepreneurial intentions. This contradicts previous empirical findings which suggest that peers have a significant effect on entrepreneurial intentions (Feola et al., 2019; Bijedić et al., 2023). However, this study does not only measure peers, but also the overall university culture. This holistic perspective of culture is further reflected in the findings, as culture is highly related to all EA-elements, which relates to previous literature on the EA, suggesting that culture is firstly influenced by environment, and then in turn effect the other EA-elements (Foss & Gibson, 2015). Therefore, the strong relation with other elements is not surprising, but it could potentially contribute to reduced statistical power of culture when including all five elements. Hence, further distinguishment could be needed to better capture the effect of culture.

Additionally, previous research emphasises that a shared vision and positive attitude towards third mission activities is important (Martin et al., 2019). When reviewing the open-ended findings, it shows that current peers can have conflicting attitudes "*…there are a lot of "old-minded" people who still thinks that "good" research needs to be free from commercialisation interests. This is something my boss have been working to change for a long time" (T1)*, which complicates the alignment of a collective culture. This further signifies that to evaluate the organisational attitude, the EA could capture the alignment of attitudes within departments when connected to commercialisation intentions. Summarising, the results suggest that perceived support from culture has no effect on intentions when investigated with the other university support factors. Further adaption is therefore suggested to emphasise the aligned attitude towards commercialisation.

The Complete Entrepreneurial Architecture

The EA is a holistic, interrelated framework illustrating the university's infrastructure for third mission activities (Nelles & Vorley, 2010a). This study's results indicate that its five elements are highly related to each other, which is expected according to the theory. However, based on the previous discussion, not all elements were found to be significant for impacting entrepreneurial intentions, on the contrary, only the elements of leadership and strategy are significant. It can thus be argued that the EA in its entirety is not directly related to developing entrepreneurial intentions among academic researchers. This contributes with novel insights to

the theoretical combination of EA and the individual perspective of researchers, which previously have established the elements indirect effect on entrepreneurial propensity (Bazan et al., 2023). Further, it supports Foss and Gibson's (2015) questioning of the theoretical assumption that all EA-elements are equally important for effective third mission transition, as the result indicates that they have distinct impacts on researchers' entrepreneurial intentions – in general the most usable predictor for entrepreneurial behaviour (Prodan & Drnovsek, 2010). The results contribute with new theoretical understanding, as their reasoning is based upon a contextual macro perspective (Foss & Gibson, 2025), which has now been complemented with an individual researcher perspective in terms of entrepreneurial intentions.

Furthermore, the results illustrate that having ambitions to commercialise before becoming a researcher is positively related to having current entrepreneurial intentions[12]. Similarly, the findings suggest that individual attitudes towards commercialisation influence how open researchers are to commercialisation support, as highlighted by a respondent "*I think our university provides really good support, but it's a matter of whether one is interested in commercialisation or not*" (T2). This indicates that researcher's attitude and motivation might impact to what extent university support is effective, which aligns with the findings of Antonioli et al (2016), who suggest that willingness to engage in academic entrepreneurship is best predicted by intrinsic motivation. Similarly, Feola et al (2019) suggest that factors of structure have a strong effect on researchers' attitude, which then effects entrepreneurial intentions. Summarising, as attitude towards commercialisation is suggested to be influential (Neves & Brito, 2020), exploring this within the conceptual framework could provide further understanding of the EA-elements in relation to intentions.

5.2 Balancing the Elements of the Entrepreneurial Architecture

The theoretical assumption of a desired balance between the elements was for the first time tested by examining its relationship to researchers' entrepreneurial intentions. According to the theory of EA, under- or overstimulation of one element may affect the remaining elements, and the effectiveness of the entire third mission, negatively (Vorley & Nelles, 2009). The results indicate that there is no significant difference in intentions when there is high or low imbalance

[12] Figure 2 - The linear relationship between researchers that had/had no ambitions to commercialise before becoming a researcher and current commercialisation intentions (p.48)

in support. Rather, the result shows that higher imbalance between the elements had a slight increase in intentions. Hence, achieving a perceived balance between all elements might not be preferable for the purpose of increasing researchers' entrepreneurial intentions. These findings are in line with the reasoning of Foss & Gibson (2015) who argue that the relevance of the different elements might depend upon the university's external context – the macro perspective. It is noteworthy to point out that the EA is developed as an organisational theory for displaying how a university effectively can execute third mission activities (Nelles & Vorley, 2010a), which is not fully captured by entrepreneurial intention. However, as previous research suggests the process' derives bottom-up through the actions of researchers (Al-Tabbaa & Ankrah, 2019), the relationship to the individual perspective can be argued as valuable.

To investigate the concept of balance, it was further hypothesised that the group with low imbalance between the EA-elements would report higher levels of support. This adds to the previous insights, as it measures whether the EA-elements are perceived as effective as well. However, the results indicate that when perceiving more balance between the elements it was not consistently perceived as effective. This means that the groups that perceived low imbalance did not report higher perceived support from all five EA-elements, combined with previous reasoning, this further support the suggestion that some elements might be more important that others (Foss & Gibson, 2015). The previous quantitative attempt to link EA to the individual researcher, does not question the theoretical foundation of balance (Bazan et al., 2023). As combining the theory of EA with the individual perspective is novel research (Bazan et al., 2023), these findings indicate that such a quantitative framework should consider the stronger effect of certain elements. Overall, reviewing the balance could still be of interest, as it additionally measures the researcher's perception between the EA elements.

6 Conclusions

This final chapter aligns with the previous identified research gaps and summarises the thesis' findings by answering the two research questions and outlining the theoretical contribution as well as managerial implications. The limitations are further addressed followed by suggestions for future research.

There is a growing practical and theoretical interest in commercialisation of research, as universities now are expected to contribute to societal development through their third mission. Yet, the management of universities continue to struggle with implementing effective mechanisms to stimulate such activities. Addressing this, the thesis sought to extend the existing literature elaborating on how combined contextual factors are related to entrepreneurial intentions (Bijedić et al., 2023; Feola et al., 2019). The authors followed a novel direction within the field of research by combining the organisational theory of Entrepreneurial Architecture with an individual researcher perspective (Bazan et al., 2023) through integrating its five elements with entrepreneurial intentions. More specifically, the thesis aimed to answer two research questions i) "*How does academic researchers' perceived support from the elements of the Entrepreneurial Architecture in Swedish Universities affect their entrepreneurial intentions*?", and ii) "*How does an imbalance in perceived support between the five elements affect academic researchers' entrepreneurial intentions?*". From the discussion, it can be concluded that the effect of perceived support from the five elements differ. A key finding is the influential importance of *leadership*, which is particularly interesting given the teacher exemption and the rather bottom-up derived process. The element of *strategy* on the other hand effects commercialisation intentions negatively, whereas the remaining three elements – *structure*, *systems*, and *culture* – had no direct relation to commercialisation intentions. The discussion further illustrates that an imbalance in perceived support from the five elements is not relevant for influencing researchers' intentions. These insights provide a foundation for both theoretical contributions and practical implications.

6.1 Theoretical Contributions

The holistic investigation of how contextual factors interplay and collectively affect entrepreneurial intentions contributes to the literature on AEI (Feola et al., 2019; Bijedić et al., 2023). The thesis additionally contributes to research on the EA by increasing the quantitative understanding of the relationship between its elements and the researcher (Bazan et al., 2023)

through investigating perceived support from the elements direct effect on intentions. The thesis extends the understanding of the original conceptual framework (Nelles & Vorley, 2010a) by relating it to researchers' entrepreneurial intentions, clarifying that the elements are not equally influential on individual behaviour. A key contribution is the potential of leadership, which is suggested to have the highest effect in relation to the other elements. The results further suggest that the element of strategy negatively affect entrepreneurial intentions, and it adds to the theoretical understanding of structure and systems, which are insignificant for stimulating intentions when investigated in combination with other university support. It is however suggested that they might facilitate the execution process once the decision to commercialise has been taken. Lastly, culture as a phenomenon is rather diffuse in practice, and the same seems to hold true for its theoretical element as the study reveals that support from culture is widely related to the other elements. This support previous arguing of how culture influence the remaining elements (Foss & Gibson, 2015), but it also indicates a need for distinguishment to measure it more accurately. Summarising, the findings provide additional understandings of how holistic university support factors effect AEI in combination, illustrating that the aspects then differ in importance. Ultimately, this contributes with new theoretical understandings of how the EA within a university setting (Vorley & Nelles 2009; Nelles & Vorley, 2010a; 2011) effect a key actor for commercialising – the researcher (Jain et al., 2009). Further, aligned with Foss & Gibson (2015), the findings question the theory's argument that all elements are equally important for university's third mission. Previous research question this from a contextual macro perspective, which is now complemented with a micro perspective in terms of how perceived support effect researchers' intention to pursue such activities.

Finally, following previous questioning of a desired balance between the EA's elements (Foss & Gibson, 2015), the thesis quantitatively investigates this assumption, to the authors knowledge for the first time, by connecting it to the individual perspective. The findings suggest that perceiving balance between the elements is not relevant for stimulating entrepreneurial intentions. Ultimately, this questions the theoretical need for a balance between the five elements and provides new insights to the EA as a theory, when investigated in terms of its direct effect on entrepreneurial intentions of researchers. Given that commercialisation is considered a bottom-up derived process (Al-Tabbaa & Ankrah, 2019) and that intentions are suggested to be the most usable predictor of entrepreneurial behaviour (Prodan & Drnovsek, 2010; Bienkowska et al., 2016), this provide valuable theoretical insight for further research of

the EA where increased distinguishments between the elements is be needed. This theoretical insight should be considered in further developments of quantitively takes on the EA in relation to individual behaviour (Bazan et al., 2023).

6.2 Managerial Contributions

This thesis suggests that managerial efforts should not be equally allocated to the different aspects of university support if the purpose is to stimulate commercialisation intentions. The study reveals the potential of leadership – how perceived support from managers and executives can affect researchers' intentions to pursue commercialisation activities. It is therefore suggested that top management should clearly communicate their support towards commercialisation activities, and especially its strategic relevance. It also places great emphasis on middle- and lower-level managers, who can influence on a more daily basis. It is therefore suggested for university management to consider this aspect when recruiting and promoting managers if increased commercialisation engagement among researchers is desired. Concretely, this can for instance include new criteria when recruiting managers, as well as educational programs to increase leaders' awareness and knowledge of the subject. It can also include developing practical recommendations for how managers on all levels can communicate the university's goals and prioritisation of the third mission. Additionally, the study reveals that strategy has potential to effect intentions, but practical alterations of goals and incentives are needed to stimulate the desired effect.

6.3 Limitations

The study is not without its limitations, which should be acknowledged to further elaborate on the implications of the study's results and potential avenues for future research.

The Novelty of the Entrepreneurial Architecture as a Diagnostic Tool within AEI

Aa previously stated, the EA has recently been tested quantitatively by validating its effect on the individual researcher (Bazan et al., 2023). Although the literature on AEI extensively has used quantitative methods to evaluate how different factors effect entrepreneurial intentions before (Neves & Brito, 2020), the quantitative application of EA to researchers is novel. Consequently, the authors acknowledge some limitations of this study. Firstly, this thesis studies entrepreneurial intentions which focus on researchers' willingness to pursue commercialisation. The individual perspective has been encouraged through previous research (Bazan et al., 2023), however, it does not capture the full extent of the third mission, which the

theory of EA is originally based on (Nelles & Vorley, 2010a). Therefore, some elements could be applicable in other aspects of the third mission, such as the outcome of commercialisation. This thus limits the broad generalisations that can be made for the theory of EA. However, the findings still provide novel insights to measure a more precise aspect of the third mission, intentions.

Secondly, there is subsequently not a complete established measurement to capture perceived support from the EA-elements in the context of a university setting. Given the outcome of correlations between independent variables, some of the measurements are suggested to overlap and capture similar constructs. Additionally, not all respondents seemed to have enough knowledge of some investigated factors to be able to have a perception of them (e.g., usage of 4 as "I don't know"). The study could have hindered this by validating the survey through a quantitative pre-study, in addition to the qualitative one. An extended timeframe for the study could have allowed for further optimisation of the measurements by testing the elements relationship to the dependent variable. If the questionnaire would have been updated to distinguish the measurement for each element, it is possible that this could have impacted the results. The authors took measures to offset these limitations by evaluating the literature on AEI with the purpose of adapting the questionnaire to capture elements based on validated previous findings. Similarly, given the findings that many researchers are unaware of certain support factors, the questionnaire could have avoided the assumption of functions being common knowledge. However, the authors did review governmental documents listing the incentives and structure functions that are currently established in Sweden to ensure that the elements were present in the contextual setting.

Thirdly, the study aimed to investigate the effect of balance between elements. In addition to the limitations of researcher perspective and the concept of intentions, the rather novel method for measuring imbalance is also a limitation. The statistical measurement of standard deviation is in general widely known and accepted. Additionally, it has been applied within social science to capture differences in perceived organisational support of groups before. However, this study constructed the groups on high and low variability which differ from most studies which compare variability of groups based on demographics (Roberson et al., 2007). Because the application within this field of research and for this purpose is, to the authors knowledge, novel, further validation through additional studies is necessary.

Broad Definition of Commercialisation Activities

The study applies a broader definition of commercialisation by including more than one related activity. According to a review of literature on AEI it seems to be more common to study a separate entrepreneurial activity (Neves & Brito, 2020). As the third mission refers to commercialisation (Vorley & Nelles, 2009), the study aimed to capture a broader sense of commercialisation which corresponds to literature on EA. The activities measured includes patenting, licencing, spin-off creation and consulting, which could involve different implications for researchers, and thus also impact their responses in the survey. Given this, having a more specific definition, e.g., focusing solely on spin-off creation, could have created a different result. Even though the study aimed at capturing a broader definition in accordance with the EA (Bazan et al., 2023), this limits the implications of the findings, as it cannot fully indicate how the elements impact a specific commercialisation activity.

Contextual Factors Impacting Conditions for Commercialising

In general, studies suggest that the impact of entrepreneurial intentions is influenced by contextual settings (Feola et al., 2019). Given the Swedish context, a unique factor for the university setting is the teacher exemption. The exemption states that academic researchers are the owners of their research results (Karlsson et al., 2015), which could provide different dynamics between the university and researchers compared to countries where findings belong to the university. Hence, the authors acknowledge that the results may differ from other empirical settings as the conditions for commercialisation greatly differs. Even though the exemption made the context of Sweden specifically interesting to examine from a bottom-up perspective, it still implies some limitations to the study's generalisability to other countries.

6.4 Suggestions for Future Research

The thesis insightful findings regarding the EA in relation to the individual researcher's activity towards the third mission, initiate further discussions and potential research within the field. Firstly, this study reviews the relationship between EA and researchers. As it is considered as novel to quantitatively analyse the EA-elements in relation to researchers, there is naturally more research needed to validate the conceptual framework. This study proposes different suggestions of alterations, emphasising both alignment of culture and network for systems. Future studies could develop the quantitative model by adapting and further investigating culture and systems in relation to commercialisation intentions.

Secondly, the results further indicate that perceived support from some of the elements might be of more relevance for realising commercialisation ideas, compared to increasing intentions to do so. To further validate the effect of university support and evaluate the institutionalisation of entrepreneurship, a process-oriented approach could be relevant to understand when and how elements interact with researchers that have intentions to commercialise. Future research could review the ongoing process of researchers with entrepreneurial intentions to commercialise to explore the interaction with EA elements to distinguish which factors are relevant for either stimulating intention to commercialise or facilitating the commercialising activity. This could give thorough understanding of the third mission and how each element contributes.

Thirdly, the study evaluates the theoretical foundation of balance between the elements of EA for effective implementation. As this study questions the need for balance and equal implementation of all elements, further understanding of the interrelation between the elements is relevant. Future studies could therefore investigate the link and interrelation between the elements through quantitative methods to understand how change or emphasis on one element effect the others. An alternative is performing structural equation modelling as used by Bazan et al (2023), to analyse more than one dependent variable. Since this study's purpose was to understand the direct effect of the elements in combination, no mediators have been investigated. Such an investigation could also provide depth and enrich the understanding of the elements' interaction. Given the findings that researchers' awareness or attitude towards commercialisation could be an indicator, this could be further explored as a mediator in the EA, which is common in AEI literature when applying the theory of planned behaviour (Neves & Brito, 2020).

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Appendix 1

Filters for literature search

	Subject area delimitations	Document type	Source type
Scopus	Business, management and accounting Social sciences Decision sciences Economics, econometrics and finance	Article	Journal
Web of Science	Management Engineering manufacturing Operations research management science Business Economics Psychology	Article	Journal

Appendix 2

Interview questions for pre-study participants

1. How long did it take for you to complete the survey?
2. How easy was it to understand the scale/ranking?
3. Did the survey become tiring? If yes, why?
4. What do you think about the definition of commercialisation?
5. Are there any questions or choice of words that needs clarification? If yes, what, and why?
6. What do you think can be clarified to improve the survey experience?
7. Other comments?

A text for mail distribution is provided below, which will be sent with the survey link:

8. Do you think the purpose of the survey and study is communicated clearly? If unclear, elaborate why?
9. Do you think the text creates incentive for recipients to answers the survey? How do you think the incentive could be improved for responses? (Especially, for researchers with less initial interest for commercialisation).

Appendix 3

Overview of questionnaire and coding of questions

		Code	Type
Q1	Current employer (University		Demographics
	Blekinge Tekniska Högskola	1	
	Chalmers Tekniska Högskola	2	
	Gävle Universitet	3	
	Halmstad Högskola	4	
	Jönköping Tekniska Högskola	5	
	Karlstad Universitet	6	
	Kungliga Tekniska Högskola	7	
	Linköping Universitet	8	
	Linnéuniversitetet	9	
	Luleå Tekniska Universitet	10	
	Lunds Universitet	11	
	Mittuniversitetet	12	
	Mälardalens Högskola	13	
	Umeå Universitet	14	
	Uppsala Universitet	15	
	Örebro universitet	16	
	Other	17	
Q2	Department of belonging		
	Technology	1	
	Science	2	
	Medicine and pharmacy	3	
	Human science and art	4	
	Social science and law	5	
	Language	6	
	Other	7	
Q3	Gender		
	Male	1	
	Female	2	
	Other	3	
Q4	Age		
		Open text	
Q5	Years of research experience		
In the following sections, commercialisation refers to activities where research findings are utilised by starting spin-offs, offering consulting, applying for patents and licensing.			
Q6	Do you have experience in patenting and/or licensing research results?		Commercialisation experience
	Yes	1	
	No	0	
Q7	Do you have experience in starting, or in any way contributing to, a spin-off based on your research results?		
	Yes	1	
	No	0	
Q8	Do you have experience in offering consulting activities based on your research results?		
	Yes	1	
	No	0	
Q9	Before becoming a researcher, did you have any ambitions to commercialise (patenting, licensing, spin-off, consulting?		
	Yes	1	
	No	0	
Commercialisation refers to patenting, licensing, spin-offs and consulting activities			
Q10	How interested are you in commercialising your research results?		Commercialization intention
	Not at all interested	1	
	Indifferent	4	
	Very interested	7	
Q11	How determined are you to commercialise your research results?		
	Not at all determined	1	
	Indifferent	4	
	Very determined	7	
Q12	How likely is it that you will commercialise your research results?		
	Not at all likely	1	
	Indifferent	4	
	Very likely	7	

The next part of this survey will be asking about your perception of the support at your univversity. Please rate the folllowing in terms of how much you **strongly agree** or **strongly disagree** with each statement.			
	My university's technology transfer office/innovation office simplifies the		Structures
Q13	commercialisation of research.		
	Strongly disagree	1	
	Indifferent	4	
	Strongly agree	7	
	My university's incubator/science park simplifies the		
Q14	commercialisation of research.		
	Strongly disagree	1	
	Indifferent	4	
	Strongly agree	7	
	My university's entrepreneurial education		
Q15	encourages the commercialisation of research.		
	Strongly disagree	1	
	Indifferent	4	
	Strongly agree	7	
	The process for commercialising research at my		Systems
Q16	university is clear.		
	Strongly disagree	1	
	Indifferent	4	
	Strongly agree	7	
	Activities for commercialising research are well-		
Q17	integrated with each other.		
	Strongly disagree	1	
	Indifferent	4	
	Strongly agree	7	
	Actors for commercialising research are well-		
Q18	integrated with each other.		
	Strongly disagree	1	
	Indifferent	4	
	Strongly agree	7	
	My university has clear goals focusing on		Strategies
Q19	commercialisation of research.		
	Strongly disagree	1	
	Indifferent	4	
	Strongly agree	7	
	My university provides attractive non-financial incentives to commercialising research (e.g., in		
Q20	promotion systems, academic recognition.		
	Strongly disagree	1	
	Indifferent	4	
	Strongly agree	7	
	My university provides attractive financial incentives to commercialising research (e.g, in wage		
Q21	determination, monetary awards.		
	Strongly disagree	1	
	Indifferent	4	
	Strongly agree	7	
Q22	My managers encourage commercialisation of research.		Leadership
	Strongly disagree	1	
	Indifferent	4	
	Strongly agree	7	
	My managers communicate clearly regarding the		
Q23	commercialisation goals of the university.		
	Strongly disagree	1	
	Indifferent	4	
	Strongly agree	7	
	The executive management clearly motivates the		
Q24	strategic importance of commercialisation of research.		
	Strongly disagree	1	
	Indifferent	4	
	Strongly agree	7	

Q25	My peers have a positive attitude towards commercialisation of research in general.		Culture
	Strongly disagree	1	
	Indifferent	4	
	Strongly agree	7	
Q26	My university values and encourages commercialisation initiatives from its researchers.		
	Strongly disagree	1	
	Indifferent	4	
	Strongly agree	7	
Q27	My university takes initiatives to inspire commercialisation activities within the university.		
	Strongly disagree	1	
	Indifferent	4	
	Strongly agree	7	
Q28	Finally, to make sure you have been paying attention press 7		Control question
	six	1	
	seven	2	
Q29	If you have any further input on the topic, please feel free to share. (optional)		
		Open text	

Dependent Independent

Appendix 4

Table displaying the authors and literature each question was adapted from

	Survey Question	Adapted from authors	Based on literature	Variable type
Q10	How interested are you in commercialising your research results?	Krueger et al., 2000; Ajzen 2002; Obschonka et al., 2015	AEI	Commercialization intention
Q11	How determined are you to commercialise your research results?	Feola et al., 2019	AEI	
Q12	How likely is it that you will commercialise your research results?	Krueger et al., 2000; Ajzen 2002; Obschonka et al., 2015	AEI	
Q13	My university's technology transfer office/innovation office simplifies the commercialisation of research.	Vorley & Nelles, 2009; Feola et al., 2019	EA, AEI	Structures
Q14	My university's incubator/science park simplifies the commercialisation of research.	Vorley & Nelles, 2009; Feola et al., 2019	EA, AEI	
Q15	My university's entrepreneurial education encourages the commercialisation of research.	Bazan et al., 2022	EA	
Q16	The process for commercialising research at my university is clear.	Bazan et al., 2022	EA	Systems
Q17	Activities for commercialising research are well-integrated with each other.	Bazan et al., 2022	EA	
Q18	Actors for commercialising research are well-integrated with each other.	Bazan et al., 2022	EA	
Q19	My university has clear goals focusing on commercialisation of research.	Bazan et al., 2022	EA	Strategies
Q20	My university provides attractive non-financial incentives to commercialising research (e.g., in promotion systems, academic recognition.	Bazan et al., 2022; Bijedić et al., 2023	EA, AEI	
Q21	My university provides attractive financial incentives to commercialising research (e.g, in wage determination, monetary awards.	Bazan et al., 2022; Bijedić et al., 2023	EA, AEI	
Q22	My managers encourage commercialisation of research.	Bazan et al., 2022	EA	Leadership
Q23	My managers communicate clearly regarding the commercialisation goals of the university.	Bazan et al., 2022	EA	
Q24	The executive management clearly motivates the strategic importance of commercialisation of research.	Vorley & Nelles, 2009; Bazan et al., 2022	EA	
Q25	My peers have a positive attitude towards commercialisation of research in general.	Vorley & Nelles, 2009; Bazan et al., 2022	EA	Culture
Q26	My university values and encourages commercialisation initiatives from its researchers.	Bazan et al., 2022	EA	
Q27	My university takes initiatives to inspire commercialisation activities within the university.	Bazan et al., 2022	EA	

Appendix 5

GDPR information shared with respondents

Hi and welcome!

The two of us, Elsa and Amanda, are currently studying the last semester of our masters at Stockholm School of Economics. This survey is a part of our master thesis and its data collection, in which **we focus on how current university support systems affect researchers' intentions to commercialise** their findings. The data will be handled by the two of us, both anonymously and on an aggregated level.

The survey is estimated to require **6 minutes** of your time, and we would be very grateful for your effort! If you have any concerns or questions, you are more than welcome to reach out to **Elsa 42087@student.hhs.se**, or **Amanda 42093@student.hhs.se**.

You can close the window anytime when filling out the survey if you no longer wish to participate.

Many thanks for your time and effort!

Elsa Sidemo & Amanda Karlsson

→

GDPR

The student's project. As an integral part of the educational program at the Stockholm School of Economics, enrolled students complete an individual thesis. This work is sometimes based upon surveys and interviews connected to the subject. Participation is naturally entirely voluntary, and this text is intended to provide you with necessary information that may concern your participation in the study or interview.

Confidentiality. Anything you say or state in the survey will be held strictly confidential and will only be made available to supervisors, tutors and the course management team.

Secured storage of data. All data will be stored and processed safely by the SSE and will be permanently deleted when the project is completed in June 2023. No personal data will be published. The thesis written by the students will not contain any information that may identify you as a participant to the survey or interview subject.

Your rights under GDPR. You are welcome to visit https://www.hhs.se/en/about-us/dataprotection/ in order to read more and obtain information on your rights related to personal data.

By pressing continue, you confirm that you have taken part of the information provided above and consent to take part in this study.

← →

Appendix 6

Results from factor analysis

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.916
Bartlett's Test of Sphericity	Approx. Chi-Square	7122.491
	df	105
	Sig.	<.001

Total Variance Explained

		Initial Eigenvalues		Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.163	54.417	54.417	2.921	19.477	19.477
2	1.388	9.255	63.672	2.554	17.028	36.505
3	1.035	6.901	70.574	2.453	16.350	52.855
4	.840	5.601	76.174	2.189	14.596	67.451
5	.697	4.650	80.824	2.006	13.373	80.824
6	.576	3.843	84.667			
7	.427	2.845	87.512			
8	.371	2.471	89.984			
9	.288	1.917	91.900			
10	.274	1.827	93.727			
11	.259	1.728	95.455			
12	.240	1.600	97.056			
13	.181	1.207	98.263			
14	.178	1.184	99.447			
15	.083	.553	100.000			

Extraction Method: Principal Component Analysis.

Rotated Component Matrixa						
	Component					
Factor	1	2	3	4	5	Survey question
Systems3	0,834					Actors for commercialising research are well-integrated with each other.
Systems2	0,823					Activities for commercialising research are well-integrated with each other.
Systems1	0,760					The process for commercialising research at my university is clear.
Mean	0,806					
Strcuture3		0,811				My university's entrepreneurial education encourages the commercialisation of research.
Structure2	0,383	0,782				My university's incubator/science park simplifies the commercialisation of research.
Structure1	0,490	0,709				My university's technology transfer office/innovation office simplifies the commercialisation of research.
Mean		0,767				
Leadership2			0,828			My managers communicate clearly regarding the commercialisation goals of the university.
Leadership1			0,779		0,383	My managers encourage commercialisation of research.
Leadership3			0,77			The executive management clearly motivates the strategic importance of commercialisation of research.
Mean			0,792			
Strategy3				0,847		My university provides attractive financial incentives to commercialising research (e.g, in wage determination, monetary awards).
Strategy2				0,818		My university provides attractive non-financial incentives to commercialising research (e.g., in promotion systems, academic recognition).
Strategy1	0,322	0,398		0,461		My university has clear goals focusing on commercialisation of research.
Mean				0,709		
Culture1			0,338		0,807	My peers have a positive attitude towards commercialisation of research in general.
Culture2		0,326		0,327	0,7	My university values and encourages commercialisation initiatives from its researchers.
Culture3	0,379	0,384		0,339	0,588	My university takes initiatives to inspire commercialisation activities within the university.
Mean					0,698	

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a Rotation converged in 7 iterations.

Regression results from multilinear regression for H1a-d and H2a

		Model summary		ANOVA			Coefficients						Collinearity statistics	
		R	R2	F	df	p	β	SE	t	p	LLCI	ULCI	Tolerance	VIF
1	Overall model	0,115	0,108	15,826	609	<0,001								
	Structure						0,073		1,286	0,199	-0,048	0,229	0,451	2,219
	Systems						-0,004		-0,60	0,953	-0,141	0,132	0,397	2,519
	Strategy						-0,175		-3,148	0,002	-0,37	-0,086	0,47	2,128
	Leadership						0,33		6,224	<0,001	0,254	0,489	0,516	1,939
	Culture						0,083		1,406	0,16	-0,04	0,24	0,415	2,408
2	Overall model	0,084	0,007	4,366	614	0,037								
	Imbalance (SD)						0,084	0,151	2,089	0,037	0,019	0,61	1,00	1,00

Result for t-test for H2b

			Group statistics			Levene's test		t-test for equality of means					
			N	Mean	SD	F	p	t	df	p	Mean.diff	LLCI	ULCI
1	<0,95	Low SD	328	3,78	1,60	10,254	0,001	-1,391	568,84	0,169	-0,192	-0,046	0,079
	>0,95	High SD	285	3,98	1,82								
2	<0,73	Low SD	203	3,88	1,57	13,791	<0,001	-1,221	397,01	0,223	-0,210	-0,548	0,128
	>1,13	High SD	207	4,09	1,90								