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International Expansion of Canadian High Technology Start-Up Companies: An Integrated Theoretical Model

*An exploratory case study of Canadian HSF
internationalization process*

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Executive Summary

Purpose – This qualitative, case-based research investigates the internationalization and growth process of Canadian high-tech start-ups (HSFs). This research observes tensions between literature and entrepreneurial tendencies, explores relevant factors to the internationalization process such as the entrepreneur’s characteristics, and proposes an integrated theoretical model. This analysis will serve to identify practical implications and a future research agenda.

Design & Approach – Three research questions are posed to support the outlined objective. An exploratory case study approach was chosen to observe the growth process of eight Canadian HSFs of varying size and stage. Data was collected through in-depth interviews with founders, which was then used to establish a case narrative in the context of the proposed research questions and perform cross-case analysis.

Findings – The Lean Start-up model best represents the Canadian HSF internationalization process. The process differs to traditional MNEs, as key decisions such as entry mode are less relevant to HSFs. Instead, the process is dictated by the founder’s ability to build their network and identify business opportunities through informal relationships and utilize existing international knowledge and experience.

Research Limitations – This thesis is limited to the Canadian HSF industry. Certain conclusions may be applicable to other SMOPECs; however, they may not be generalizable to HSFs in alternate markets or industries. This research would benefit from the combination of both quantitative and qualitative research methods, and the application of longitudinal analysis.

Practical Implications – While several practical implications are identified throughout this paper, three stand out in particular: 1) Founders primarily enter the U.S. as their initial market and use Canada as their demo market to acquire knowledge. 2) Entrepreneurial competencies dictate the firm’s internationalization process; firms that lack knowledge of international markets should seek advisors with foreign knowledge early in the process to identify opportunities. 3) Founders primarily use informal

networks to facilitate growth; connections through incubators and informal advisors enable knowledge acquisition.

Originality – There is no recent research observing Canadian HSF internationalization utilizing a case study approach. Previous research on this topic does not establish an integrated theoretical framework or observe emerging research trends in detail such as informal networks or entrepreneurial characteristics.

Contribution & Future Research – An integrated theoretical model is proposed along with a comprehensive outline of the HSF internationalization process. Research questions are established with reference to relevant research agendas, exploring topics such as the knowledge acquisition process and the role of the entrepreneur in international growth. A research agenda outlines potential finance applications of the internationalisation process, particularly the use of real options.

Acknowledgement

This thesis consummates my Master of Science in Economics & Business Administration at the Norwegian School of Economics, within my major of Financial Economics. The degree was completed as part of a joint program with Ivey Business School. This thesis has proved to be both challenging and rewarding, and would not have been possible without the support of a number of people from both academic communities.

I would like to make a special acknowledgement to my supervisor, Kyeong Hun Lee. Despite the unique circumstances presented by the outbreak of Covid-19 that resulted in primarily virtual contact, Dr. Lee was supportive and provided constructive feedback throughout the process.

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Finally, I would like to thank my family and friends for providing their support throughout the process.

I hope that this thesis proves to be insightful to its reader, and proves useful to founders, investors, advisors, and academics.

Enjoy,



Justin Groff

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Abbreviations:

- HSF:** High-Tech Start-Up Firm
- SME:** Small & Medium-Sized Enterprise
- MNE:** Multinational Enterprise
- INV:** International New Venture
- BG:** Born Global
- SMOPEC:** Small and Open Economies

1. Introduction:

1.1. Background of Study:

Internationalization incurs costs and risks attributed to the liabilities of foreignness and newness, poses challenges in terms of complexity and lack of information, and may result in increased governance and transaction costs due to uncertainties (Prange & Pinho, 2017). As a result, the decision to expand into a foreign market is likely one of the most significant choices a young technology firm will have to make, and perhaps one of the riskiest. Literature implies that these decisions should be a calculated and informed process through the proposition of various theoretical models. Yet in practice, it is found that managers and start-ups often lack structure in comparison to MNEs, and are therefore less procedural in their decision making process (Gulati & DeSantola, 2016). This tension is partly a result of fragmented conceptual frameworks and mixed empirical findings in internationalization research (Jiang et al., 2020). Practical applications related to firm decision process such as entry mode and market entered is found to be limited (Ahi et al., 2017).

Many firms now target global niches and develop an international presence within one or two years of their establishment (Tanev, 2012). The proportion of these ‘born global’ (BG) firms has increased over time as a result of advancements in digital capabilities and macroeconomic trends such as globalization (Sui, Yu, & Baum, 2012). This trend has led to theoretical advancement to account for environmental and organizational changes, and has resulted in the emergence of business models such as High-Technology Start-ups (HSF) (Monaghan, Tippmann, & Coviello, 2019), posing an interesting topic for analysis. However, research on the internationalization of SMEs, particularly start-ups, is still relatively under-represented (Gilli, Gunkel, & Nippa, 2018), as international business literature has traditionally limited application of foreign market entry strategies to multinational enterprises (Hofer & Baba, 2018).

1.1.1. Defining High-Technology:

This study will look specifically at HSFs. Based on initial interviews with select industry professionals and the literature review, it became clear that the distinction of high-tech is important, rather than an observation of technology as a whole. Firms within the software sector would have a different internationalization process and face different restrictions than high-tech, such as a lower need for physical presence in the foreign company (Neubert, 2017). As a result, software-as-a-service (SaaS) and other platform based models have a greater potential to be born global (Coviello & Tanev, 2017).

While the precise definition of “High-Tech” is found to vary marginally throughout research, any electronics and precision instruments (Fleming et al., 2007) with a hardware component company with more than 4% of its revenues allocated towards R&D expenses (OECD, 2019) will classify in this paper. HSFs share the same characteristics as born global firms (BGFs) with the following additional characteristics: early and fast entry to a new foreign market within five to six years after inception, focused on the B2B customer segment, operate in global markets with low market entry barriers and local adaptation needs, and offer an innovative product that can be protected such as a patent (Neubert, 2017). While these defining features will be used to select appropriate firms to interview, BGF literature will be referenced throughout and assumed to be applicable, due to the lack of HSF specific research.

1.2. Contributions & Research Questions:

The number of study’s specific to internationalization from the Canadian market is found to be scarce, with only two conducted in the past decade. While Canada ranks third on the Global Entrepreneurship Index (GEDI, 2019), this research is equal to only 5% of related studies globally (Jiang et al., 2020), implying that it is underrepresented in the field. Furthermore, internationalization literature has traditionally been limited to multinational enterprises (MNEs), while applications to HSFs have only recently advanced (Hofer & Baba, 2018). The removal of imposed barriers and recent technology advancements in manufacturing, transportation, and communications, has induced this new research trend

and expanded the field (Dabic et al., 2019). This paper intends to contribute to the advancement of HSF internationalization research and establish further context for Canadian HSF growth process by exploring the overarching question:

“How do Canadian high-technology start-ups expand globally?”

The field would benefit from an observation of how internationalization processes intersect with each other and how firms deal with the tensions and contradictions that these forces produce (Welch et al., 2016). The first contribution of this paper twofold: an analysis of these tensions between proposed models in literature, and an observation of the existing models conflict with entrepreneurial tendencies. This is accomplished by exploring:

RQ1: What tensions exist between formal processes presented in literature and entrepreneurial tendencies, and which theoretical frameworks are most representative of Canadian HSF internationalization in practice?

Next, applying the theory established in this first section, this paper will propose an integrated theoretical model. The proposed model is established through an in-depth analysis of the holistic internationalization process, leveraging existing literature on the topic. To advance the understanding of HSF internationalization, an integrated theoretical model incorporating cross-disciplinary research efforts, comprising entrepreneurial, firm, and environment related factors, is necessary (McDougall, Jones, & Serapio, 2013). To contribute to the field, three components of the model will be identified for further analysis: founder specific competencies, the knowledge acquisition process, and the role of networks in the process and the way these networks are formed. The following research questions address these proposed topics:

RQ2: How do founders’ human and social capital impact internationalization process and firm strategy?

RQ3: How do HSFs develop or acquire knowledge assets, and how does the firm's network impact this process?

Several auxiliary questions such as the expansion timeline and impact of external financing will be addressed as part of the discussion and explored for practical applications. The study leverages findings from eight in-depth interviews with Canadian HSFs of varying stages to contribute to this analysis. This analysis will contribute to the field by demonstrating that The Lean Start-up model best represents the Canadian HSF internationalization process. It is proposed that the process differs from traditional MNE, and even SME internationalization. The process is instead dictated by the founder's ability to build their network and identify business opportunities through informal relationships, and utilize existing international knowledge and experience.

There is 'great potential' for the theoretical extension and theory development in the field, as it covers the tenets of four subjects: IB, marketing, strategic management and entrepreneurship (Paul & Rosado-Serrano, 2019). A research agenda will be directed towards the extension of HSF internationalization theory and practical applications, specifically with reference to integrated theoretical models. A case will also be established for the numerous applications to the field of finance, such as its implications for valuation.

1.3. Outline:

To answer the research questions outlined above, the following structure is adopted:



In Chapter 2, I introduce existing theories related to foreign market entry strategies and the internationalization process. This provides context to the key decisions

that HSFs must make, from the initial decision to explore foreign activities to the implementation of the firm's strategy. A thorough literature review is established to demonstrate this decision process from a theoretical perspective. A brief introduction to common valuation methods will be established in the context of start-ups. This will build off of the decision process identified previously to demonstrate how the residual implications of each decision throughout the internationalization process may be translated into value creation and measured using the real options approach. Given that literature in this both the field of HSF process and real options valuation of internationalization is relatively scarce, several recommendations for future research are suggested.

The methodology section describes the research design and approach used in this thesis. This will demonstrate why semi-structured interviews were used as the primary method of data collection. The results from these interviews will be discussed in detail and contrasted to previous literature as part of the analysis. This analysis will then be applied in the final chapter to make key conclusions and outline how these findings may contribute to future research. Implications for future research will make both theoretical and practical implementation considerations. Limitations of this thesis will be identified when establishing these considerations.

1.4. Limitations:

This thesis is limited to the Canadian HSF industry. Firm decision criterion varies significantly depending on the type of market or industry (Evers et al., 2014). The results presented in this thesis may not be generalizable beyond HSF's internationalizing from small open economies (SMOPEC) such as Canada. Growth from an emerging economy or an alternate technology industry such as SaaS would likely require different assumptions and yield varying conclusions.

2. Literature Review - Start-up Internationalization:

This chapter identifies literature relevant to HSF internationalization, specifically the various factors and decisions that dictate the process in practice. This theory will be compared to observations in this case study, used to identify outline a theoretical framework, and address proposed research questions.

2.1. Uppsala and HSF Internationalization:

The following models have traditionally been used in both MNE & SME research. This review will demonstrate that while some aspects of traditional models may be applied to HSF internationalization process, numerous factors such as advancements in digital networks have resulted in certain models becoming less relevant. This review will demonstrate which models are in fact relevant to Canadian HSFs, and how models have adapted to strengthen their practical applicability over time.

A significant portion of IB research relies on the **Uppsala model** of internationalization, which suggests that firms expand globally in a systematic and sequential way, expanding only when domestic production has developed sufficiently (Spence, 2003). The model takes a ‘stage approach’, and implies that firms pursue progressively more committed modes of entry, starting with the initial exporting stage, until it is eventually directly producing in the foreign market (Johanson & Vahlne, 1977). This progression begins with a domestic phase, before moving to an international phase or initial expansion, and finally a global phase. This process of entering foreign markets is often referred to as using an establishment chain (Verbeke et al., 2014), whereby firms first enter markets geographically and culturally close to them (Cavusgil and Knight, 2015); inferring that an internal process of discovery and learning enables the firm to expand by learning from its past investments (Buckley, 2016).

While the Uppsala model remains a leading theory (Monaghan, Tippmann, & Coviello, 2019), it has received no shortage of criticism, particularly in reference to its practical implications. Andersen (1993) finds that the model lacks an explanation of the internationalization origination process and the mechanism driving the knowledge

commitment cycle. Similarly, empirical models have addressed the significant limitations of Uppsala, such as its lack of time dimension and time-dependent variables, which enables studies to explain the direction of internationalization, but not its timing (Buckley, 2016).

While the Uppsala model has received criticism on both a theoretical and operational level from the beginning (Mtigwe, 2006), changes in the economic environment has seemingly accelerated these critiques and the emergence of new models. This transition has resulted from several factors such as rapid globalization, and digitization, which has revolutionized cross-boarder activity of firms (Monaghan, Tippmann, & Coviello, 2019). Firms are now able to use a leap frogging approach to jump straight from the domestic to global phase, skipping this incremental international phase (Bouncken et al., 2015). Johanson and Vahlne have made several revisions to the original Uppsala model to acknowledge theoretical advancements, account for environmental and organizational changes, and changing business practices which have led to the emergence of business models such as HSF (Monaghan, Tippmann, & Coviello, 2019). Perhaps most notably was their proposed internationalization process model (IPM) (Johanson & Vahlne, 2009). The first revision included in the IPM was the integration of **Network theory** into the Uppsala, which implies that a firm's relationships are a key determinant of success when competing globally (Johanson & Mattsson, 1988), and greatly impact the speed of entry (Mtigwe, 2006). The second outlined that firms should have a greater focus on the creation of business opportunities with network partners rather than on the reduction of uncertainty in foreign markets (Neubert, 2015). The IPM suggests that BG internationalization endangers a firm's survival in the export market because the firm lacks sufficient time to learn about the foreign market sufficiently (Sui & Baum, 2014).

Related theories have originated and created tension in the field by challenging this stage approach. International entrepreneurship (IE) focuses on how firms discover, analyze and exploit foreign opportunities, and implies that advancements in technology, declining cultural barriers and increasing cultural awareness has enabled all types of firms to access foreign markets (Agwu & Onwuegbuzie, 2018). Contrary to stage approaches; it assumes

that firms do not necessarily need to stretch international activities gradually, instead assuming that start-ups increasingly have the opportunity to pursue rapid and global expansion (Sui, Yu, & Baum, 2012). IE has yielded numerous models such as the **International new ventures (INV) model**. The INV is considered to be a dominant theoretical approach in the field alongside Uppsala, yet it implies significantly different predictions with regard to internationalization strategy (Sui & Baum, 2014). The model postulates that certain firms are able to leverage manager's awareness and foreign resources to meet international demands soon after inception (Linan, Paul, & Fayolle, 2019). Under this assumption, firms may profit from a BG strategy by exploring and capitalizing on international opportunities and by exporting certain learning advantages that accompany newness (Sui & Baum, 2014)

2.1.1. A Canadian Perspective:

If the Uppsala holds, HSFs would initiate the internationalization process by exporting to the country with the closest psychic distance. Canadian firms would therefore enter the United States as the second stage of the chain, after establishing a presence in the domestic market. Spence (2003) and Sui & Baum (2014) challenge this in different ways.

Spence (2003) provides a case study approach observing the international strategy formation of small Canadian high-technology companies. Conclusions are found to deviate from the stage approach, and instead support Network theory, which had not yet been integrated. Spence distinguishes three categories when observing initial triggers for pursuing an international strategy: the availability and use of existing networks, serendipitous encounters, and targeting of niche markets through planned strategies. These categories are used to demonstrate that SMEs no longer enter overseas markets in a systematic way, but rather as part of a holistic process. These conclusions are consistent with network theory, and would therefore be supportive of the more recently revised Uppsala. While not yet proposed at the time, this also relates to the **lean start-up** model. This model demonstrates the importance of repeated integrative cycles of opportunity development and implementation, whereby learning and discovery are built into the process to identify new insights for improvement and adaptation throughout the

organization (Mom et al., 2019). Rasmussen & Tanev (2016) later outline relevance of the lean start-up model in Canadian HSF internationalization, suggesting it provides a way of emphasizing the complexity of managing innovation, business development, and early internationalization.

Sui & Baum (2014) explore the relationship between internationalization strategy and the survival in the export market of Canadian SMEs with an average firm size of 20 employees. Their results show that BGs were smaller and less productive than firms that chose gradual internationalization, and hence, had the lowest survival rate in the export market. However, when controlling for endogeneity, there were no significant differences found between these internationalization strategies with respect to firm survival, suggesting that start-ups are rational and efficient in choosing the best-fit internationalization strategy. Sui & Baum (2014) argue instead that while no strategy is necessarily superior, the strategy pursued dictates the importance of resources to a firm's survival. Innovation and slack resources are most important for BGs, and less relevant to those that pursue gradual internationalization.

[2.2. Integrated Theoretical Model](#)

Integrating several lines of inquiry, such as the consideration of multiple forms of foreign market entry and the influence of formal and informal networks, provides a more general conceptualization of the holistic internationalization process, and offers relevant managerial implications (Rialp & Rialp, 2001). To advance the understanding of HSF internationalization, an integrated theoretical model incorporating cross-disciplinary research efforts, comprising entrepreneurial, firm, and environment related factors, is necessary (McDougall, Jones, & Serapio, 2013).

Jiang et al. (2020) review 167 articles to develop an integrated framework (Figure 3) to account for the relationships between: determinants, early internationalization, and outcomes.

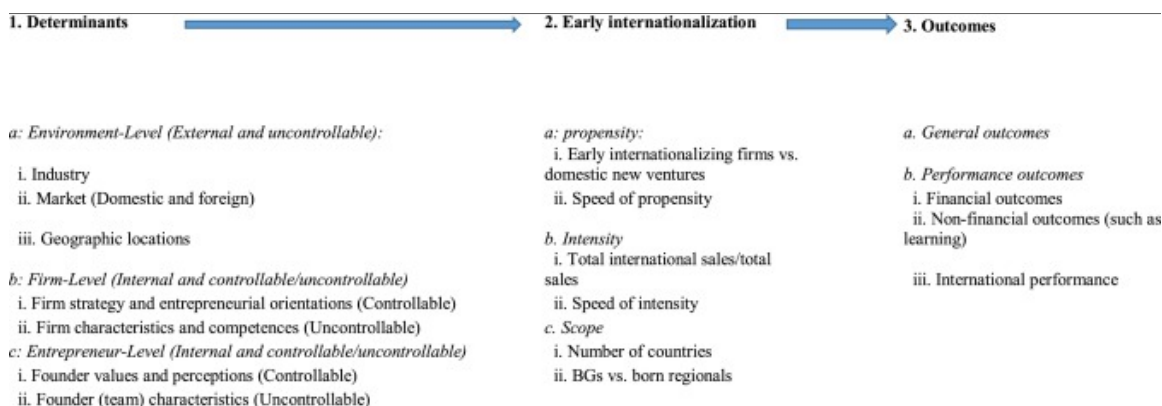


Figure 1: Determinants of early internationalizing firms and their performance: an integrative framework, Jiang et al., 2020

The proposed model is established with the intention of supporting a future research agenda, working towards a unifying framework. Several shortcomings of this model and future additions are outlined. Their review indicates that past research has mixed empirical findings, with varying international extent, speed, and scope, which are expected to result from context-based factors such as the size of the home market, different industries and countries (Jiang et al., 2020). Practical applications of existing integrated theoretical models is limited (Ahi, 2017), particularly the firm decision process such as entry mode and market. An integrated theoretical model relevant to all industries and markets would be beyond the scope of this paper. The theoretical model and proposed advancements will therefore only apply to HSF's from SMOPEC, primarily Canada. This is done with the intention of providing more relevant practical implications for the theoretical model. While applying related research and concepts introduced, the model will deviate from Jiang et al. (2020) by observing a holistic process, rather than focusing exclusively on determinants of performance.

2.2.1. Internationalization Process

HSFs often found to lack structure in comparison to MNEs, and are therefore less procedural in their decision making process (Gulati & DeSantola, 2016). Their decision-making process is primarily based on intuition and personal or family relationships, unlike the rational strategic planning used by managers of larger enterprises (Kubickova,

Votoupalova, & Toulouva, 2014). In practice, many founders view these formal structures and processes as bureaucratic threats to their entrepreneurial spirits, and worry about losing speed, control and team intimacy (Gulati & DeSantola, 2016). However, some argue that rapid BG internationalization endangers a firm's survival because the firm lacks sufficient time to learn about the foreign market sufficiently (Sui & Baum, 2014)

This conflict between theory and firm's decision process in practice raises some important considerations critical to this study. A detailed overview relating to growth options and potential ways start-ups can adopt more formal processes presented in theory will therefore be relevant. The following processes will rely on previous literature and later be compared to qualitative results from this study to establish a relevant framework for Canadian technology start-ups.

Foreign market entry differs from other expansion strategies, as geographic expansion usually involves launching a new operation in an unfamiliar location (Chung, Chen, and Hsieh, 2007). Existing literature outlines three basic entry decisions that management must consider when looking international (Hill, 2017). The firm must decide **when to go global**, as either a first-mover or later entrant. While first-movers may experience high costs and greater uncertainty, they typically have lower competition that enables them to access to growth opportunities that the foreign market presents (Suarez & Lanzolla, 2005). Later entrants in contrast have the opportunity to learn best practices and avoid pitfalls of competitor's expansion initiatives (ibid.). Managers must consider **which market** to enter, based on several factors, including: costs, competition level, regulation, etc. (He, Lin, & Wei, 2016). Finally, the manager must determine **the scale**, or level of commitment and involvement they are willing to have (Masum & Fernandez, 2008).

2.2.2. Determinants:

Once a firm has determined that it is the appropriate time to pursue a global strategy, it must determine which market to enter by identifying the most significant factors that will impact their decisions. While there has been limited research examining the influence of

industry factors on the internationalization process and strategic choices of INVs (Evers et al., 2014), numerous studies may be used to identify primary factors HSFs are expected to face. These critical success factors are found to have strong practical implications for the operation and international expansion initiatives (Bose, 2016).

Regardless of the process or internationalisation pattern that the firm follows, diverse organizational and managerial competences are needed to compete in the global arena (Olejnik, 2014). Buckley & Casson (1998) created a dynamic model that accounts for all major market entry strategies to address the high degree of complexity associated with linking multiple issues in this subject. Their empirical study identifies key factors in determining firms' foreign market entry decisions: location costs, internationalization factors, financial variables, cultural factors, market structure and competitive strategy, adaptation costs to the local environment, and the cost of doing business abroad. Numerous studies have explored this topic from different perspectives more recently. Cao, Criscuolo, and Autio (2016) develop a conceptual framework to present determinants of SME internationalization performance, highlighting: organizational capabilities, resource endowments, and strategic orientations. Depending on the literature, these are defined as internal or firm specific factors.

Figure 2 presents a conceptual framework to interpret these factors in the context of making further decisions with relation to entry mode. This framework is inspired by Driscoll's (1995) dynamic mode choice framework of global expansion (Masum & Fernandez, 2008), and later adaptations by Ekeledo and Sivakumar (2004) and Musso & Francioni (2012). Driscoll's original model exhibits high-level firm and environmental factors that influence the desired mode characteristics and in turn the mode chosen. Subsequent models introduce greater detail such as host and home country specific factors. The proposed framework triangulates findings from these studies and outlines factors specific to HSFs with the intention of providing practical applications. For example, the original model proposed by Driscoll outlines organizational culture as a key firm specific resource. Research has since shown that there is limited evidence illustrating the association between organizational culture and entry mode choice (ibid.).

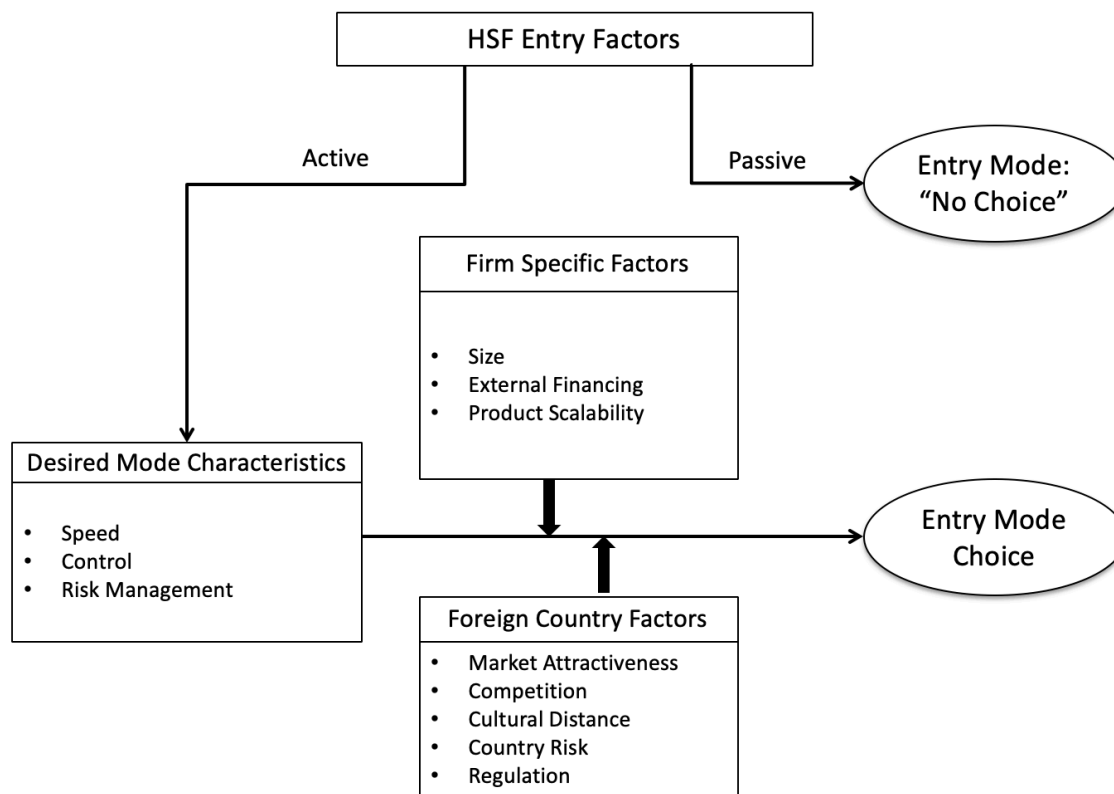


Figure 2: Adapted model of a HSFs entry mode selection, *own creation*

Mode Characteristics	Relevance
<i>Entry Speed</i>	A recent survey by Gulati & DeSantola (2016) demonstrated that founders primary concern with formal structures and processes was the potential loss speed. Crick and Crick (2014) examine rapidly internationalizing high-tech UK SMEs, identifying how firms' strategies vary depending on several firm specific factors, including speed.
<i>Control</i>	Another key concern highlighted by managers of HSFs in Gulati & DeSantola's (2016) survey was the potential loss of control. Entry mode literature has recommended paying attention to the level of control, as it is found to be the most significant determinant of both risk and return (Musso & Francioni, 2012).
<i>Risk Management</i>	While managing risk is inevitably a goal of every manager regardless of the industry, HSFs should be particularly interested in modes that help protect their most important

asset, Intellectual Property.

The Resource-based view demonstrates firm performance in the context of its ability to utilize its capabilities and other resources, implying that a sustainable competitive advantage may be achieved through the exploitation of both internal and external factors (Kraaijenbrink et al., 2010). This model delineates between these internal and external factors in the form of firm specific factors (internal) and foreign country factors (external). Jiang et al. (2020) implies that internal factors are the major determinants of internationalization speed and performance, contrary to industrial organization (IO) theory which implies that external factors influence firm strategy and that they must be able to adapt to a dynamic external environment in order to remain competitive. Their primary argument is that internal factors may be changed in the long run, while external factors are uncontrollable and have less relevant practical implications for the entrepreneur's strategy (Jiang et al., 2019).

Firm Factors	Relevance
<i>Firm Size</i>	Firm size is usually regarded to indicate access to external resources and internal capabilities that would help improve the firm's likelihood of success in a foreign market (Antoncic and Hisrich, 2000). There is substantial literature to support that SMEs use different competitive approaches to internationalize, depending on their resource capabilities (Pett, Francis & Wolff, 2004). Empirical research demonstrates that larger firms are more likely to take a high degree of control and prefer equity modes of entry compared to smaller firms (Musso & Francioni, 2012). While smaller firms possess behaviour strengths such as entrepreneurial dynamism, flexibility, and efficiency, larger firms often have a competitive advantage in international markets due to economies of scale, scope, marketing skills, and financial and technological resources (Linan, Paul, & Fayolle, 2019).
<i>External Financing</i>	Both equity and bank financing are found to enhance a firms' foreign entrance intensity (St-Pierre, Sakka, & Bahri, 2018). From a Canadian technology perspective, Spence (2003) found a common pattern that demonstrating that a strategic shift occurred after receiving external financing, resulting in greater involvement in the internationalization process. Funding specifically from a venture capital firm produced formal structural changes and more systematic planning,

	enabling a more sophisticated entry strategy. Further, studies have found that venture capital plays an important role in influencing the strategic direction of the firm, and serves as a catalyst through shared knowledge and reputation (Fernhaber & McDougall-Covin, 2009). Of the eight actions Nilsson & Sawicki (2019) outline to mitigate challenges, their recommendation is to utilize an established investor.
<i>Product Scalability</i>	Cannone & Ughetto (2013) conduct a cross-country survey on high-tech start-ups to confirm that the presence of a small domestic market and the scalability of the product have a positive effect on the probability of a start-up internationalizing from its inception.

Foreign Country Factors	Relevance
<i>Market Attractiveness</i>	Market attractiveness is characterized by factors such as high market demand, market growth and potential, low investment risk, favourable attitude of the host government towards foreign firms and high political and economic stability, provide firms ample opportunities to grow and also to achieve scale economies (Mansour, 2006).
<i>Competition</i>	Firms must be able to transfer its FSA, to establish a competitive advantage in every new foreign market in order to cover the cost or the liability of foreignness (Johanson and Vahlne, 2009).
<i>Cultural Distance</i>	High-technology products are often less culture-specific and require relatively minimal adaptation to local markets (Evers et al., 2014). The Conservative, predictable and pacemaker model is used to help SMEs understand the legal and cultural distances between different countries and adapt accordingly to ensure competitive entry (Paul and Sanchez-Morcilio, 2018). In this model, markets are classified as: conservative (conduct business locally), predictable (do business in a legally integrated regional market such as the EU), and pacemaker (expand globally quickly) (Linan, Paul, & Fayolle, 2019).
<i>Country Risk</i>	Country risk encompasses several types of risk, including political, ownership, operation, and transfer risks. Studies have demonstrated a negative relationship between country risk and the degree of control, likely attributed to the fact that firms will have a tendency to make a smaller commitment for greater flexibility in uncertain markets (Ketchen et al., 2014).

<i>Formal Standards & Regulation</i>	Countries vary depending on their formal standards and regulations. Formal standards lead to lower innovation efficiency in markets with low uncertainty, while regulations result in higher innovation efficiency (Blind et al., 2017). While the U.S. remains Canada's primary trade partner, Sui, Yu, & Baum (2012) demonstrate that Canadian SME's have a growing tendency to trade more intensively to non-U.S. markets due to tighter Canada-U.S. boarder security.
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Mode characteristics and these various firm and foreign country factors influence entrance strategy. Intuitively, a firm that seeks to enter a market quickly will place greater importance on speed characteristics. While they may intend to enter soon after inception and pursue a BG strategy, they will be constrained by these firm and foreign country factors.

2.2.3. Expansion Motives:

Relative to other industries, high technology start-ups are found to internationalize quickly for several reasons, such as the industry's dynamic nature, and high research and development costs (Johnson, 2004; Evers et al., 2014). It has been found that high-tech has an easier acceptance of standardized global products from customers that helps to ease the process and has push factors such as shorter product life cycles, which can make early internationalization a necessity (Kuivalainen et al, 2007). In developed markets, the typical life cycle for HSFs average approximately 5 years, compared to chemical products 7-10 years, or computer software's 3 years (Ayal & Izraeli, 1990). Karadeniz and Gocer (2007) present findings that provide some tension to this hypothesis, as they demonstrate that smaller firms were more likely to internationalize gradually. Further, previous literature has also shown a positive relationship between firm size and entrance intensity (Bartoli, Ferri, and Murro, 2014). It is found that born global firms still account for a smaller proportion than born regional firms (16% vs. 27%), but are found to be increasingly established over time due to macroeconomic trends such as lower institutional regulations which reduce the costs of foreign entry and operation (Meyer et al., 2009; Sui, Yu, & Baum, 2012).

To explore when it is appropriate for a HSF to go global, it is important to begin by outlining the numerous reasons why start-ups may initially look to expand into foreign markets. Most fundamentally, foreign expansion provides the opportunity to access new markets to facilitate growth. Theory presents various **internal** or **external triggers** that must result to initiate the strategy (Hollensen, 1998), which may include: inter alia (possession of unique organizational competencies); existence of idle operating capacity; prevalence of home market constraints; pressures by domestic competitors; identification of business opportunities in overseas markets; and encouragement by external agents (Pett, Francis, Wolff, 2004). From a practical standpoint, OECD (2009) conducted an empirical study alongside APEC to demonstrate the factors that motivate SMEs globally, differentiating between four primary categories: growth motives, motives related to the firm's knowledge, motives reflecting social ties, networks and supply chain relations, and motives connected with the domestic and for foreign market (Kubickova, Votoupalova, & Toulouva, 2014). It will become clear that each of these motives can be tied to entrepreneurial preferences a determinant for internationalization.

2.2.4. Entry Mode:

The firm's level of commitment, or scale, is ultimately determined by its mode of entry. Non-equity modes tend to reflect smaller commitments to overseas markets, while equity modes require larger commitments that are usually more difficult to reverse (Peng & Meyer, 2017). SMEs have a limited resource base in comparison to MNEs, which exacerbates the long-term impact of entry mode decisions (Bruneel & De Cock, 2016). Furthermore, it is found that equity modes of entry are preferred when it comes to transferring intangible assets (Peng & Meyer, 2017). While tangible assets such as starting capital are important, experience of founders and other intangible assets are found to have much more significant impact on a start-up's critical success factors such as innovation speed (Heirman & Clarysse, 2007). Previous models, such as Root (1998), has focused on the trade-off between risk and management control when contrasting the various entry modes. The foundations of this model have been used to propose a new framework for this trade-off specific to HSFs:

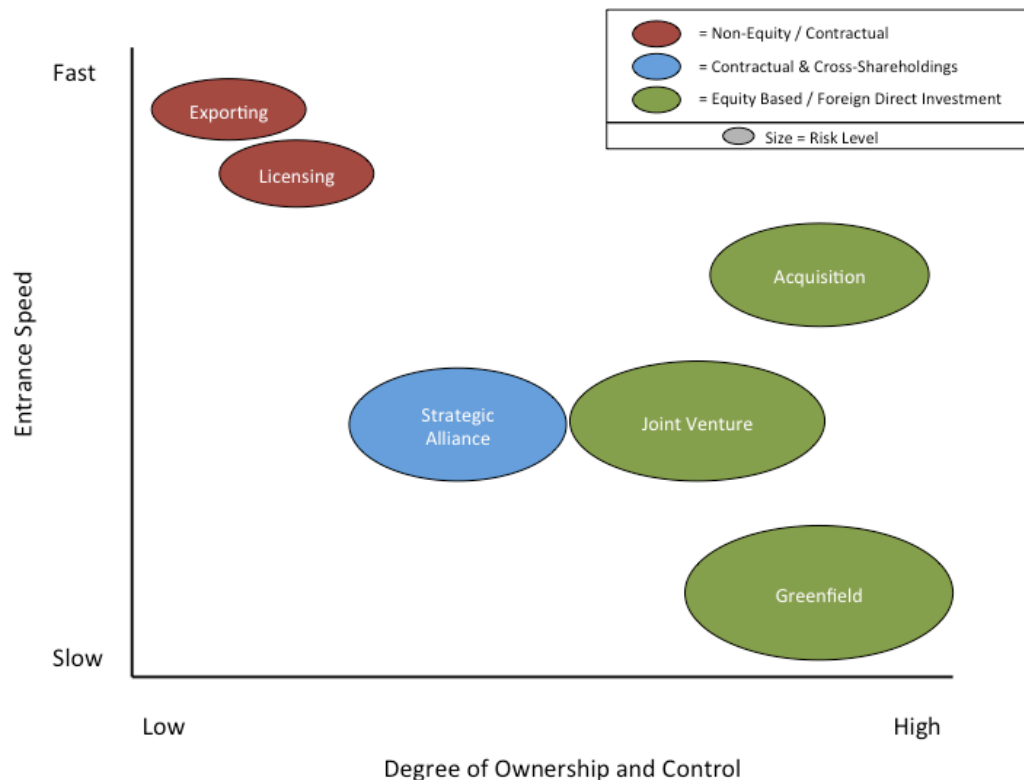


Figure 3: Contrasting key entrance modes by entrance speed, degree of ownership & control, and risk level, *own creation*

This framework makes several key adjustments to the original model to make it specific to the high-tech industry, such as the inclusion of entrance speed. Recent industry data (Gulati & DeSantola, 2016) and theory (Cavusgil & Knight, 2015; Neubert, 2015) demonstrate that entrance speed is a primary factor for HSFs when internationalization, and firms included early and fast internationalization into their business plans, and should intuitively be factored into the entry mode strategy. Secondly, the measure of risk deviates from the original model. This framework proposes that HSF's should take a slightly different approach to risk, and instead focus on factors such as technology transfer. As outlined, intangibles are HSF's greatest asset, particularly the firms IP (Heirman & Clarysse, 2007). Risk in this framework therefore includes investment risk as in the traditional model, but places greater significance on risks associated with data and

technology sharing. The positioning in this framework and key aspects of each mode are as follows:

Exporting: There are several types of exporting, distinguished between indirect and direct exporting. Grunig & Morschett (2011) outline that indirect export has a low resource commitment, which is typically ideal for firms that only sporadically sell products abroad or sell across several markets in which it would be difficult to build up specific knowledge. In contrast, direct exporting has varying levels of commitment, as it may be facilitated through a distributor, agent, sales branch, etc., or direct to the customer. The choice of which direct export path is dependent on a number of factors such as country specific laws and regulations. For example, distributors and agents often have exclusive rights for a specific country, inhibiting direct sales to the customer (Grunig & Morschett, 2011)

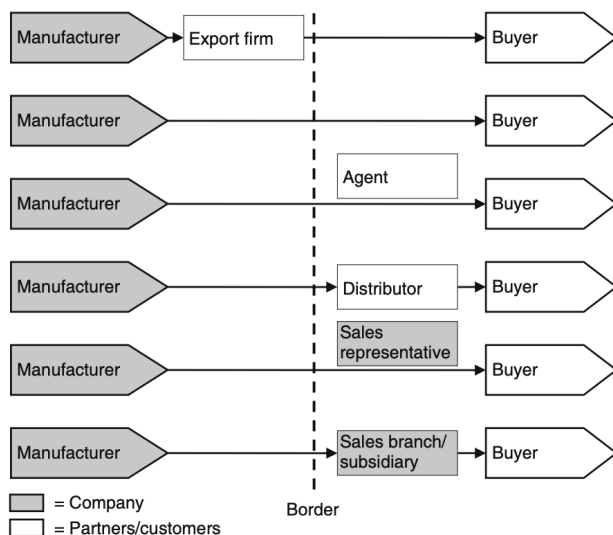


Figure 4: Different alternatives within exporting, *Grunig & Morschett (2011)*

Licensing: Hill (2007) outlines this mode as an arrangement in which the licensor grants the rights of an intangible asset to another entity for a specific period, in return for a loyalty fee. This is common in industries where patents are important, and may benefit firms that are capital constrained or are looking to enter a market with significant government regulations (Masum & Fernandez, 2008).

Greenfield: Also commonly referred to as Wholly Owned. Greenfield requires the construction of new factories and offices. This mode has relatively lower risk in terms of technology related risks, as the firm will hold full control over its foreign operations. However, while the firm does maintain equity and operational control, Greenfield investment slows the rate of entry and requires significant investment (Peng & Meyer, 2017).

Acquisitions: Acquisitions are perhaps the quickest entry method to maintain control. While this mode requires high up-front capital commitments and may pose integration challenges, it often offers protection against managing local regulations (Musso & Francioni, 2014). This mode can also be the preferred mode of entry in high growth industries, when capitalizing on first-mover advantage is important.

Strategic Alliances: Strategic Alliances is an arrangement between two or more companies to work together to carry out a certain objective. Strategic alliances have become increasingly popular strategic move by firms to improve their competitive position, particularly in the technology industry (Drago, 1997). Substantial positive financial impacts have been found through strategic alliances. In a 2002 International Data Corporation study, 90% of respondents reported that alliances contributed to between 5-50% of corporate revenue (Kelly & Schaan, 2006). Strategic alliances can also help reduce costs, provide faster acceptance and access to technology, and help to access a new market (Drago, 1997). Alliances found to work best for companies entering new geographic markets or related industries. Conversely, acquisitions, which are found to be the main alternative to alliances, are more likely to be effective in core business areas or existing, highly competitive markets (Kelly & Schaan, 2006).

However, these benefits do not exist without risk. Strategic alliances are found to require a significant amount of technology transfer, resulting in coordination risks and management costs (Das, 2020). Further, this mode of entry results in reduced control, reduced flexibility in optimizing global production and marketing efforts, lost

opportunity costs, and may even contribute to creating or strengthening a competitor (Kelly & Schaan, 2006).

Joint Ventures: A Joint Venture is when a new corporate entity is created, and is jointly owned by two or more parent companies. While a joint venture is considered as one form of strategic alliance, several distinctions:

Joint Venture	Strategic Alliance
No independent entities exist once JV formed, no impact on autonomy	New company formed with both existing company's continuing to operate
Separate legal entities exist	No separate legal entity, just contractual agreement
Bilateral form of management	Delegated management

A joint venture can enable the firm to leverage a partner firms' local knowledge and share costs, risks, and profits (Peng & Meyer, 2017). While this method may help a firm overcome foreign market challenges such as culture and language by leveraging its partner's expertise, it may be risky from a technology firm perspective. This mode often requires a firm to share the control of its technology with its partner (Hill, 2007). While software start-ups tend to rely more on trade secrets, intellectual property is often the most important assets (Wilton, 2011). It is therefore a sensitive and risky decision to share with a foreign competitor.

Another key consideration HSFs must make when determining the scale of entry is the channel they will use. In the context of high technology, a firms channel to market is a set of interdependent organizations concerned with the process of creating services obtained for use or consumption (Tybout & Calder, 2010). These channels are often categorized into six categories: Internet, relationship with multinational, distributors, re-sellers, direct sales force, and referrals (Yoos, 2013). Of these categories, Internet sales were found to be the most common among start-ups, attributed to low cost and ease of integration (Gabrielsson et al., 2010). However, start-ups looking to expand globally should consider a combination of these six categories (Yoos, 2013). It is suggested that start-ups need to look beyond solely using Internet to internationalize early (Yoos, 2012), as relationship

development with small local channels and MNCs remains important when Internet sales channels are used (Gabrielsson et al., 2010).

2.4.5. Proposed Model:

Research and frameworks outlined in previous sections are used to establish an integrated theoretical model:

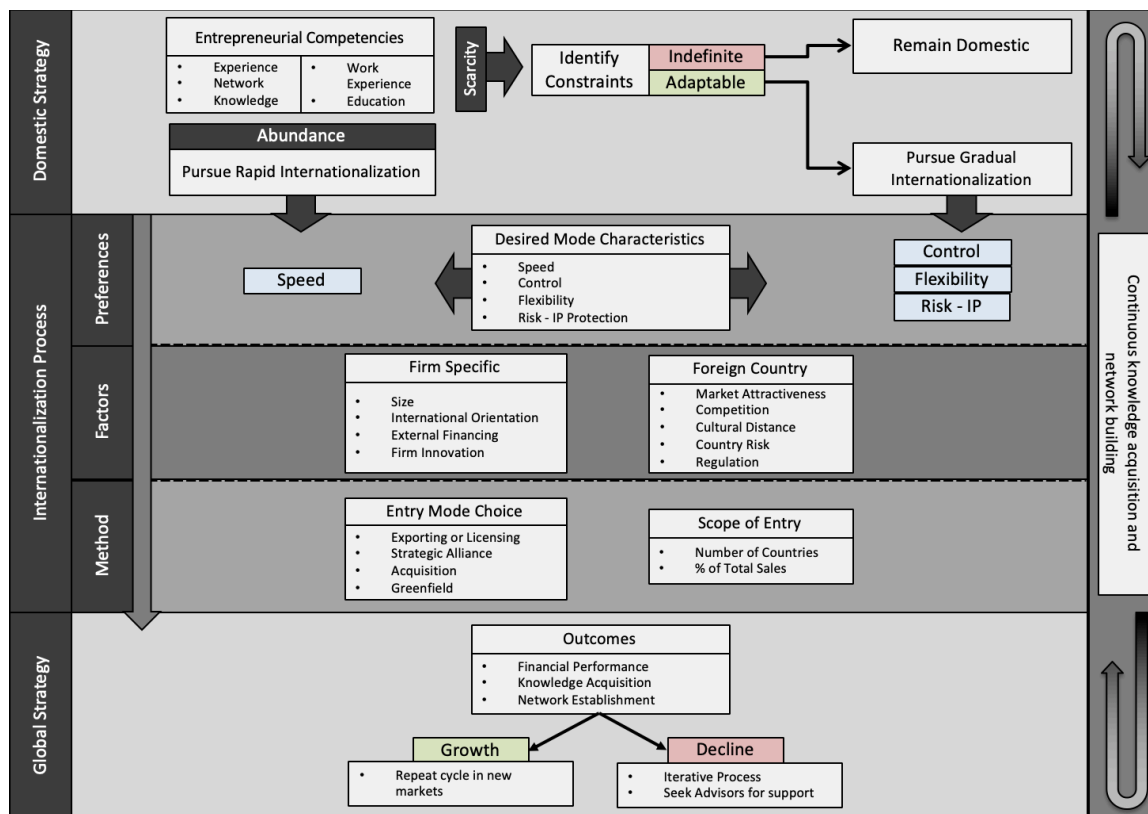


Figure 5: Proposed integrated theoretical model, *own creation*

2.4.5.1. Model Process:

The integrated theoretical model demonstrates the process of moving from a domestic strategy to a global strategy. The process was established through existing models (Jiang et al., 2020), literature on internationalization as outlined in previous sections, and literature specific to entrepreneurial competencies and knowledge acquisition.

Unique to this model, the key determinant driving internationalization are entrepreneurial competencies. This detail will be explored in greater detail in following sections, but generally includes the entrepreneur's network, particularly their access to advisors and business partners, and international knowledge. Pre-existing foreign knowledge influences export intensity in younger firms, and the effects of vicarious learning and experiential learning on export intensity are conditioned by firms' strategic intentions (Casillas et al., 2015). Therefore, if these competencies are in abundance, either in the founder or within the founders network of advisors, they are in a position to pursue rapid internationalization, and will likely care most about speed characteristics. If the founder does not possess these competencies, it should identify ways that it can develop them, such as developing their network domestically to leverage advisor knowledge. Born-local theory states that most small firms need support in the form of intermediated internationalization, as they typically lack previous global exposure (Linan, Paul, & Fayolle, 2019). Taking this intermediated approach to internationalization increases risk, and the founder might seek to mitigate this by taking a more controlled entry mode. Once this strategy is initiated, whether rapid or gradual, firms will follow the internationalization process that has been identified in previous sections to transition into a global strategy.

Once the firm has established its global strategy, subsequent entry is intuitively dictated by performance. Jiang et al. (2020) distinguishes outcomes relevant to post-internationalization such as financial performance and learning outcomes. If the firm achieves this success, the firm should expand into subsequent markets, continuing this internal process of discovery and learning as according to Johanson and Valhne (1977).

2.4.5.2. Entrepreneurial Competencies:

While Driscoll (1995) and subsequent research outline firm specific and foreign country factors, as referenced previously in Figure 2, these models lack the inclusion of management specific factors. This model proposes that these management factors, or entrepreneurial competencies, are key determinants for rapid internationalization and should be central to the integrated theoretical model. Jiang et al. (2020) and Neubert

(2015) propose relevant research agendas to address gaps related to the role of the entrepreneur in existing integrated models. Jiang et al. (2020) demonstrate that incorporating the role of the entrepreneur and founding team when developing a comprehensive understanding of the internationalization process would “enrich the field”. Neubert (2016) recognizes the need for further research analysing the relationships between different variables such as the location, industry, and abilities of the entrepreneur, and the extent to which decision makers, be it management or investors, compensate for lacking certain abilities. The way that entrepreneurs develop these characteristics and skills is a source of tension in literature and calls for further exploration, as it is often not expressed sufficiently (Verbeke et al., 2014). This paper will only focus on Canadian (SMOPEC) HSFs, making location and industry variables less relevant for analysis. However, these research agendas substantiate the inclusion and exploration of entrepreneurial competencies in the growth process.

In this paper, human and social capital will refer to the quality of entrepreneur’s characteristics and skills. These factors are typically associated with the firm-specific advantage (FSA), and influence the success and speed of HSF internationalization. The specific entrepreneurial factors that influence this FSA vary marginally in literature. For example, Nilsson & Sawicki (2019) find that the primary entrepreneurial challenges of BG HSFs expanding into foreign markets include lack of: networks, previous experience, partnerships, market-specific knowledge, and support. This analysis will apply Neubert (2015), who distinguishes entrepreneurial factors as: global vision, international experience and network, international knowledge and capabilities, working experience, education, ability, and cognition.

To reiterate, Network theory implies that a firm’s relationships are a determinant of internationalization success and speed of entry. The following introduction the role of networks induces this study’s third line of inquiry: the exploration of how HSFs develop or acquire knowledge assets, and how the firm’s networks impact this process. Jiang et al., (2019) imply that further research should observe the way that entrepreneurs develop market and technical knowledge from sources such as customers, VC’s, MNEs and other

relationships in their network. To further this inquiry, this study distinguishes between the role of formal and informal relationships, which differ primarily in terms of: degree of external control, planning and institutionalization, level of intentionality, nature of goals, locus of decision about goals, depth of the relationship, degree of voluntary participation, timeframe, and nature of setting (Colley et al., 2003). Intuitively, formal relationships have a greater level of control, institutionalization, intentionality, etc. In this context, HSFs formal relationships are primarily its investors, board members, and accelerator or incubator programs. Informal relationships are based on trust and sympathy, often in terms of oral agreements rather than contracts (ibid.). They are voluntary and spontaneous, such as friends, family, advisors, professors and other mentors.

While this line of inquiry is relatively new and seen as more difficult to identify, Dymitrowski et al. (2019) provide valuable insights. They distinguish between four streams of informal relationships: supply chain, innovation, knowledge, and strategic alliances. Most relevant to this thesis, they find that informal relationships enable identification of market needs, determine access to external resources, influence absorptiveness of and access to external knowledge, and determine mutual long-term success of business networks. Their findings will serve as a basis for further analysis in this study.

2.4.5.3. Knowledge Acquisition:

The way entrepreneurs develop market and technical knowledge from sources such as customers, VC's, MNEs and other relationships in their network is an important inquiry and recognized as worthy of additional research efforts (Jiang et al., 2019). The model proposes that this is a continuous cycle throughout the business. This is based off of the fact that IB research pertaining to MNE's, including Uppsala, infers that firms acquire knowledge through an internal process of discovery and learning from experience and established networks. Smaller firms in contrast use recruitment, government advisors and consultants to acquire indirect experience to compensate for a lack of relevant experience or useful networks typically available to larger firms (Fletcher & Haris, 2012). To

explore this tension further, Jiang et al. (2020) provide guidance as to how further insights towards the knowledge acquisition process will help enrich the field. They direct future research to explore how the founders' network, resources, and knowledge originate. They also outline that research should examine how founders develop new products or services and how their specific knowledge contributes to the knowledge development process.

3. Methodology:

This chapter outlines the papers research design and approach, and subsequently contrasts this approach to previous research for further context. This will serve to demonstrate the reasoning behind each method of data collection applied in this analysis.

3.1. Research design and approach:

The primary focus of this paper is to understand the internationalization process of Canadian HSFs. An exploratory case study approach was chosen to observe the growth process of eight Canadian HSFs of varying size and stage. Similar to many exploratory, early-stage research studies, this thesis applies a qualitative method of data collection and analysis (Ghuri & Grønhaug, 2010). Qualitative research is outlined as the systematic inquiry into social phenomena in natural settings, including how individuals behave and how organizations function (Teherani et al., 2015).

As outlined in the literature review above, a significant amount of empirical research exists with relation to start-up internationalization. However, many of these studies are found to lack authoritative longitudinal data drawing from non-random cross-sectional databases, and may therefore induce biases (Sui, Yu, & Baum, 2012). For this reason, results pertaining to the prevalence of early stage internationalization strategies using this method may be unreliable (Anokhin and Wincent, 2012).

The case study approach is used to explain, describe or explore a phenomenon in its real-life context to develop an understanding of a complex issue (Crowe et al., 2011). In contrast, experimental designs test a hypothesis based on manipulating the environment, while the case study approach captures information on a more exploratory basis (ibid.). Given the nature of this thesis, it would not be possible to conduct a formal experimental investigation. An experimental investigation in this context would require deliberately manipulating the business decisions of numerous start-ups, which is simply not feasible. Further, this thesis instead intends to explore ‘how’ and ‘why’ questions consistent with the case study approach.

3.2. Literature review:

The first chapter of this thesis provides a detailed literature review on the HSF internationalization process. Literature was gathered primarily from Google Scholar, Omni at Western University, and the Norwegian School of Economics online library database. The review focused to identify relevant scholarly, peer-reviewed articles. An emphasis was placed on articles that originated or focused on the Canadian technology market specifically. However, given the limited research on this particular topic, related literature deviating marginally from the Canadian market still comprised the majority of this review. Case studies applied in this literature review focused only on developed economies, to avoid deviating too far from the observed market's characteristics.

3.3. Interviews:

All primary data used in this thesis was collected through in-depth, semi-structured virtual interviews, which were then transcribed in summary for the purpose of analysis. These in-depth interviews with founders were then used to establish a case narrative in the context of the proposed research questions and perform cross-case analysis. While face-to-face interviews would have been preferable for this analysis, this method was avoided for safety reasons during the global Covid-19 health pandemic at the time of research. The interviews used a set of questions concentrated on facts and events rather than on respondents' interpretations, and then used a subsequent questionnaire to triangulate information, similar to related studies (Spence, 2003; Kalinic, 2012). Before selecting the case studies, preliminary informal interviews were conducted with four industry professionals. Each had experience guiding start-ups through the internationalization process, including two venture capital investors and two director level consultants focussed specifically on foreign market expansion. These initial interviews were not recorded or included in the analysis, but served to set the direction of the study from a practical standpoint.

3.3.1. Sample Selection:

This thesis uses a sample of eight Canadian technology start-up's (Table 1), of various size and growth stage. The following criteria was used to select these firms for interviews:

Criteria	Reasoning
Established and maintained presence in Canada	This thesis focuses specifically on the internationalization process of firms expanding from Canada to other developed economies.
Classified as a start-up	Export Development Canada defines SMEs as firms with less than 250 employees (). Specific to start-ups, common classification of the 50-100-50 rules applied. Firms are no longer classified as start-ups if they exceed: \$50 million in revenue run rate (forward 12 months), 100 or more employees, or are worth more than \$500 million (Silvestrin, 2017).
Categorized as a high technology	OECD industry classification outlines that firms that use greater than 4% of their revenues towards R&D expenses are classified as high-tech companies. Butchard (1987) defines high-tech as electronics and precision instruments. Each firm selected had some form of physical hardware component to their business as a result.

Table 1: Sample Selection Criteria

While previous SME research has drawn their samples from the regional databases (Spence, 2003), it was found that relevant HSFs were not yet listed likely as a result of age. Firms were identified through a variety of sources including accelerators, incubators, venture capital portfolios, LinkedIn, and referrals. A detailed overview of each firm can be found in Appendix 2.

Firm	Vertical	Stage	Employees	Age (years)	International Revenue
A	Real Estate	Seed	8	3.5	10%
B	Sports	Pre-Seed	3	1.5	Pre-Revenue
C	Bio-Sensors	Seed	19	6	Pre-Revenue
D	Wearable Health	Seed	10	2	Pre-Revenue
E	Organic Lighting	Series A	43	8	100%
F	Batteries	Seed	8	4	Pre-Revenue
G	Drug Detection	Seed	11	2	Pre-Revenue
H	Prosthesis	Seed	4	2	Pre-Revenue

Table 2: Firm Profiles

3.3.2. Interview Design:

A guide was established prior to conducting the interviews (Appendix 1). While the questions posed in the guide were kept consistent across each interview, the structure of

the interview was left to be flexible with the goal of allowing the interviewees to speak freely. The guide was not sent to the interviewees prior to the interview. It is expected that this will provide the opportunity for interviewees to present more honest answers and reduce anchoring bias (Champonnois, Chanel, & Makhloufi, 2018). The interview questions were directed towards the research questions to develop a detailed understanding of the founder and growth process of the firm.

In the initial interview guide, several questions relating to entry mode were posed, including: Which entry mode did you use (acquisition, greenfield, license, etc.), how did you decide which mode to use, and did this vary depending on the market you were looking to enter/ change as you made subsequent entries? These questions were formed as a result of related studies (Spence, 2003; Masum & Fernandez, 2008). It became clear through initial interviews these questions were not relevant to HSF internationalization process. While these questions have not been included in the final interview guide, its omission will be discussed in the Findings and Analysis section. Similarly, a question of the impact of internationalization was posed: following your first international expansion, what was the impact on your local operations? Most companies interviewed were found to be BGs, which would not have established local operations prior, making this question irrelevant for analysis.

[3.4. Evaluation of Research Method:](#)

Qualitative research may be considered unbiased, in-depth, valid, reliable, credible and rigorous if carried out properly (Anderson, 2010). The research method used in this thesis will be primary outlined in the context of Jackson et al. (2007) and Ambert et al. (1995), which identify methods of understanding and evaluating qualitative research. Examining the data for reliability and validity assesses both the objectivity and credibility of the research (Anderson, 2010). Jackson et al. (2007) look further by establishing non-conventional measures of trustworthiness, such as: credibility, transferability, dependability, and conformability. Moreover, Ambert et al. (1995) highlights the goals

and procedures of the paper, as well as the contribution to the field as important evaluation criteria.

3.4.1. Reliability:

A study's reliability refers to the reproducibility of the findings (Anderson, 2010). The data collection process outlined throughout this methodology chapter serves to establish transparency, enabling reproducibility. HSF internationalization research has produced mixed empirical findings. In this study, responses from each founder proved to be unique and context dependant. It is expected that future research using this methodology could yield varying results, depending on factors such as location, vertical, etc., and perhaps most notably, founders beliefs and biases.

3.4.2. Validity:

The validity of research findings refers to the extent to which the findings are an accurate representation of the phenomena they are intended to represent (Anderson, 2010). Validity may be established by accounting for personal biases, acknowledging biases in the sample, and data triangulation (Noble & Smith, 2015). An interview guide was established prior to conducting primary research, and was kept consistent across each case. A clear explanation of the purpose of the research was outlined at the beginning of the interview to establish context. The guide was not sent to the interviewees prior to the interview. It is expected that this will provide the opportunity for interviewees to present more honest answers and reduce anchoring bias. Further, this interview guide is expected to reduce personal bias, as it aids helps to avoid proposing leading questions based on the researchers own beliefs.

Perhaps the clearest forms of bias are conclusions related to accelerators and incubators, of which each case study had participated. Including firms that had taken an alternate path, without the use of these programs, would strengthen these conclusions. Additionally, the scoring system in the founder competencies section (4.2) is based on

subjective observations, exposing this analysis to bias. It is recognized that there are likely other biases existent throughout this paper that have not been addressed. Data triangulation was accomplished in both chapter 4 and 5, whereby results were compared to previous theory and studies.

3.4.3. Trustworthiness:

Jackson et al. (2007) suggests that good qualitative research applies standards of trustworthiness such as member-checking, stepwise replication, and audit trails, to avoid subjective iterations of the researcher's own belief system. Member-checking, or respondent validation will occur following submission of this paper. Stepwise replication requires a number of researchers to carry out separate inquiries in order to compare data in addition to findings (Aguinis & Solarino, 2019). The nature of this study does not allow for stepwise replication. Results have been compared and discussed in the context of past studies of a similar nature to account for this. This thesis will receive inquiry audit from external reviewers.

3.4.4. Goals & Procedures:

Ambert et al. (1995) outline the importance of delineating foci and goals of qualitative research. Research should seek depth rather than breadth, and draw from in-depth and intimate information about a smaller group rather than a large representative sample of the entire population (ibid.). The case study method helps to achieve this, and a strict set of criteria was used to determine a sample of relevant HSFs for this study. While an observation of the holistic internationalization process may be considered broad, analysis of specific factors such as entrepreneurial competencies and knowledge acquisition provide an in-depth and targeted exploration of this topic.

3.4.5. Contribution to Research:

Ambert et al. (1995) also suggests that a piece of research should be examined for its individual contribution to its field, according to whether it makes substantive contribution to empirical knowledge or advances theory. There are several ways that this can be accomplished: by providing new data or replicating previous studies within a different time frame, by studying groups that are difficult to access, by advancing or amending previous theories, or by correcting research (ibid.).

This thesis contributes to research by proposing an integrated theoretical model along with a comprehensive outline of the HSF internationalization process. Research questions are established with reference to relevant research agendas, exploring topics such as the knowledge acquisition process and the role of the entrepreneur in international growth. A research agenda outlines potential finance applications of the internationalisation process, including valuation implications and the use of real options.

4. Findings and Analysis:

This chapter presents the findings and analysis of the research, directed at answering the question, “How do Canadian high-technology start-ups expand globally?” The three proposed research questions are referenced to structure this analysis. To explore RQ1, aspects of the internationalization process of each firm interviewed. Tensions between various models proposed in literature and observed entrepreneurial tendencies will then be revisited in the Discussion and Research implications chapter. Next, the focus will shift towards the role of founder’s human and social capital in each case, and findings will be presented in the context of the knowledge acquisition process, demonstrating the role of informal networks.

4.1. Internationalization Process:

This section observes the firms growth pattern, specifically focusing on timing, motives, and process. This will serve as a reference in identifying tensions between literature and entrepreneurial tendencies in the next chapter. It was found that the majority of firms were in fact BG’s, seeking international markets early after inception:

Firm	Timing (years)	Motives	Process
A	2.5	Network & Timing	Advisor presented the opportunity and the process moved quickly over a month to get it set up and closed.
B	1	Market Size	Demo and initial market screening in domestic market with local teams and accelerators. Launch end products to U.S.
C	4	Market Size & Scalability	Started direct into the U.S. market. Worked with an advisor to identify and capitalize on opportunity.
D	0.5	Market Size	Canada and US first, followed by Japan then Europe (expected commercial path). Based on where customers were identified in three demo rounds in 20+ countries.
E	4	Market Size	Research in school. Participated in accelerator, which helped form connections for investment. Direct sales to Asia once products were available, client interested and contracts signed before the products became commercially available.
F	4	Market Size & Access to Talent	R&D local. Opening office in California to debut in the U.S. market.
G	1	Regulation	Networking and research showed that regulation for marijuana detection was not yet established in Canada. Needed to enter a market with established regulation. The U.S. was the closest, most connections, and had regulation.
H	N/A - domestic focus	Pricing, Costs, & Lack of Knowledge	Started in a hackathon. Joined incubator early after inception. Worked with amputee coalitions to find early adopters. Learned that they must sell through prosthetic clinics and pricing is more favourable in Canada.

Table 3: Case study results: Timing, Motives, and Process

While all firms are technically defined as BG's, the motives of Case A and Case H imply some similarities with gradual internationalization strategy for various reasons. Case A started the firm in 2017 and officially launched in 2019. Approximately 6 months after their initial domestic launch, an opportunity to enter the U.S. was presented by an advisor, causing them to shift their strategy and move international quickly over the course of a month. This was not a conscious or active decision, but rather a spontaneous opportunity. Consistent with Figure 2, and previous iterations by Driscoll (1995), Ekeledo and Sivakumar (2004) and Musso & Francioni (2012), this passive strategy resulted in 'no choice' of entry mode. Instead, the founder relied on the advisor to establish a channel partner, who is responsible for managing the relationship and sales cycle. Case H is too early stage to definitively classify as BG or gradual. They have expressed intent to launch periodically, starting provincial, then national, then into the U.S. Their gradual tendencies stem from their pricing strategy and lack of international knowledge. Since they must sell through prosthetic clinics, which are publicly funded, the public healthcare system in Canada is preferable. Further, they expressed that they lack the knowledge and network at this stage to pursue international growth. From their view, international expansion would only be justified once domestic prosthetic clinics have been exhausted.

In Case B, the founder entered the U.S. first primarily as a result of market size. In this case, the HSF produced a device that replicated the trajectory of Major League Baseball pitches. The Canadian market possesses one MLB team, as well as several minor league teams. At this stage in its development, this particular device would not be affordable for minor league teams; significantly limiting the firm's target market.

Case E has experience expanding into multiple Asian markets early after its inception. They outline that there is a big difference between expanding internationally into the U.S. and 'truly' international. "It is much easier to enter into the U.S., primarily due to shared culture, time zone, etc. If a company is looking to expand into markets other than the

U.S., it is important to surround the firm with advisors who have a deep understanding of business practices there, and then spend a lot of physical time there face-to-face to build relationships. Do not rely solely on remote agents in foreign countries; stay involved and committed to travel. The biggest pitfall is assuming norms in North America are the same in every international market.”

4.2. Founder Competencies:

Literature outlines that the success and speed of HSF internationalization is influenced by the entrepreneur’s characteristics and skills, such as: global vision, international experience and network, international knowledge and capabilities, working experience, education, ability, and cognition. These characteristics are depicted in Table 4 for each case study and scored subjectively on a scale from 1 to 5 to further this analysis (1 being the best). Ability and cognition were excluded from this analysis, as these characteristics seemed to be more subjective than others. Similarly, global vision was excluded after reviewing the findings, as every founder in case study expressed an interest in competing globally soon after inception making it difficult to cross-examine. Other characteristics observed are scored based on the following criteria:

International Experience and Network – At the start of the business, does the entrepreneur or founding team have relevant global work experience (conducted similar business), or connections abroad that may facilitate business activity?

International Knowledge and Capabilities – At the start of the business, does the entrepreneur or founding team have a detailed understanding of foreign market regulations, business standards, competition, etc.?

Working Experience – First time founder or significant experience growing HSFs? Has the founder recently completed education or had the chance to form deep, long-term connections in the industry?

Education – Level of education, related to role in the business: High School, Undergrad, Masters, or PhD? The founder’s role in the company was taken into account when scoring. In Case H for example, the founder had a Bachelor of Commerce, and limited education related to prosthetics. The other founders in contrast had mechatronics engineering and computer science education backgrounds with a deep understanding of the technical side of the business. In this case, the education score would be comprised of both the founders’ education relative to their ability to conduct business development and related activities, as well as the cumulative education of the management team.

It should be noted that this scoring system is still highly subjective, and is in no way a definitive predictor of success, as it is well recognized that many entrepreneurs are successful as first time founders with no formal education. Nonetheless, to further this analysis, the case studies present the following:

Case	A	B	C	D	E	F	H	I
Role	Founder & CEO	Founder & CEO	Founder & COO	Founder & CEO	Founder & CEO	Founder & CEO	Founder & CEO	Founder & CFO
International Experience & Network	Limited	Experience in target market, limited network	Limited	Extensive from previous business	Limited personal, but co-founders do	Experience in target market, limited network	Limited	Experience in target market, limited network
International Knowledge & Capabilities	Limited	Limited	Limited	High, detailed knowledge	High technical, cultural knowledge	Limited	Limited	Limited
Working Experience	First time founder	First time founder	Second time founder	Scaled and sold related business	First time founder	First time founder	First time founder	First time founder
Education	Master in Innovation + Science UG	Bachelor in Engineering	Master in Entrepreneurship + Engineering UG	Bachelor in Engineering	Post-Doctoral Fellow in Engineering	Bachelor in Engineering & Business (incomplete)	Bachelor in Engineering	Bachelor of Commerce
Score								
International Experience & Network	5	4	5	1	3	4	5	4
International Knowledge & Capabilities	5	5	5	1	3	5	5	5
Working Experience	5	5	4	1	5	5	5	5
Education	3	4	3	4	1	4	4	4
Total	18	18	17	7	12	18	19	18
Speed (years)	2.5	1	4	0.5	4	4	1	N/A

Table 4: Implications of founder competencies on internationalization, *own creation*

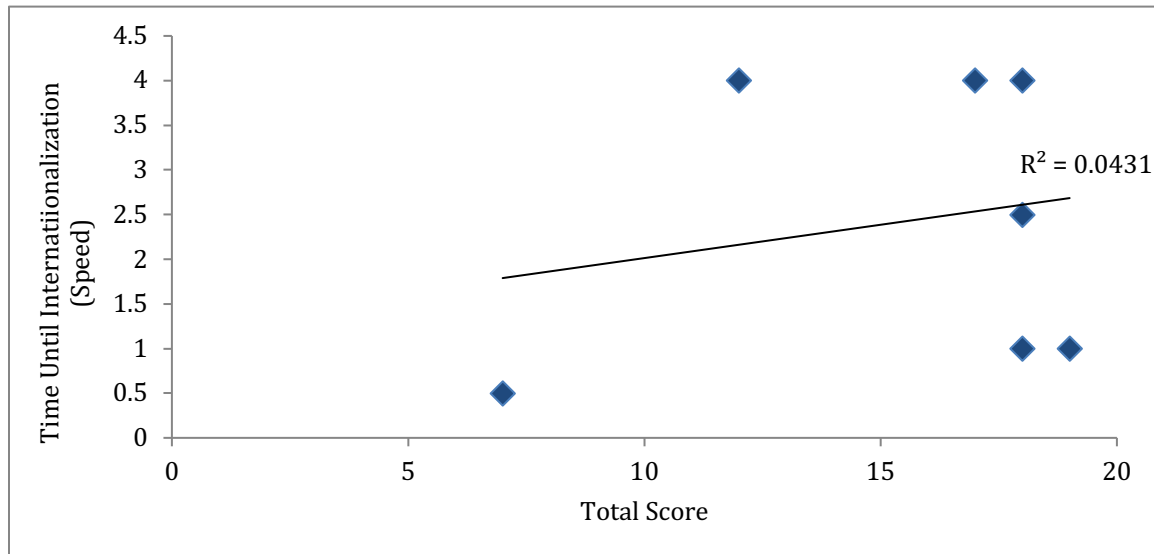


Figure 6: International competency score and foreign entry speed, *own creation*

Case I is only operating in the Canadian market, and was therefore excluded from this analysis. The results of this case study yield a relatively low R^2 of 0.0431, implying a weak linear relationship between founder's international competencies and their entrance speed. There are several explanations are posed in response to this R^2 value. As mentioned, the assigned scores are highly subjective, even after removing global vision, ability and cognition. Ahmad et al. (2010) suggest that future studies should deviate from self-report data and identify ways to obtain competency data from multiple informants to minimize the possibility of response bias. While having founders assign their own scores was avoided for this reason, this data is still likely subject to the researchers own bias. Sample size also likely influences these results. Sample size requirements to identify meaningful patterns in related studies ranges from 30 to 460 cases (Wolf et al., 2013). Future research might use a structural equation modeling (SEM) procedure similar to Ahmed et al. (2010) with a greater sample size to test this proposed model. While this inquiry primarily serves as a foundation for future research, there are several implications for analysis.

Case D attained the best score out of the sample, with a total of 7. This founder had extensive experience entering and competing in foreign markets. They had previously

scaled a similar product into a global competitor before selling the business. This experience provided them with an existing network and international competencies, that they were then able to leverage early in this new venture. As a result, they were able to launch demos of their product only 6 months following inception. In this example, it is clear that entrepreneurial competencies played a significant role in early internationalization.

Cases with worse relative scores such as Case A, B, H, and I, all explicitly identified a lack of international competency. For example, Case B suggested that their biggest concerns in growing the business was due to lack of foreign market knowledge, such as: tariffs on moving product, whether approval will be needed for their projectile device and whether it will be subject to unique regulations, and what costs are involved in exporting. Despite this, each of these cases (excluding I), sought foreign market entry early after inception. Neubert (2015) outlines that further research should analyse the extent to which decision makers, compensate for lacking certain abilities. This phenomenon will be observed in greater detail in section 4.3.1.

Case E had the next best score of 12. In this case, despite having a good entrepreneurial competency score, the firm did not pursue a global strategy until 4 years after inception. This is due to the significant R&D period prior to establishing sales. However, once through the R&D phase, the firm launched globally within the first year of commercialization. This was also true for Case C and Case F. Case C, who develops advanced medical devices, had to pass through several rounds of clinical trials before initiating conversations with physicians regarding commercial use. Similarly, Case F has spent the last 4 years on R&D and has only now started observing how it may commercialize its product.

The level of technology intuitively has an impact on the time spent on R&D. It may be argued that the ‘inception’ of the business does not begin until after this R&D phase is complete, since the company would not yet be in a position to be seeking a geographic market yet.

Total	18	18	17	7	12	18	19	18
Speed (years)	2.5	1	1	0.5	0.5	1	1	N/A

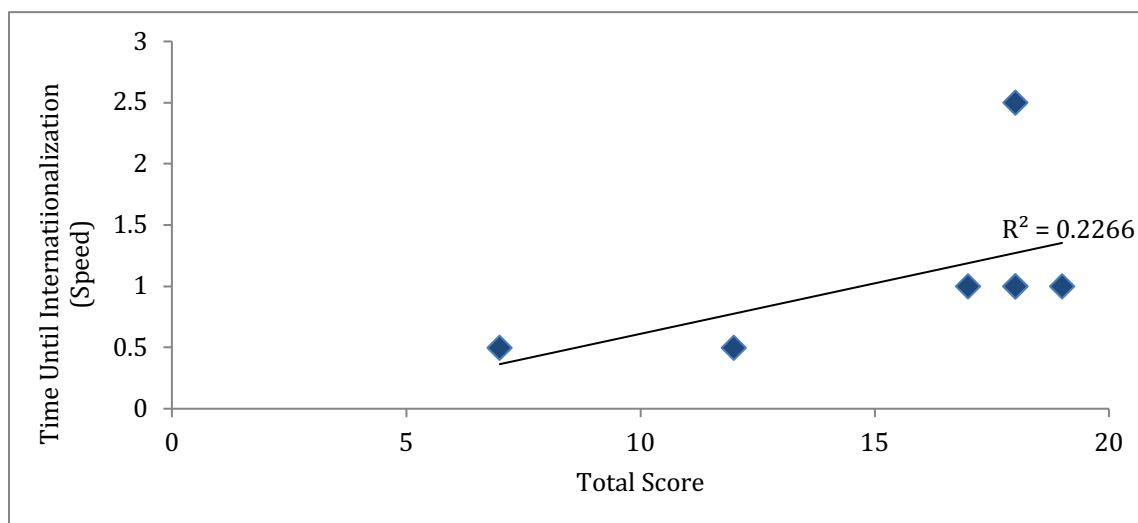


Figure 7: International competency score and foreign entry speed, excluding R&D phase, *own creation*

Figure 7 demonstrates that this would strengthen the observed relationship, producing a R^2 of 0.2266. While it is unclear in this analysis whether this R&D phase should be included in the process or not, future research is encouraged to distinguish further within high-tech, based on R&D duration.

4.3. Knowledge Acquisition & Learning Process:

As outlined in the literature review, the Uppsala model refers to the process of entering foreign markets as an establishment chain, moving from a domestic phase to a global phase, through a process of discovery and learning. If this stage approach were assumed to hold, it would be expected that Canadian HSFs would first establish their business operations locally, and subsequently enter the United States after learning relevant practices, applying their acquired knowledge assets. However, the interview data presents an alternate conclusion. While every firm interviewed entered the United States before any other markets consistent with the hypothesis, many did so before operating in Canada first. To discuss this, findings are summarized in Table 5:

Firm	Initial Demo	Initial	Rationale/ Strategy
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	Location	Launch	
A	Canada	Canada	Local knowledge and network. Sufficiently large real estate market/customer base. Proximity to client is important.
B	Canada	United States	Lack of domestic market, but almost exclusively local connections for demo, network building, and feedback.
C	Canada	United States	R&D done mostly at university and in local incubator. U.S. healthcare has better adoption of this technology.
D	Several	Several	Demo several iterations of the product to identify the market with the greatest willingness to pay and update specifications based on feedback.
E	Canada	China	Demo's primarily during R&D phase in university. Many international clients established from these demos.
F	Canada	United States	Primarily in the R&D phase currently. Moving into commercialization but would like to set up a team in California (target market) before scaling
G	United States	Pending	Lack of regulation, demos primarily at industry conferences in the U.S.
H	Canada	Canada	Early stage, domestic market extensive and preferred pricing strategy.

Table 5: Case study results: Launch Process & Rationale, *own creation*

This observation has implications for both to the acquisition of knowledge assets and the impact of founders' human and social capital. This data implies that the knowledge acquisition process is consistent with Uppsala, even if its sales and distribution process is not. It is clear that the majority of firms interviewed launched into the U.S. first to export their product. In this context, the knowledge acquisition process begins before the product is commercially produced

4.3.1. Informal Relationships:

The way that entrepreneurs develop market and technical knowledge from sources such as customers, VC's, MNEs and other relationships in their network is an important inquiry and recognized as worthy of additional research efforts (Jiang et al., 2019). Every firm interviewed emphasized the importance of informal relationships in their growth process and indicated that formal business relationships were less important for network building. Findings demonstrate that informal relationships are essential for network building, identifying opportunities, knowledge acquisitions, and much more. While there is some variance in terms of how relationships were developed and leveraged, and how knowledge was sourced, several trends emerged:

Early stage VC's and other investors play a minimal role:

To explore the role of investors, a formal relationship, each firm was asked their stage and whether they received advisory support from their investors throughout the process. Of the eight HSFs interviewed, one was pre-seed, six were seed stage, and one was series A. The results imply that the stage of investment is an important distinction to make. A pre-seed firm is irrelevant in this analysis, as it uses capital raised exclusively from friends and family, along with any grants or competitions they may have won. There is also an important distinction between seed and series A investors. The series A firm, Case E, outlined that it did in fact leverage investors and board members throughout the internationalization process. This was primarily to establish networks, but less in terms of knowledge development.

In contrast, pre-seed companies yielded a variety of responses, all of which implied that investors had not had an impact on the knowledge acquisition or network building process. Case A suggested that only one out of its 48 investors was strategic. While this one industry partner provided relevant connections and knowledge, early stage VCs involved had not helped significantly. In this case, the majority of connections established in foreign market were through non-equity advisors and partners. This was fairly consistent with Case D, a seed stage firm who suggested that angels have limited impact on building networks, but do act as references and make introductions as they discover them rather than active engagement in the business. In many cases, this minimal role was primarily attributed to lack of investor competencies. In Case G, the founder sought investors that had previous experience or knowledge of selling to police. This proved difficult given that it is such a small niche. Similarly, Case H found it difficult to find investors with specific knowledge on regulation and licensing in the healthcare space.

Customers are key for knowledge and network development:

After previously establishing, growing, and selling a related start-up in the wearables vertical, the founder of Case D outlines the importance of knowing the customer as well as possible and define the market before building anything. While not an applicable method for all HSFs, Case D simultaneously launched first demo product of their wearable technology in Canada and more than 20 other countries internationally. They have used three rounds of demos pre-commercialization, using customer feedback to improve the product before mass production and define their market more clearly. Case H, who was at the earliest stage of the sample, outlined the importance of this. When building connections, people were a bit hesitant on the technology when it was first proposed. One of their primary growth methods was sending cold emails. Based on feedback from customers, they built out demo video in each of their cold emails. The visual aspect attracted much more interest and enabled them to gain further insight into the demands of their customers. Numerous other firms interviewed used similar methods, many referring to the importance of this constant feedback loop (Case B, C and F). Furthermore, earlier stage companies which primarily use cold calls and emails to source clients highlighted that these customers will often provide relevant referrals even if they are not interested in purchasing the product.

Accelerators and incubators have numerous benefits, though only while in the program:

While to varying degrees, every firm interviewed leveraged resources in accelerators and incubators. When asked for practical recommendations, Case G outlined that these resources are “the most valuable experience and very worthwhile”. They highlighted that the accelerator’s biggest contribution beyond fundraising, was the encouragement to leave their home country to attend specific industry conferences. By attending these conferences throughout the U.S., they were able to form connections with toxicologists, police, and regulatory bodies such as NITSA. Through this process, they found that it would be possible to sell product without as much regulation and these connections would be necessary for wide adoption. In this case, the accelerators and incubators did

not necessarily create the necessary network, but they did create value by facilitating the process.

Advisors and industry partners help fill gaps where management lacks competencies:

Neubert (2015) recognizes the need for further research analysing the extent to which decision makers, be it management or investors, compensate for lacking certain abilities. Case C's primary recommendation was that firms should partner with advisors early, as it can help cut down time with approval and getting the product to market. In several cases, founders attributed their internationalization strategy was attributed to advisors. Case A had limited prior knowledge or work experience in international markets. However, they were able to work closely with an industry partner based out of the U.S. early on. The partner had detailed knowledge of the U.S. market, and was able to present the firm with the expansion opportunity. The founder suggested that this "expansion would not have been possible without the partner", due to the lack of knowledge and network necessary to compete in the U.S. market.

Similarly, Case E attributed international expansion to their advisor, who was a faculty member that had overseen the team's research during their PhD and post-doctorate fellowship. While the other two members of the founding team had some knowledge and connections in relevant foreign markets, the founder outlined that this supervisor was critical in establishing the necessary connections and identifying which markets to enter initially. While finding advisors with relevant technical backgrounds may prove difficult in emerging fields such as OLED displays (Case E), the results show that they are a necessary part in scaling the business.

5. Discussion and Research Implications:

This final chapter expands on the theoretical and practical implications of the findings in the previous section.

5.1. Theory & Entrepreneurial Tendencies:

RQ1: What tensions exist between formal processes presented in literature and entrepreneurial tendencies, and which theoretical frameworks are most representative of Canadian HSF internationalization in practice?

Founders do not typically follow formal structures and processes, as they worry about losing speed, control and team intimacy (Gulati & DeSantola, 2016). Numerous models were identified in the literature review. This discussion will focus primarily on the finding's relation to the original and revised Uppsala model, as it remains the best recognized in internationalization research (Monaghan, Tippmann, & Coviello, 2019).

5.1.1. Psychic Distance:

While there have been numerous studies analysing the role of psychic distance in the internationalization process, particularly the relationship between distance and market selection, entry mode, and performance, the cumulative findings are found to be mixed and inconclusive (Ciszewska-Mlinaric & Trapczynski, 2020). Consistent with past research, the case study results pose conflicting implications for Johanson and Valhne's (1977) concept of psychic distance. From a practical standpoint, there is no doubt that the U.S. possesses the closest physic distance to Canada when observing Johanson and Valhne's (1977) defined variables, which include: language, culture, political systems, business practices, etc. The U.S. has been the first international market for a majority of Canadian firms for a long time (Spence, 2003). This was the case for the majority of firms in this case study, with 6 of the 8 identifying the U.S. as their primary target market outside Canada. Case E entered China first, due to specific product demand, as Asian countries manufacture the majority of cellular and handheld devices which the firm's

products are primarily used for. Case D pursued rapid global expansion to numerous countries and will commercialize in several markets simultaneously.

The primary source of tension with Johanson and Valhne's (1977) concept of psychic distance are the motives being market selection. The theory suggests that firms internationalize based on shared language, culture, political systems, business practices. While these are likely factors, not a single firm interviewed referenced these as a motivation for entry or explicitly referenced them as a factor. Case E did suggest that the process becomes much easier entering the U.S. for these reasons, yet it did not dictate their growth pattern, as they focused instead on distributing their product to Asia. Other respondents attributed their internationalization strategy to market size, pricing and scalability, and placed a greater emphasis on regulation, approval, and talent acquisition concerns.

5.1.2. Establishment Chain:

Uppsala outlines that firms internationalize using an establishment chain that outlines progressively more committed modes of entry, starting with the initial exporting stage, until it is eventually directly producing in the foreign market. This progression begins with a domestic phase, before moving to an international phase or initial expansion, and finally a global phase. From an entry mode standpoint, the findings were consistent with this literature, as the majority of firms interviewed either chose or expressed intent to export (Case B, D, E, and F), or used direct sales through a partner (Case A). Other firms, including Case C, G, and H, were all required to license through a distributor due to regulation.

The second component of this establishment chain, the expansion phases, may be challenged by this study's findings. The findings imply that Canadian HSFs often skip the domestic phase, depending on entrepreneurial competencies (Case D), regulations (Case C and G), and foreign market opportunity (Case B and E). For example, Case E had high competencies and was able to leverage advisors to identify and capitalize on foreign market opportunities early after the R&D phase. Literature finds that firms are

now able to use a leap frogging approach to jump straight from the domestic to global phase, skipping this incremental international phase (Bouncken et al., 2015). Results may extend this conclusion further by implying that firms now jump straight to the global phase, in some cases skipping the domestic phase altogether. The role of founder competencies and influence of advisors in facilitating this jump will be explored further in Section 5.2.

5.1.3. Lean Startup Model:

Findings are most consistent with the Lean start-up model. The model suggests that firms use repeated integrative cycles of opportunity development and implementation, whereby learning and discovery are built into the process to identify new insights for improvement and adaptation throughout the organization. This is not to suggest that other models are irrelevant to Canadian HSF internationalization, as it was demonstrated that some aspects of Uppsala are supported in the previous sections. However, the Lean start-up model is recurring in Canadian HSF literature (Spence, 2003; Rasmussen & Tanev, 2014) and supports this study's topic and findings most clearly. The model was relevant to every case to some degree, most clearly in Case D and Case G.

As outlined in the Findings and Analysis chapter, Case D sent three rounds of demos to potential customers in a broad range of markets. By starting broad and sending their product to more than 20 countries, the firm was able to gain valuable insight into product specification demands directly from their target customers, and identify which markets to begin commercialization in. Through each of the three iterations, Case D improved their product based on demo feedback and narrowed their target market, releasing subsequent demos to fewer countries.

Case G fits the Lean start-up model in a different way. Early after inception, the founder started speaking with local police precincts about their product. Through these conversations, they realized they would be unable to sell in Canada, because regulations did not yet exist for marijuana detection products. This shifted the firm's strategy in two

ways. For their initial marijuana detection device, international markets (the U.S.) became the primary target market, as further market research demonstrated that it would be possible by coordinating with regulatory bodies (NITSA), toxicologists and police. Their product strategy also shifted towards fertility detection. Their discovery process helped them realize that their research and products could be adapted to the fertility market, which has more lenient regulations and a simpler the approval process.

5.2. Founder Competencies:

RQ2: How do founders' human and social capital impact internationalization process and firm strategy?

RQ3: How do HSFs develop or acquire knowledge assets, and how does the firm's network impact this process?

Discussion – Management competencies influence internationalization speed and the use of advisors

Based on the findings in the case approach, it seemed suitable to outline RQ2 and RQ3 together, given the significant overlap between competencies, knowledge, and the role of networks. The relationship between founder competencies and internationalization speed (section 4.2) showed a weak relationship and proved to be quantitatively inconclusive based on this data set. However, qualitative observations implied that for many founders that lacked competencies, such as international knowledge and experience, a BG strategy is still possible with the support of both formal and informal advisors.

A well-recognized method to overcoming a shortfall of a management team that lacks international orientation is to hire a local and experienced employee on-site (Nilsson & Sawicki, 2019). Results were consistent with past studies to some extent, as 3 of the 8 (Case A, E, and F) explicitly outlined the importance of hiring local in their internationalization process. Other earlier stage firms (Case B, G, and H) all suggested

that this method was part of future plans to some degree but had several outstanding contingencies such as approvals.

Born-local theory states that most small firms need support in the form of intermediated internationalization, as they typically lack previous global exposure (Linan, Paul, & Fayolle, 2019). The founders interviewed were considered to have a global orientation or mindset, and all came from strong educational backgrounds. While firm stage and competency level varied between each case, every founder indicated the presence of at least one informal advisor from early after inception. Coviello and Munro (1997) demonstrate that networks provide piggybacking arrangements and are critical in providing access to necessary distribution channels. The use partnerships or strategic alliances to overcome internal or external constraints such as resource or capability deficiencies and spread investment costs among partners has been stressed in literature (Bose, 2016; Li & Qian, 2007). Networking enables greater access to information (Anderson, 2006), improved positioning in the market (Johnsen, 2007), and identification and exploitation of market opportunities (Mort & Weerawardena, 2006). Case A and Case E most clearly aligns with these findings. In Case A, their advisor helped identify the foreign opportunity, build and manage relationships, and help manage regulations and other hurdles. Similarly, Case E worked closely with an advisor (informal supervisor) during the R&D phase. This advisor then helped by leveraging their own network to establish relevant industry connections in China, their primary market where they had no significant prior connections. These trends also support the notion of ‘serendipitous encounters’ proposed by Spence (2003), who suggests that Canadian HSFs are innovative, proactive, and opportunistic, and often pursued internationalization following chance encounters with a potential business partner.

Firms A, B, C, F, G and H all suggested that their network was leveraged in a variety of ways. Dymitrowski et al. (2019) finds that advanced firms leverage informal networks for facilitating formal relationships, division of responsibility, creating new ideas along with numerous other functions. Meanwhile, beginner firms leverage these networks by building relationships, facilitating business activities, and solving conflicts. In this study,

earlier stage firms (B, G, and H) all outline their use of informal networks to account for lack of competencies, primarily attributing their relationships to product specific and market knowledge, further network building, and opportunity identification. Of these network connections, founders highlighted the importance of informal networks. For example, Case B had friends that played NCAA baseball. In developing their precision pitching technology, they leveraged these friends to test and receive feedback on product specifications, as well as build their network by forming relevant introductions with their hitting coaches. This is consistent with Dymitrowski et al. (2019), however they emphasized seeking the use of formal networks, such as accelerators or investors, for conflict resolution, notably with regard to regulation concerns.

St-Pierre, Sakka, & Bahri (2018) demonstrate that a firm's network, or its formal business partnerships, positively influence its access to equity financing. Case G specified that accelerators and incubators were essential to fundraising activities. Other firms interviewed did not state otherwise, but rather did not specify any notable impact.

Pre-existing foreign knowledge influences export intensity in younger firms, and the effects of vicarious learning and experiential learning on export intensity are conditioned by firms' strategic intentions (Casillas et al., 2015). Case D was the only firm with pre-existing foreign knowledge out of the firms interviewed. It was clear in this case that this prior knowledge influenced the founder's strategy and use of networks. Their strategy entailed a demo of the product soon after inception in numerous markets that the founding team had experience and knowledge in. They placed much less emphasis on using networks and relied primarily on their own competencies instead of advisors. However, the findings may conflict with Casillas et al. (2015) in other cases, as pre-existing foreign knowledge did not dictate the firm strategy. Instead, firms that lacked competencies such as this knowledge, leveraged knowledgeable advisors.

5.3. Future Research:

This section identifies enhancements to the methodology and proposes a research agenda to extend and further substantiate the theoretical model.

5.3.1. Research Methodology:

Future research would benefit from the combination of both quantitative and qualitative research methods, and should apply longitudinal analysis, which is recognized as a research gap in IB literature (Sedzinauskienė et al., 2019). IB research is found to lack authoritative longitudinal data drawing from non-random cross-sectional databases, and may therefore induce biases (Sui, Yu, & Baum, 2012). This thesis is also bound to qualitative, cross-sectional analysis. The analysis could be strengthened by taking a longitudinal approach, observing each firm in the case study over a longer time period, rather than point in time as presented. The approach could focus on the HSFs full life cycle, including its evolution of network ties and growth trajectory (Sedzinauskienė et al., 2019).

Central to the research questions and analysis, was the proposal by Neubert (2016) for further research analysing the relationships between different variables such as the location, industry, and abilities of the entrepreneur, and the extent to which decision makers compensate for lacking certain abilities. As previously addressed, the methodology used would be strengthened by increasing the sample size to at least 30 cases and using an SEM procedure. To reduce bias, this method could incorporate both self-scoring, and researcher based to improve inter-rater reliability.

5.3.2. Research Agenda:

Numerous alternate approaches for further research exist. To strengthen the theoretical model, one approach may be to observe the implications of entry from emerging markets rather than developed economies such as Canada. Several authors have highlighted the need for further research (Neubert, 2017; Knight and Liesch, 2016), as there has been limited research focusing on BGs from emerging markets (Gonzalez-Perez et al., 2016). Further, many characteristics of HSFs in developed economies are not necessarily

transferable (Knight and Liesch, 2016). Further exploration into the role of founder competencies and informal networks on the internationalization process is also encouraged. Future research might observe deeper relationships between these factors and internationalization outcomes. For example, it may be useful to explore whether founders with high competencies are more successful in internationalizing than founders with low competencies that are partnered with knowledgeable advisors. From another perspective, future research may observe the relationship between investor stage and the level of involvement in building firm network or knowledge acquisition abroad. This concept was introduced in section 4.3.1., as results implied that later, more committed investors were more likely to play an active role in facilitating growth. The field would also benefit from further empirical studies on internationalization process as findings are still considered ‘mixed’.

While variations to the approach such as this are substantial, this section will develop a research agenda specific to addressing the potential extension of the theoretical model to valuation. Neubert (2015) briefly introduces this agenda, however, only in the context of how speed of internationalization may impact valuation of HSFs. The implications on valuation are scarce, especially in the context of integrated theoretical models.

5.3.2.1. Performance & Valuation:

While this topic is rather auxiliary to the core focus of this paper, it relates specifically to extending the outcomes section of the integrated theoretical model. This extension is based on the idea that a company’s financial performance strongly reflects the firm’s value, and is usually embodied in profitability, growth, and shareholder value (Susanti and Restiana, 2018). Arora et al. (2018) conducted a study analyzing performance trends from 1997 to 2011, and demonstrated that across 19,921 HSFs, the decision to compete globally resulted in a premium of approximately 2.5% over their domestic counterparts. Assuming this premium is a true reflection of value creation from this global strategy, the question is then raised regarding how this value is captured.

Research on the valuation of start-up technology firms suggests that traditional valuation methods present “extreme” difficulties; attributed to the lack of comparable companies, the inexistence of historical data, the complexity to estimate volatility, and the number of intangible assets that give worth to the firm (Gaston, 2013). The real options valuation method is less common than other cash flow-based valuation approaches such as comparables or NPV methods (Appendix 3). However, option-pricing theory is useful in situations where the flexibility to increase or decrease the rate of production, defer development, or abandon a project exists (Lerner & Willinge, 2011). Research suggests that the binomial approach is one of the most powerful tools available, since it can be used to create a decision tree based on demand, price, and other parameters for each period of time (Wardani & Fujiwara, 2018). While real options theory of investment has been increasingly applied to analyse foreign market entry and multinational operations, applications to start-ups growth and entrepreneurial investment decisions have been limited (Li, 2006). This IB specific research has focused on understanding how international investments may be structured to provide firms with flexibility under uncertain conditions, and its applications have been found to be highly suitable (Song, Makhija, Kim, 2015).

One suggestion is to include the **7-P framework** in this analysis, which outlines that in order to achieve competitiveness through internationalization, SMEs will analyse: potential, path, process, pace, problems, pattern, and performance, whereby performance is defined as a function of the other 6 Ps (Linan, Paul, & Fayolle, 2019). Using this framework in the context of real options may pose an opportunity to draw further parallels between internationalization process in terms of performance, and value creation.

5.4. Practical Implications:

This topic will continue to gain relevance as the technology ecosystem continues to develop in Canada and globally. Recent research suggests that Canada does not have a reliable history of transitioning companies from a local success into a global competitor,

as many HSFs either move to the United States or are sold to foreign investors (Wolfe, 2019). Only one case outlined that they would move and consider the opportunity of a sale once established in the U.S. The findings of this case study challenge this concept, as each of the other 7 firms expressed the intent to keep their headquarters in Canada. However, it may be the case that the firms interviewed were simply too young to be able to assess this.

It is now widely acknowledged that Canada's innovation performance has remained relatively weak by international standard (Globerman & Emes, 2019), and has fallen from 12th to 17th in the Global Innovation Index over the past decade. Prominent public policy analysts have suggested that government should focus on assisting companies that have demonstrated commercial potential to compete globally and promote the creation of businesses capable of developing disruptive technologies (Wolfe, 2019). Based on previous research and conclusions drawn from this thesis, HSFs in Canada must think globally and participate in foreign markets in order to remain competitive in the long run.

This qualitative, case-based research investigates the internationalization and growth process of Canadian high-tech start-ups (HSFs). The study aims to develop an understanding of the tensions between literature and entrepreneurial tendencies, explore relevant factors to the internationalization process such as the entrepreneur's characteristics, and proposes an integrated theoretical model. The goal of this study is to enhance integrated theoretical models of internationalization which currently lack practical relevance, to provide insight and relevant recommendations for founders. While established in greater detail in previous sections, practical implications for founders are summarized:

1. Advisors and industry partners help fill gaps where management lacks competencies. While founder competencies can be a determinant of early and successful internationalization, founders that lack these competencies may leverage advisors for knowledge and network building to achieve success.

2. VC's and other investors play a minimal role in facilitating internationalization and helping build networks in the early stages of a start-up. Other formal business relationships such as mentors in accelerators and incubators play a bigger role.

3. The primary ways of developing knowledge are through experiential learning by using customer feedback from demos, speaking with related founders, working with advisors and support programs (i.e. accelerators and government incentive programs), and attending industry conferences. This is a continuous cycle of learning and integration.

4. The main knowledge gaps or concerns of early stage start-ups expanding into foreign markets include: Talent acquisition, export tariffs and other costs, approvals and regulations, costs involved in exporting, implications for tax, and leveraging government incentive programs.

Readers are encouraged to review Appendix 2, which provides a detailed summary of each interview for further practical insights.

6. References:

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7. Appendix:

Appendix 1: Interview Guide

Prior to Interview:

- Present purpose of the study
- Ask for recording consent (deleted following transcription) and confirm anonymity in the report

Firm Profile:

- Can you provide an overview of your company, including your primary business activities, industry vertical, date created, and number of employees?
- How would you describe your current revenue breakdown by geographic location (% of sales from international) and primary expenses you face?

Internationalization:

- Timing – How soon after inception did you go global and when did you first think about going global? What was the first market you entered, and what was your timeline and location of subsequent entry?
- Motives – How would you describe your company's position in domestic market right before going international? Was it important to go global to remain competitive?
- Process – Can you explain how you determined that this was appropriate or possible for your business, and how did you execute it?
- Knowledge – How did you gather information about the foreign target market before entering that market? Did you have a system before choosing?
- Decision Factors – Once you determined you would pursue a global strategy, how did you decide which market to enter? Name and total number of countries your company has international activities with (in order, first to last) and year of internationalization.

- Concerns – What were your primary concerns throughout the process, specifically in choosing the entry mode? What would be your suggestion to the SMEs that are planning to internationalize in the near future, regarding strategy and methods?
- Network – What stage are you – VC or angel backed? Did you receive advisory support throughout the process? How did you primarily build your networks? What role did investors or accelerators play in building your network or your growth process as a whole?
- Entrepreneur – Tell me about your own background. How did that fit into your role in the company? What is your work background – first time founder or international experience? What skillset or characteristics did your management team lack when starting out and how did you fill this gap if any?
- Practical – If *later* stage: Do you have any recommendations for other startups looking to expand and compete globally? Best practices and key takeaways that could be applicable? If *early* stage: What would you like to know about the international growth process/what is your biggest unknown in scaling your company looking forward?

Closing Remarks:

- Thank them for taking the time; ask if there is anything else they would like to add.

Appendix 2: Detailed Interviews

A full transcription of each interview can be made available upon request. Company names are kept anonymous.

Case Study A:

Case A is an IoT company providing smart labor allocation and supply utilization to commercial property managers powered by smart sensing technology. They optimize the way buildings perform day-to-day cleaning maintenance by enabling intelligent cleaning decisions with connected dispensers, bringing the IoT to the restroom, helping property managers save money, stay green, and delivering the best experience to their patrons.

Profile

Interviewee	Interview Date	Vertical	Stage	Employees	Age (years)	International Revenue
Founder & CEO	May 12, 2020	Real Estate	Seed	8	3.5	10%

Summary of Interview Responses

Topic	Response
Timing	Started in 2017 and officially launched in 2019. Approximately 6 months after initial domestic launching an opportunity became available, no serious thought prior as operations in Canada were still being scaled up.
Motives	Entry based on network and timing. Side experiment to test capacity to scale as a result of an advisor created opportunity.
Process	Opportunity presented itself and moved quickly over a month to get it set up and closed. Once started recurring revenue in Canada, able to start to shift the focus to scaling commercially rather than a proof of concept.
Knowledge	Limited prior knowledge of working in the U.S. or internationally. Partner helped with expansion, likely would not have been possible without them. Partner had extensive knowledge of U.S. market. Aspect of selling through channel partner rather than direct export. They manage the relationship and sales cycle.
Decision Factors	It was not a conscious decision. Instead more of a side experiment to test capacity to scale as a result of an available opportunity. In terms of subsequent entry, the potential opportunity for entry into the U.K. through another advisor came up only 4 months after U.S. expansion. Facing resource capacity right now, a couple buildings in the U.K. have expressed interest, but it is seen as higher risk due to distance, cultural market and time zone.
Entry Mode	Licensing. Sales through channel partner rather than direct export. More regional focus for sales of this particular technology. Using a channel provider proved to be more effective than setting up from scratch. The real estate business is very centralized and people tend to think of physical assets, much greater emphasis on proximity to sales and support. Difficult to hire the right people and gain market knowledge, this arrangement makes up for this.
Concerns	Lack of market knowledge but less concern with the help of advisor

	and sales through channels. Canada to the U.S. was seen as much more seamless, seen as pretty much the same market, so seen as low risk.
Network	One investor was strategic (industry partner) was most helpful but generally VCs haven't helped significantly. Most connections established in foreign market through a partner.
Entrepreneur	First time founder with limited start-up or professional experience. Holds a master's in innovation and entrepreneurship.
Practical	Most things are not altruistic, building in structures early. Understand the channel/ distribution process and be clear about referrals well before going international. Move quickly on opportunities, U.S. entry happened over the course of one month.

Case Study B:

Case B is the Boston Dynamics for elite human performance training. They leverage advancements in robotics, AI and neuroscience to revolutionize athlete performance, enhancing the fan experience. For the first product release Case B is building a base-ball pitching robot that can exactly replicate any pitch imaginable. Case B's precise pitch replication enables highly realistic practice. MLB Organizations can use Case B's Pitching Machine to improve batter performance, vindicate scouting prospects and design new deceiving pitches.

Profile

Interviewee	Interview Date	Vertical	Stage	Employees	Age (years)	International Revenue
Founder & CEO	April 16, 2020	Sports (Trajectory)	Pre-Seed	3	1.5	Pre-Revenue

Summary of Interview Responses

Topic	Response
Timing	While still in the demo phase, Case B started negotiating contracts within the first year in the U.S.
Motives	Majority of major league teams present in U.S. Amount of engineering and material cost not attainable for collegiate teams. Want to establish brand recognition at the highest level once material costs can come down.
Process	Demo and initial market screening in domestic market with local teams and accelerators. Most similar market to Canada with potential buyers.
Knowledge	Some connections and knowledge of the U.S. market after working in management consulting in New York. Most connections and market entry facilitated by referrals from local team and various advisors.
Decision Factors	Originally did explore staying in the domestic market. However, it is new technology, and price-point proved to not currently be relevant to collegiate teams. Market size primary factor.
Entry Mode	Export. Expected mode, but still in demo phase so not yet confirmed.
Concerns	Lots of unknowns still. Need to know if there are tariffs on moving product. Whether approval will be needed (since it is a projectile device it may be subject to unique regulations). Costs involved in exporting.

	Potentially incorporating or setting up a subsidiary in the U.S., but the implications for tax and import/export are unknown still. How to leverage government incentive programs.
Network	Accelerator used for business advisors. Started with cold messages to local MLB team, developed a use case to build the product. Then later went through this initial connection to get further introductions. Also used cold emails to teams throughout the U.S. Introductions were also established through personal connections playing NCAA baseball. Investor's networks also used, but to a fairly minimal extent. Advisors leveraged for concept development while in early stages during university.
Entrepreneur	Idea started in undergrad. Founders have strong engineering background, with some work experience in the U.S. and Canada. Both first time founders. Some international experience and global orientation. Overall experience scaling similar business and competing globally is limited.
Practical	Canadian export challenge (pitch competition held by Export Development Canada) and speaking to other similar founders has proved most useful. Need to address outlined concerns.

Case Study C:

Case C aims to reduce the risks that are associated with surgeries by monitoring the patient's health after a surgical operation. Its platform composed of bio-sensors detects post-operative complications and alerts doctors as soon as the complication develops.

Profile

Interviewee	Interview Date	Vertical	Stage	Employees	Age (years)	International Revenue
Founder & COO	May 29, 2020	Health - Surgery	Seed	19	6	Pre-Revenue

Summary of Interview Responses

Topic	Response
Timing	Pre-commercialization but started with contracts with U.S. doctors and hospitals in the first year. Currently fully functioning solution tested in animal models and in clinical setting but still yet to receive regulatory approval, expected to receive by end of the year.
Motives	Private healthcare market more desirable.
Process	Started direct into the U.S. market. Also looked at the Canadian and Gulf market. Realised that the private system in the U.S. presented greater opportunity and started working with an advisor there.
Knowledge	Limited, with fully Canadian team. Working with physicians in U.S. Mostly R&D and testing in simulated environments. Then went to accelerator to move closer to commercialization stage. Worked with consultants and product development experts to understand the regulatory approval process in terms of times and documentation.
Decision Factors	Market size, U.S. healthcare has multiple payers. In Canada, there is only one payer. Longer approvals and more difficult to get into hospital in Canada with only on payer. Difficulty for regulations in the U.S. not a concern.

Entry Mode	License. Distribute through contracts with physicians and hospitals.
Concerns	Regulatory approval is the biggest concern, and then medical device adoption. Need to understand physician workflow in the development phase. Uncovering what is needed to understand in terms of approvals, have some knowledge on an informal level with the FDA to understand the approval process and requirements.
Network	4 years of using existing physician network from own personal connections to validate the problem and solution. Network through partner (hospital itself) or try and establish name in actual market with data, presenting in trade shows and conferences. Two step process, accelerator program in the U.S., exposed to a bunch of surgeons and hospitals to work with them in early stages of studies. Expand the relationship into early pilot sites or for commercialization. Had an advisor on board who was a surgeon in the U.S. hospital, able to informally establish a partnership with an institution.
Entrepreneur	Second time founder, first did not take off but provided valuable learning experience. Holds a master's in entrepreneurship, which helped establish a network in the space. Limited international work experience.
Practical	Don't think you know it all. Partner with advisors early, as it can help cut down time with approval and getting the product to market. The founding team from the beginning is the most important.

Case Study D:

Case D automatically tracks your mental workload ("mental effort/stress") for any activity. Case D alerts you depending how long your mental effort "mental stress" has been sustained for. The mobile app provides insights and suggestions on how to potentially improve your mental effort or make changes that you decide on. Case D enables the user to learn when to take cognitive breaks at the right time.

Profile

Interviewee	Interview Date	Vertical	Stage	Employees	Age (years)	International Revenue
Founder & CEO	May 29, 2020	Wearables	Seed	10	2	Pre-Revenue*

Summary of Interview Responses

Topic	Response
Timing	Simultaneously launched first demo product in Canada and other countries (users in more than 20 internationally for first demo). Three rounds of demos pre-commercialization.
Motives	Limited restrictions/regulations enabled a very broad focus for the first iteration. Actually had more products distributed to the states in the first phase and distributed to many more countries than in the current phase. Canada, U.S. and Europe for the current test phase.
Process	Canada and US first (grouped together), then Japan, then Europe. Based on where customers are as identified by test rounds.
Knowledge	Currently a test unit format. No finalized commercial form to produce in mass quantity. Units are out in the market used by people that have pre-purchased units. Some knowledge from advisors, but mostly from

	information gathered from each demo round and previous experience.
Decision Factors	Primarily based on willingness to pay and reception to previous demo rounds. Non-prescriptive category has lower regulation as long as it stays in 'awareness' category.
Entry Mode	Direct export. Still pre-commercialization but used export to those who have pre-paid in demo/kick-starter rounds.
Concerns	For any hardware component business – more tightly matched the feedback loop with end customers earlier on, the better the result in final version of the product. Need to launch at the appropriate time.
Network	Mostly one-on-one cold messages on LinkedIn, referrals from these messages as well. Gain attention from people in accelerator almost exclusively while you are still there, less so after. Angels have limited impact on building network, act as references and make introductions as they discover them rather than active engagement in the business.
Entrepreneur	2 nd venture in wearable tech space, grown from nothing to exit (sale). Co-founder is a leader in the wearable's space. Experience selling in most secondary markets throughout the world in past ventures.
Practical	Know your customer as well as possible and define before building anything. Find someone that complements skillset to other team members but has similar values (hard to find though because you don't know someone until you work with them). Take time with any investor and do due diligence, as they are part of the firm for the life of the business.

*Note: Though the company is pre-commercialization, it has received remuneration for demo products through a kick-starter campaign. This will not be considered revenue, as these were not direct sales.

Case Study E:

Case E is developing advanced materials using quantum simulations, machine learning and real-world testing in pilot production. They are currently focused on key enabling materials for OLED displays that will be used in next-generation consumer electronics and automotive. Their advanced electrode materials, and associated manufacturing technology, are being used to build transparent displays and lighting.

Profile

Interviewee	Interview Date	Vertical	Stage	Employees	Age (years)	International Revenue
Founder & CEO	June 8, 2020	Organic Lighting	Series A	43	8	100%

Summary of Interview Responses

Topic	Response
Timing	Developed product during PhD and post-doctorate, launched internationally immediately. Interest internationally while still in R&D phase.
Motives	Target market (high performance displays & OEMs) almost exclusively in the Asian market/international. Early internationalization necessary given lack of local market.
Process	Started research in school with co-founders. Participated in accelerator,

	which helped form connections for external investment. Direct sales to Asia once products were available.
Knowledge	Leveraged advisors and foreign consultants with relevant experience to acquire knowledge.
Decision Factors	Combination of market size and existing network, as well as location of potential customers that had already expressed interest during the R&D phase.
Entry Mode	Direct export. Utilize local agents in certain markets for distribution. Subsidiary (greenfield) established in Asia 6 years into process.
Concerns	Regulations and understanding foreign business practices. 3 rd party agents used to address these concerns.
Network	Introductions from supervisor with relationships/previous experience in similar space. Trade shows, cold calling, and contacts from publications initially. Hired industry professionals abroad later on. Leveraged board members and investors.
Entrepreneur	Founding team all has a background in materials engineering (each post-doc fellow program). 2 co-founders had experience in international market.
Practical	There is a big difference between expanding internationally into the U.S. and 'truly' international. Its much easier to enter into the U.S., rather than countries with different culture, time-zone, etc. If outside the U.S., surround with advisors who have a deep understanding of business practices there and spend a lot of physical time there face-to-face to build relationships. Do not rely solely on remote agents in foreign countries; stay involved and committed to travel. The biggest pitfall is assuming norms in North America are the same in every international market.

Case Study F:

Case F produces zinc-ion batteries for applications in the electrical grid. Their batteries are cheaper, safer, and longer lasting than anything else on the market.

Profile

Interviewee	Interview Date	Vertical	Stage	Employees	Age (years)	International Revenue
Founder & CEO	May 29, 2020	Batteries	Seed	8	4	Pre-Revenue

Summary of Interview Responses

Topic	Response
Timing	While R&D has been the focus for the past several years in domestic markets. Scaling the product commercially was intended for the U.S. early in the lifecycle.
Motives	Size, access to talent, and access to capital are primary motives. Need certification anyway, and the process isn't drastically different to Canada. Culturally, Canada is not as ambitious.
Process	Currently securing funding to build out pilot plant next year, which will take the firm to the end of the commercialisation phase and enable a focus on monetization. Opening office in California to debut in American storage market.

Knowledge	Leveraged personal connections and knowledge acquired in previous work experience.
Decision Factors	California has the largest energy storage market. Based on this and the abundance of talent, there were few locations that would be feasible.
Entry Mode	Greenfield. Setting up an office in foreign market.
Concerns	Need know how to hire, what is the best skillset, hiring the right people in the new market (California). Less concern about actually selling the products, once the tech is ready there is no major concern.
Network	Plan on joining an incubator, already went through an accelerator and will use this accelerator to build connections. No significant impact from investors.
Entrepreneur	Educational background in business and nanotechnology. Past relevant internship experience in business (investment banking) and developing liquid metal batteries. No formal international work experience or extensive experience scaling start-ups.
Practical	It is important not to underestimate how unpredictable the future is, and don't be too confident. The hardest part of commercialisation will be determining whether to sell the business, license the technology, or scale the manufacturing beyond a component supplier.

Case Study G:

Case G is at the leading edge of the rapid drug detection market, by producing a nanotechnology-based portable breathalyzer for cannabis.

Profile

Interviewee	Interview Date	Vertical	Stage	Employees	Age (years)	International Revenue
Founder & CEO	June 9, 2020	Drug Detection	Seed	11	2	Pre-Revenue

Summary of Interview Responses

Topic	Response
Timing	In incubator during university, spent 9 months in the incubator, accepted to accelerator for 3 months, which helped then a seed round, now 6 months seed round. The accelerator was based in the U.S., which was the first major entry and exploration into foreign markets.
Motives	Still pre-commercialization, initial market launch is based on regulation; a combination of market size, market opportunity, and where they can receive approval first.
Process	Started locally but realized that the process was regulated and confusing for specific distribution. At this stage, couldn't sell in Canada because regulations didn't even exist yet for marijuana detection. Decided to pursue international markets and pivot focus of product in local markets due to regulation.
Knowledge	Once realizing regulation would be an issue locally, they did market research in U.S., and found that it is possible to sell product without as much regulation but for wide adoption they would need connections with regulatory bodies (NITSA), toxicologists and police. Found that

	they could form these connections together at various conferences in the U.S. Used incubators and accelerators to develop knowledge related to fundraising and finding the right industry conferences in the foreign market.
Decision Factors	Primarily regulation/approval based. Market size and proximity for the decision to focus on understanding the U.S. market.
Entry Mode	License. Depending on the market and approval received, will need a distributor for marijuana testing product. May be able to export fertility test, but too early in the process to know.
Concerns	Terrified of entering foreign markets with no connections (china, Germany, etc.). It would be helpful to have someone at the firm with experience entering those markets. Would seek investors with experience in those markets with knowledge of right people to hire to mitigate this risk/concern.
Network	Some introductions from incubators. The accelerator's biggest contribution beyond fundraising, was the push to leave country or state to attend other conferences. Looked for investors that were connected to selling to police but small niche which wasn't super helpful.
Entrepreneur	Some international background, extensive travel and European passport. Limited benefit so far. 2 recent nanotechnology engineers. Dynamic of one with strong communication and networking strength and one with strong technical/ product development, with defined roles.
Practical	Incubator or accelerator is the most valuable experience and very worthwhile. Be passionate about product.

Case Study H:

Case H is a medical technology company, using current advances in computer vision and machine learning to develop an ultra low-cost prosthesis device.

Profile

Interviewee	Interview Date	Vertical	Stage	Employees	Age (years)	International Revenue
Founder & CFO	May 29, 2020	Prosthetics	Seed	4	2	Pre-Revenue

Summary of Interview Responses

Topic	Response
Timing	Prototype currently underway with medical device review with Health Canada. Internationalization not in question until domestic sales are established.
Motives	Incubator services (legal services, etc.) free of charge, cost constraints of launching into the U.S. market. 100% of the time these arms are reimbursed. Public healthcare more attractive in Canada, offers more flexibility on pricing than the private healthcare market would in the states.
Process	Started in a hackathon. Joined incubator early after inception. Worked with amputee coalitions to find early adopters. Push to market once approval is received. Sell through prosthetic clinics. First provincial

	launch, then domestic, then U.S.
Knowledge	Had to navigate regulatory and licensing landscape by themselves, which has been a challenge. Mentorship from case competitions and incubators, as well as personal connections primary source of learning.
Decision Factors	Filed for medical device licensing in order to sell. Different risk classifications before able to sell (in both U.S. and Canada).
Entry Mode	Licensing. Even though they are only looking domestic currently, all devices must be licensed through prosthetic clinics.
Concerns	Pricing in the U.S. market is very different; need info on level of commitment and funding from the U.S. government. Payments would be through insurance companies rather than the government in Canada. Need to be recognized as an accredited manufacturer.
Network	Won large start-up competition that helped establish connections, along with connections through incubator and personal. Otherwise, network primarily established through direct contact of clinics.
Entrepreneur	All recent graduates with significant relevant internship experience. Diverse education with both business and engineering backgrounds. Limited international experience and understanding of U.S. regulations.
Practical	When building connections, people were a bit hesitant on the technology when first proposed. Sending cold emails is tough, built out demo video in cold emails sent. The visual aspect attracted much more interest. Financing – hard to find investors with specific knowledge on regulation and licensing in the healthcare space. View hardware investments differently, due to alternate capital structure and business model.

Appendix 3: Traditional Valuation Methodologies

Comparables. This technique involves identifying other firms that display similar value characteristics (growth rate, risk profile, capital structure, etc.) to the company in question (Pinto, 2020). While this is the most commonly applied method in the public markets, used by approximately 93% of industry professionals (Pinto, 2019), its applications to start-up valuation is relatively limited (Pepis, Evans, & Jong, 2018). For private companies, particularly earlier stage start-ups, it is difficult to determine what valuations have been assigned to other private firms. As a result, research finds that accounting-based comparables have limited predictive ability, due to the limited information available in the private markets and the question of whether assumptions made during the comparable company valuation are valid given that many firms at this stage are unprofitable and are experiencing rapid growth (Lerner & Willinge, 2011).

Net Present Value. This method involves estimating the value of future cash inflows and

outflows discounted at a specific rate (usually the weighted average cost of capital, or WACC). This cash flow valuation method factors in the benefits of a tax shield from tax-deductible interest payments in the discount rate. Previous literature highlights how utilizing a start-up company's financial statements for discounted cash flow valuation requires excessively speculative measures, suggesting that projected free cash flows of established firms with similar business models may be a more appropriate technique (Pepis, Evans, & Jong, 2018). While the method is considered technically sound, it faces many of the same challenges as the comparables method. For example, a comparable company beta is required to calculate the WACC and is used to estimate a target capital structure (Lerner & Willinge, 2011).

Adjusted Present Value. The APV method is a variation of the NPV method, but is preferred when the firm's capital structure is changing (Lerner & Willinge, 2011). Under the APV, cash flows are valued without taking capital structure into consideration by essentially assuming that the firm is financed solely by equity.

Venture Capital Method. Given that the majority of start-ups have negative cash flows and earnings, typical valuation methods as mentioned above are often less applicable. While it has been established that start-ups looking to expand globally are generally later stage, this is still generally a reality for most firms. As a result, the venture capital method takes this into account by using a multiple at some point in the future once the firm is expected to achieve positive cash flow. This "future" cash flow is then discounted at a rate typically between 40% and 75% based on the firm's expected returns (Lerner & Willinge, 2011).