

International Expansion Strategy in Fast-Growing Businesses: Using Bayesian Networks to Identify Influencing Factors

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Abstract

The article aims to identify the key factors influencing strategic decisions regarding international expansion amongst rapidly growing digital businesses in Amsterdam, Berlin, London, New York, and Paris; whilst uncovering prominent trends that can provide guidance to investors and managers engaged in the internationalization process. The data used for this study was gathered from business networking events held between 2016 and 2020, with a specific focus on the short-term strategic growth options pursued by these companies. To analyse the data, the authors employed Bayesian Network modelling, comprising two components: 'International Expansion' as the primary factor (parent node) and 'Factors of Interest' as the secondary factor (child node). The findings indicate that companies based in Amsterdam, New York, and Paris are primarily influenced by 'Exits' and 'Acquisitions' when making decisions about international expansion. In contrast, businesses in Berlin, London, New York, and Paris lean towards alternative venture capital options such as 'Debt,' 'Venture Debt,' and 'Private Equity.' The results suggest that companies in London and Berlin possess mature business models, significantly impacting their ability to attract investments and expand internationally. Moreover, this research not only demonstrates the applicability of Bayesian Networks in analysing strategic choices but also provides valuable insights into how these choices influence a company's internationalization strategy, offering practical guidance to investors and managers. Finally, the study highlights the existence of distinct intentions for international expansion amongst CEOs and founders in the regions under investigation, indicating the need for further research to comprehend these unique idiosyncrasies.

Keywords: fast-growing businesses, bayesian networks, international expansion, start-ups

1. Introduction

Rapidly expanding businesses serve as catalysts for economic growth and job creation in both developed and emerging nations. This dynamic organisational approach has garnered support since the 2008 global financial crisis and persists to the present day (Lee, 2017). Given the increasing significance of rapidly expanding companies to the economy, researchers are displaying heightened interest in comprehending this business model (Noronha et al., 2023; Stallkamp et al., 2022), and nations are spearheading numerous initiatives to further bolster these enterprises and create an internationalization oriented culture (Costa et al., 2022; Thomas et al., 2020; Yin et al., 2019; Daunfeldt & Halvarsson, 2014).

The pursuit of accelerated growth in these enterprises necessitates a meticulous approach to technological capabilities (Wentrup, Nakamura & Ström, 2020). Nonetheless, it is vital to note that technological prowess alone does not guarantee success (Huang et al., 2017). In addition to technological capabilities, a unique set of factors intrinsic to each organisational management model is indispensable (Thomas et al., 2020). Gaining insights into the success factors of rapidly expanding organisations that adopt an internationalisation-based expansion model can contribute significantly to the development of a dynamic and competitive business ecosystem (Yin et al., 2019).

In an environment characterised by uncertainty, information can be effectively analysed within control and planning systems, provided that there are models to support such analyses. Bayesian Network (BN) analysis facilitates the estimation of information pertaining to potential costs and/or benefits that may substantiate managerial and strategic decisions (Higgins, 1974). Nevertheless, it is worth noting that Lohrke et al. (2018) have highlighted the paucity of highly qualified research employing Bayesian Networks (BN) methods in the

realm of entrepreneurship and strategic decision-making. The increase in information added to studies can be obtained through a vast space available for the implementation of new methods of analysis (Silva & Araújo, 2023).

The BN model may assist in decision-making through probabilistic analysis, capable of addressing the uncertainties arising from intricate business environments (Hudson & Morgan, 2021; Silva et al., 2021a). Astonishingly, the current authors have not encountered examples in the literature where BNs have been utilised to support decision-making concerning international expansion or strategic growth choices, neither for entrepreneurs nor investors, despite the wealth of complex information available on these subjects (Thomas et al., 2020; Lohrke et al., 2018; Wallin et al., 2016; Shah et al., 2013; Weinzimmer, 2000; Monteiro, 2019; Penrose, 1995).

While statistical inferences employ scientific methods to contribute to decision-making by estimating unobservable probabilities related to specific phenomena, Bayesian theory takes a different approach. It seeks to maximise statistical inferences by introducing a degree of subjectivity, relying on the judgments of specialists or external sources. This fundamental distinction distinguishes Bayesian models from the so-called classical theory (Carvalho & Chiann, 2013). BNs simulate a graphical model capable of efficiently representing joint probabilities for multiple variables based on prior information (Heckerman, 2008). Moreover, researchers focused on studies in Artificial Intelligence (AI) have extensively employed BNs to compile specialised knowledge (Heckerman et al., 1995). The results obtained in the Bayesian Network can foster interactive discussions among managers, helping better decision-making (Silva et al., 2023).

To effectively support decision-making, a transparent and flexible structuring model is imperative. BNs have consistently responded to such demands (Stritih et al., 2020). Despite employing mathematical probabilities, BNs can yield unique illustrative results of the analysed network, facilitating comprehension for individuals unacquainted with equations and fostering interactive discussions about their analyses (Dettileux, 2020). Additionally, BNs offer the advantage of low cost and moderate complexity, with satisfactory applicability in various scenarios. They also account for environmental changes during event execution, simulating the uncertainty and influence exerted by causality in existing interrelationships (Shi et al., 2020). By operating in tandem with environmental uncertainties, BNs present themselves as a viable tool for the utilisation of probabilistic graphic models (Boutkhamouine et al., 2020), making them suitable for inferences in an unfamiliar environment based on previous observable information (Almond, 2010).

The current research query reflects the quest for a probabilistic model to provide support in identifying influential factors that may impact international expansion within rapidly growing digital enterprises. The authors sought to address the following question: "Amongst the key short- and medium-term choices made by CEOs and founders that influence international expansion in rapidly growing digital businesses, are there significant regional disparities, or do these factors maintain a consistent degree of relevance?"

In addressing this question, the current authors aim to discern the factors influencing alterations in the international expansion strategy choices of rapidly growing enterprises in the cities of Amsterdam, Berlin, London, New York, and Paris, pinpointing key trends that can guide both investors and managers in the internationalisation process of digital-based companies.

2. Theoretical Background

In the contemporary landscape, fast-growing businesses serve as catalysts for innovation across various regions worldwide (Ray et al., 2020). They leverage emerging technologies capable of birthing new business models and, consequently, novel products (Monaghan et al., 2019; Shree et al., 2021; Kohler, 2016). The rapid ascent of these organisations gained substantial momentum from 1994 onwards when a plethora of Internet-based technology corporations exhibited unprecedented growth rates, vastly surpassing prior benchmarks (Hellmann & Puri, 2000). Following the global financial crisis in 2008, developed nations such as Germany, Japan, the United States, and England, alongside emerging economies like China, actively embraced policies fostering the growth of fast-growing enterprises to contribute to economic restructuring and job creation (Lee & Kim, 2019). However, Knight and Liesch (2016) argument that our understanding of their internationalization process remains superficial.

It is imperative to underscore that when referencing fast-growing businesses, the present authors adhere to the definition stipulated in the OECD-Eurostat Manual on Business Demography Statistics. This definition centres on a rapid cycle of growth, characterised by a minimum margin of 20%, in either headcount or revenue, over the past three years, facilitated by a scalable and replicable business model (Stallkamp et al., 2022; Costa et al., 2021).

Fast-growing businesses, as a rule of thumb, exhibit a proclivity for innovation within their purview, coupled with substantial investments in research and development of products and/or services. This commitment translates into superior performance when juxtaposed with competitors (Almeida & Oliveira, 2023; Yim, 2008). A study conducted in Singapore delved into the nexus between partnership development and the performance of fast-growing organisations. It revealed that a larger volume of partnerships contributes to enhanced performance, as it provides access to previously unavailable skills within the organisation, cultivated through an expanded portfolio of partnerships (Teece, 2018; Parente et al., 2018; Pangarkar & Wu, 2012).

On initial examination, it may seem that digital business endeavours encounter minimal barriers to global expansion. Given that digital products and services can be swiftly delivered over the internet to any corner of the globe, digital business models appear to eliminate numerous conventional hindrances to internationalization. However, in practice, the process and scope of internationalization vary significantly amongst digital ventures (Stallkamp et al., 2022). Prior research typically emphasised the significance of innovation and entrepreneurship but omitted to elucidate how fast-growing businesses could effectively seize and capitalise on new opportunities to internationalize (Van Schijndel, 2019). The introduction of novel business concepts, exploration of latent markets, and the adoption of emerging technologies do not invariably guarantee market success unless they are accompanied by substantial value propositions to the target market (Thomas et al., 2020; Steininger, 2018). Astute managers should actively seek and engage with sectors of the business that entail moderate investment risks yet promise higher returns. Factors such as a manager's social acumen can leverage the organisation's limited resources, enhancing overall performance (Moon & Yin, 2020; Weinzimmer, 2000; Shah et al., 2013).

Moon & Yin (2020) contend that the role of partnerships in augmenting performance or mitigating risks for fast-growing businesses has been examined in previous research. However, these studies primarily abstained from scrutinising other integration factors and the access of these organisations to different markets. Another significant limitation in prior research on fast-growing businesses is its confined focus on their competitiveness solely at the local level. Hence, the existing body of knowledge merely offers a partial understanding and does not explore the operational dynamics when these organisations expand internationally.

Although internationalisation is an intricate and uncertain process fraught with significant challenges for any organisation, several enterprises embark on this journey at the outset of their operations (van Schijndel, 2019; Knight & Liesch, 2016; Luostarinen & Gabrielsson, 2006). Early internationalisation presents an opportunity for rapid growth, positioning the organisation favourably in both domestic and foreign markets (Woo, 2020; Fernhaber & Li, 2010; Autio et al., 2000). Partnerships and international endeavours, particularly in nascent businesses, exert a positive influence on pricing strategies, enhance distribution networks, and consequently, fortify market positioning (Anwar et al., 2022; Blesa et al., 2008). They also enhance domestic operational performance (Woo, 2020). Moreover, a positive correlation exists between technological proficiency and international expansion in fledgling businesses (Zahra et al., 2000). Conversely, a delayed foray into international markets may raise barriers to entry posed by foreign competitors (Paik & Woo, 2017).

External investors and venture capital play a pivotal role in the internationalisation of businesses. They partake in strategic decisions and furnish insights into potential growth prospects in international markets (Woo, 2020). Consequently, companies backed by foreign corporate venture capital exhibit a higher degree of international involvement and augmented profitability, particularly in the early stages around the IPO (Woo, 2020; Park & LiPuma, 2020). Moreover, they demonstrate a greater likelihood of successful exits through IPOs and acquisitions as well as early internationalization (Otomo et al., 2023; Dai et al., 2012).

Exits and acquisitions represent viable options for organisations seeking rapid growth, as private equity firms often strategize for swift and successful exits via trade sales, IPOs, or secondary buyouts (Woo, 2020; Park & LiPuma, 2020; Dai et al., 2012). It is crucial to acknowledge that, in the context of start-ups and scale-ups, exits do not carry any connotation of failure. On the contrary, they signify the culmination of the entrepreneurial and start-up journey, characterised by a transfer of control and an injection of liquidity for founders and early investors. This infusion of capital represents the prospect of substantial earnings, rapid expansion, successful IPOs, and fruitful mergers and acquisitions (Otomo et al., 2023; Pisoni & Onetti, 2018; Ragozzino, 2016; Wennberg & DeTienne, 2014; DeTienne, 2010).

In the context of fast-growing businesses, exits primarily revolve around two financial harvest strategies: initial public offerings (IPOs) and mergers and acquisitions (M&A). It is crucial to acknowledge that exit intentions – the preliminary strategic orientations of founders – can influence future decisions and actions. Companies originally designed for swift exits, underpinned by a growth-oriented outlook, may encounter scalability challenges beyond a certain threshold, necessitating IPOs or mergers and acquisitions (Amor & Kooli, 2020;

Wennberg & DeTienne, 2014).

Hence, it is paramount for investors to discern between venture capital-backed start-ups, engineered for successful exits from inception, and lifestyle companies, which adhere to business models oriented towards longevity (Amor & Kooli, 2020; Pisoni & Onetti, 2018; Ries, 2011). Additionally, the phenomenon of dual tracking, wherein entrepreneurial firms are acquired shortly after an initial public offering, merits consideration. This phenomenon is particularly favourable for investors in close proximity and operating within the same industry (Ragozzino, 2016). Irrespective of its nature, it is arguable that exit strategies should be formulated from the outset, even if only as an alternative course of action (Ma et al., 2014).

During the early stages of growth, many companies traverse the process of building and overseeing an effective board. A dearth of management experience often stands as the primary reason for setbacks in new ventures. Entrepreneurs must surmount these challenges by attracting top-tier talent, thereby enhancing the company's value (Almeida & Oliveira, 2023; Sasteban & Mauricio, 2017). A well-constituted board of directors can steepen the learning curve for firms navigating their initial developmental phases. It enriches human capital by infusing knowledge, expertise, experience, and networking capabilities; thus, operational and administrative organization is a predominant factor for business internationalization (Noronha et al., 2023; Monteiro, 2019)

The networking, information, and managerial insights supplied by venture capitalists and private equity firms are pivotal in the board development process. This is especially critical since rapid growth seldom aligns seamlessly with effective and profitable management. The scaling of recruitment and selection processes poses inherent challenges. Venture capitalists thus play a seminal role in assisting new ventures transition from an entrepreneurial orientation to a professionally-managed organisation (Kainde, 2019; Meglio et al., 2017).

The performance of a management board in businesses embarking on rapid growth is also considered a pivotal factor in the organisation's international expansion. It constitutes an integral component of managerial capital, engendering the creation and mobilisation of knowledge and skills through human capital. This, in turn, drives the organisation towards a fast-growth trajectory, attracting and retaining talent (Costa et al. 2023; Boon et al., 2017; Quinton, 2016).

Businesses also extend their reach beyond borders through mergers and acquisitions (Pisoni & Onetti, 2018; DeTienne, 2010). This strategy assumes significance as an option for managers seeking accelerated growth. It also serves as a valuable instrument for diversification and innovation, bolstering international expansion (Otomo et al., 2023; Dai et al., 2012). Through mergers and acquisitions, organisations not only have the capacity to adjust their scale but also gain the ability to harness new technologies previously beyond their reach (Nguyen et al., 2021). Established organisations frequently resort to mergers and acquisitions to chart their expansion, swiftly extending their product offerings, customer portfolios, and resource base (Woo, 2020). Mergers and acquisitions also constitute a noteworthy exit route for owners and investors in digital businesses. They represent a vital avenue for technology acquisition, diversification, and international expansion, particularly when foreign and venture capitalists collaborate on investments (Dai et al., 2012).

Lastly, another pivotal aspect considered in this research is the equilibrium between growth and profitability for fast-growing businesses, a matter of substantial interest to business ventures. This is especially pertinent for companies undergoing rapid growth through investments and positioned in Funding Series B, C, and beyond. It is worth noting that rapid growth does not invariably translate into sustained performance, especially for very young firms and even during IPO events (Rosenbusch et al., 2013). International expansion assumes a pivotal role in the balancing act between growth and profitability (Noronha et al., 2023; Teece, 2018; Paik & Woo, 2017).

It is essential to acknowledge that the growth stage at which a company finds itself determines the type of funding and investors it is likely to attract. This growth stage is intricately intertwined with the risks encountered, the level of expertise, and market expansion potential (Monaghan et al., 2019; Cremades, 2016; Rosenbusch et al., 2013). Table 1 elucidates this distinction, underscoring the focus of the present research, which targets companies in a juncture where striking a balance between growth and profit assumes paramount importance.

Table 1. Investment series and firm growth stage

Type of Funding	Growth Stage	Type of Investor	Relevant for the research
Pre-seed	Defining business model and operations – basically a potentially good idea without a business form or monetization plan.	Usually the company founders themselves.	No
Seed	The first official equity funding stage. The capital injection aims to expand the company into a scalable and repeatable business.	Founders, immediate founders' acquaintances, business incubators and accelerators, angel investors and venture capital companies.	No
Series A	The business aims to expand its established user base and optimize product offerings. Scalability may imply cross border growth. The entrepreneur engages in resource-structuring behaviours.	Larger angel investors and more traditional venture capital firms as well as equity crowdfunding.	No
Series B	They are past the development stage and are ready to expand market reach on a larger scale. That is the stage of rapid headcount growth, with the integration of a professional team.	Venture capital firms specialized in later-stage investments, private equity funds, investment banks.	Yes
Series C and beyond	Successful fast-growing companies. Their challenge is to maintain growth, rather than achieve it. They are into marketing expansion and product development, but also consider acquiring new companies or undergo an IPO in order to expand rapidly and secure their leading position.	Hedge funds, investment banks, private equity firms, venture capital firms (to a lesser extent).	Yes

Note. Adapted from Cremades (2016), Costa et al. (2021), Penrose (1995).

In contrast to the external risks that often accompany most strategic decisions, such as global crises or competitors' performance, strategic decision-making, which encompasses dialogue and analysis, is predominantly influenced by the idiosyncrasies of CEOs, founders, and senior managers. Consequently, significant consideration should be given to their actions concerning the outcomes stemming from strategic decisions (Anwar et al., 2022; Lin et al., 2016; Garbuio et al., 2015).

Given their intricate nature and interdependencies, to effectively identify the factors that can influence changes in the international expansion strategy choices of fast-growing businesses, it may be necessary to employ a tool capable of aiding in the identification of factors with varying degrees of influence, depending on the specific context under examination. The development and execution of a Bayesian Network (BN) incorporating available information about fast-growing organizations can prove invaluable in addressing the current research objective (Silva et al., 2021a; Lohrke et al., 2018).

Over the years, Bayesian networks have found application in diverse studies related to strategy and the decision-making process. These include quantifying information value in management information systems (Higgins, 1974); conducting market research and sales forecasting (Doyle & Fenwick, 1976); formulating result-oriented strategic planning and decision-making (Garbuio et al., 2015); evaluating the impact of managers' idiosyncrasies on individual decision models and their role in outsourcing decisions (Lin et al., 2016); exploring the influence of external sources on business model innovations (Snihur & Wiklund, 2019); macroeconomic forecasting (Cross et al., 2020); and examining the impact of information networks on business cycle performance (Hudson & Morgan, 2021). Nevertheless, in-depth discussions and the utilisation of Bayesian methods in the realm of entrepreneurship and strategy remain somewhat limited, despite the potential utility of such methods in supporting decision-making in contexts fraught with uncertainty (Lohrke et al., 2018).

To grasp the modus operandi of Bayesian Networks, it is imperative to delve into the concepts surrounding the Bayesian theorem in contrast to classical probability. Bayesian probability pertains to a particular event 'x' based on a given degree of belief in that event. In contrast, classical probability concerns a physical occurrence (e.g., the likelihood of a coin landing on tails). Bayesian probability, on the other hand, is an attribute assigned to a specific prior source that imparts this probability (e.g., the prior source's belief regarding the odds of the coin landing on tails). Consequently, while classical probability signifies the physical or true probability of an event, Bayesian probability represents a probability assigned based on a particular source or individual's beliefs. Essentially, when the definition is considered, Bayesian probability is presented merely as a probability

(Heckerman et al., 1995).

A pivotal distinction between Bayesian probability and physical probability lies in the fact that Bayesian probability does not necessitate repeated experiments for measurement. For instance, when repeatedly tossing a sugar cube onto a damp surface, each throw results in a rapid change in the cube's orientation. Consequently, while classical probability may struggle to gauge the likelihood of the cube resting on a specific face, Bayesian probability simplifies the scenario to the next throw, attributing a new probability to it (Heckerman, 2008).

The mathematical framework employed in Bayesian Networks is rooted in the Bayes probability theorem, also known as the Bayesian theorem. It operates on the basis of an initial understanding of a particular hypothesis 'H,' subsequently updating its outcomes in response to the observation of specific evidence 'E' (Liu et al., 2021). Equation 1, as highlighted in Wipulanusat et al. (2020), exemplifies the probabilistic structure of Bayes' theorem.

$$P\left(\frac{H}{E}\right) = \frac{P\left(\frac{E}{H}\right) P(H)}{P(E)} \quad (1)$$

$P(H/E)$ will admit the future probability, which is the probability that the hypothesis H continues in a certain state, after the eventual impact of the evidence E. Therefore, the probability $P(H/E)$ will be deliberated as the conditional probability, which according to the hypothesis to be ascertained will constitute the evidence probability. $P(H)$ will constitute the antecedent probability of the hypothesis, which will constitute the probability of the event of hypothesis H prior to the discovery of probable evidence E. $P(E)$ is an autonomous probability, being accepted as a probable scale of the method. Based on the use of Bayes' theorem, the BNs are constituted through an interface with several variables N_1, N_2, \dots, N_n , forming the network nodes.

The network of nodes, called "parent nodes", with direct linkage to N_i will be conceived by π_i (π). Thus, the conditional probabilities arrangement could be designed by $P(N_i | \pi_i)$ (Wipulanusat et al., 2020). Equation 2 is displayed next:

$$P(N_1, N_2, \dots, N_n) = \prod_{i=1}^n P(N_i | \pi_i) \quad (2)$$

The sensitivity analysis is another relevant element pertaining to BNs, it refers to the diagnostic deduction procedure of how the uncertainty of the output node can be connected to the various sources of uncertainty of the input nodes (Zheng et al., 2020). It allows the identification of input nodes that are likely to exhibit the uncertainties along with the output node estimates. Thus, the sensitivity analysis is a relevant tool within the decision-making process, given that from the assessments it will be possible to identify the critical input nodes (variables), and how the variations in these nodes probabilistically interfere in the consequences of the node (variable) output (Shi et al., 2020; Wipulanusat et al., 2020).

For sensitivity analysis, S is defined as the output node and E, the input node. The degree of sensitivity of S to E is denoted by the decrease in variance (V_r). Equation 3 displays the expected decrease in output node variance, coming from the input node value (Wipulanusat et al., 2020).

$$V_r = V(S) - V\left(\frac{S}{E}\right) \quad (3)$$

$V(S/E)$ is the variance of the output node according to the input node E, and $V(S)$ is the variance of the output node S. The input node with the greatest reduction in variance will probably constitute the node that will modify the output node's beliefs, thus resulting in the explanatory ability on the output node (variable) (Wipulanusat et al., 2020). A high variance reduction in the input node will imply that the output node exhibits a high sensitivity to changes near the input node (Boutkhamouine et al., 2020).

Although Bayesian Networks employ mathematical equations in their parameterization framework, it is possible to visualize a model with a graphical representation of the network, supporting an understanding for managers who may not be familiar with mathematical equations (Silva et al., 2023). Based on the theoretical concepts observed, the current authors support that it is possible to develop a method capable of helping to identify the factors that influence changes in the choices of international expansion strategy in a short period of time, taking into account the localization of the evaluated business and the preferences and priorities of their CEOs and founders towards certain strategic choices.

2. Method

The study is descriptive and exploratory, as it aims to describe a perceived phenomenon by measuring certain characteristics inherent to the research theme. Simultaneously, it proposes a different approach for comprehending this phenomenon, thus exploring new methodological possibilities (Saunders et al., 2016; Hair et

al., 2003).

The assumptions, derived from theory, guide the process and determine what needs to be measured. In this study, these assumptions pertain to the factors influencing changes in the international expansion strategy choices of fast-growing businesses. The exploratory nature of the research is rooted in the procedures, concepts, and conjectures employed, introducing an original analytical approach - Bayesian Networks - applied in a real-world context. The goal is to contribute to the existing body of knowledge on this subject (Hair et al., 2003).

The research comprised two distinct stages. First, qualitative longitudinal research was conducted (Saunders et al., 2016) involving CEOs and Founders of fast-growing digital businesses located in, or significantly operating in, Amsterdam, Berlin, London, New York, and Paris between 2016 and 2020. Second, Bayesian Networks were utilized to model conditional dependence and infer causal pathways based on the collected data (Stritih et al., 2020; Efe et al., 2018). This approach aimed to provide support in identifying key factors influencing CEOs' and Founders' international expansion strategies.

The study's sample was selected for convenience, drawn from companies that participated in invitation-only networking business meetings in the respective cities. These meetings were designed to foster connections between fast-growing businesses and other essential ecosystem stakeholders, such as investment banks, angel investors, private equity firms, and consultants. Table 2 displays the sample size and its longitudinal section.

Table 2. Research Universe and Sample

	Year	2016	2017	2018	2019	2020
Amsterdam	Number of companies	96	91	77	0	0
	Year	2016	2017	2018	2019	2020
Berlin	Number of companies	0	135	113	101	97
	Year	2016	2017	2018	2019	2020
London	Number of companies	146	153	120	119	0
	Year	2016	2017	2018	2019	2020
New York	Number of companies	0	0	72	77	0
	Year	2016	2017	2018	2019	2020
Paris	Number of companies	0	0	94	87	0
	Year	2016	2017	2018	2019	2020
All cities	Number of companies	242	379	478	384	97
	Year	2016	2017	2018	2019	2020

The analysed companies had to meet a set of criteria, including: i) Solely securing funding in series B, C, and beyond; ii) Having their headquarters or primary operations situated in the cities under examination; iii) Exclusive consideration of digitally enabled businesses (Kainde, 2019); iv) Maintaining a minimum growth rate of at least 20% over three consecutive years (Piaskowska et al., 2021); v) Restricting participation in the meeting and survey to only CEOs and founders (individuals holding primary equity shares or significant stakes in the business) (Costa et al., 2023).

The data analysis concentrated on the strategic growth options and priorities for international expansion, as reported by the CEOs/Founders of these companies. The options presented to the respondents, who could select more than one, included: i) Strategies for maximizing personal returns in an exit; ii) Pre-IPO planning; iii) Exits and Acquisitions; iv) Exploring alternatives to venture capital, such as debt, venture debt & private equity; v) Building and managing an effective board; vi) Achieving growth through acquisitions; vii) Balancing growth vs profit.

Since all the companies met the aforementioned criteria, the current authors are inclined to believe that they constitute an unbiased sample, capable of describing significant characteristics of the analysed universe with a valuable degree of accuracy (Saunders et al., 2016, Hair et al., 2003).

The Bayesian Network framework encompasses both a qualitative and a quantitative approach (Efe et al., 2018). The qualitative approach, referred to as structural learning, is derived from the network modelling, revealing observable interdependencies among the researched variables. This approach elucidates how the choices of international expansion strategy relate to the influencing factors, simulated within a framework of acyclic directed graphs. Consequently, the quantitative approach, known as learning parameters, results from the

observed connections in the joint dependencies found in the probabilistic distributions of the researched variables. This quantitative approach is rooted in cause-and-effect relationships, derived from the initial parameters (Lee et al., 2009). These initial parameters were obtained through a treatment performed on the database.

The data were collected from a data frame available in .xlsx file format, considered a secondary type of external database. To standardize the data into a probabilistic structure, the standard used in the Bayesian Networks, the variable "International Expansion," which was considered the key factor in the research, was initially grouped by location, encompassing Amsterdam, Berlin, London, New York, and Paris. Subsequently, the factors of interest were categorized as follows: Maximizing personal return in an exit, Pre-IPO planning, Exits and Acquisitions, Other options to venture capital (debt, venture debt & private equity), Building and managing an effective board, Growth through acquisitions, Balancing growth vs profit, and None of the options. Equation 4 was utilised together with the above clusters, this was suggested in the study by Silva et al. (2021b), presenting a viable data standardization structure for BNs elaboration.

$$PG_{RB} = \frac{EG_{RB}}{TG_{RB}} \tag{4}$$

In equation 4, PG_{RB} simulates the desired standardization in the cluster (node) of the BN. The variable EG_{RB} refers to non-standard data (prior to treatment). The TG_{RB} variable represents the sum total of non-standardized data from the interest group. The purpose of the equation is to unify, in an adjusted way, the presence of a specific data within its interest group, so that the sum of all grouped data presents the total value 1 (Silva et al., 2021b). The Bayesian Network will employ a divergent connection structure. Divergent connection structures present two arcs (arrows) with directions that diverge from a central node, called the parent node, this uses a notion of conditional interdependence (Scutari & Denis, 2021). The network has a parent node "International Expansion" that acts directly on a child node "Factors of Interest".

In possession of the equation to be employed, it is necessary to implement standardization throughout the database, for this the research will use the programming language Python 3.8, from the Anaconda Spyder 4.1.5 platform that will be responsible for the execution of the algorithms. Two algorithms will be used for the standardization of the data along with the elaboration of the BN. The first algorithm will be responsible for standardizing the grouping between the Local and International Expansion, that is, it will classify each locality, in the data frame, its option for International Expansion. The acquired result will accommodate the information necessary for the construction of the first node (variable) of the BN, this will be termed as International_Expansion. Figure 1 shows the algorithm, next to it there will be a step by step about each step.

Algorithm	Action description
<code>import pandas as pd</code>	➡ Software library used in the Python language for data analysis and manipulation.
<code>worksheet_path = "Database.xlsx"</code>	➡ Path to access the file with the records in spreadsheet format .xlsx. Note that this path will only work if both files (algorithm and records) are in the same folder.
<code>dataframe = pd.read_excel(worksheet_path)</code>	➡ Loads the information from the dataframe using the pandas library.
<code>def get_occurrences(dataframe, interest, local):</code> <code>return len(dataframe[(dataframe["Interested in"].str.contains(interest) & (dataframe["Event Name"].str.contains(local))])</code>	➡ Definition of the function that will return the reading of the records that meet the specified interest according to the location .
<code>def calculate_percentage (factors):</code> <code>total_values = sum(factors.values())</code> <code>percentages = {variable: (value / total_values) * 100 for variable,</code>	➡ Definition of the function that will calculate and return as a result the percentage of factors that meet the pre-established criteria. Here the calculation of Equation 4 will occur.

<pre>value in factors.items() return percentages places_interest = ['Amsterdam', 'Berlin', 'London', 'New York', 'Paris'] IELocal = {f'IE {local}': get_occurrences(dataframe, "International Expansion", local) for local in places_interest} percentages = calculate_percentage (IELocal) for variable, percentage in percentages.items(): print(f"{variable}: {percentage:.2f}%") print(IELocal)</pre>	<p>→ Assignment of locations to variable places_interest.</p> <p>→ Attribution of the factor of interest, in the case of "International Expansion", to the assigned place of interest. Running the get_occurrences function.</p> <p>→ Calculates the percentage for each of the locations. Running the calculate_percentage function from the assignment in IELocal.</p> <p>→ Prints the results for the participation of each of the locations. The total must correspond to 100%, prerogative base for the elaboration of the node in the BN.</p> <p>→ Prints the specific amount of responses from each location that presents the interest in International Expansion.</p>
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Figure 1. Location standardization algorithm joined to International Expansion

The second algorithm will group the Local the International Expansion, and also, the other factors of interest. These factors are found in the Interested field of the dataframe, as well as International Expansion. These factors are: Exits and Acquisitions, Building and managing an effective board, Balancing growth vs profit, Growth through acquisitions, Other options to venture capital: debt, venture debt & private equity, Pre IPO planning and None of the above. The result obtained will accommodate the essential information for the construction of the second node (variable) of the BN, this will be called as Interest_Factors. Figure 2 shows the algorithm along with the walkthrough on each step.

Algorithm	Action description
import pandas as pd	→ Software library used in the Python language for data analysis and manipulation.
worksheet_path = "Database.xlsx"	→ Path to access the file with the records in spreadsheet format .xlsx. Note that this path will only work if both files (algorithm and records) are in the same folder.
dataframe = pd.read_excel(worksheet_path)	→ Loads the information from the dataframe using the pandas library
def get_occurrences(dataframe, interest, local):return len(dataframe[(dataframe["Interested in"].str.contains("International Expansion")) & (dataframe["Interested in"].str.contains(interest)) & (dataframe["EventName"].str.contains(local))])	→ Definition of the function that will return the reading of the records that meet the factors of specific interest, joined to "International Expansion" and the location.
def calculate_percentage(factors):total_values = sum(factors.values())	→ Definition of the function that will calculate and return as a result the percentage of factors that meet the pre-established

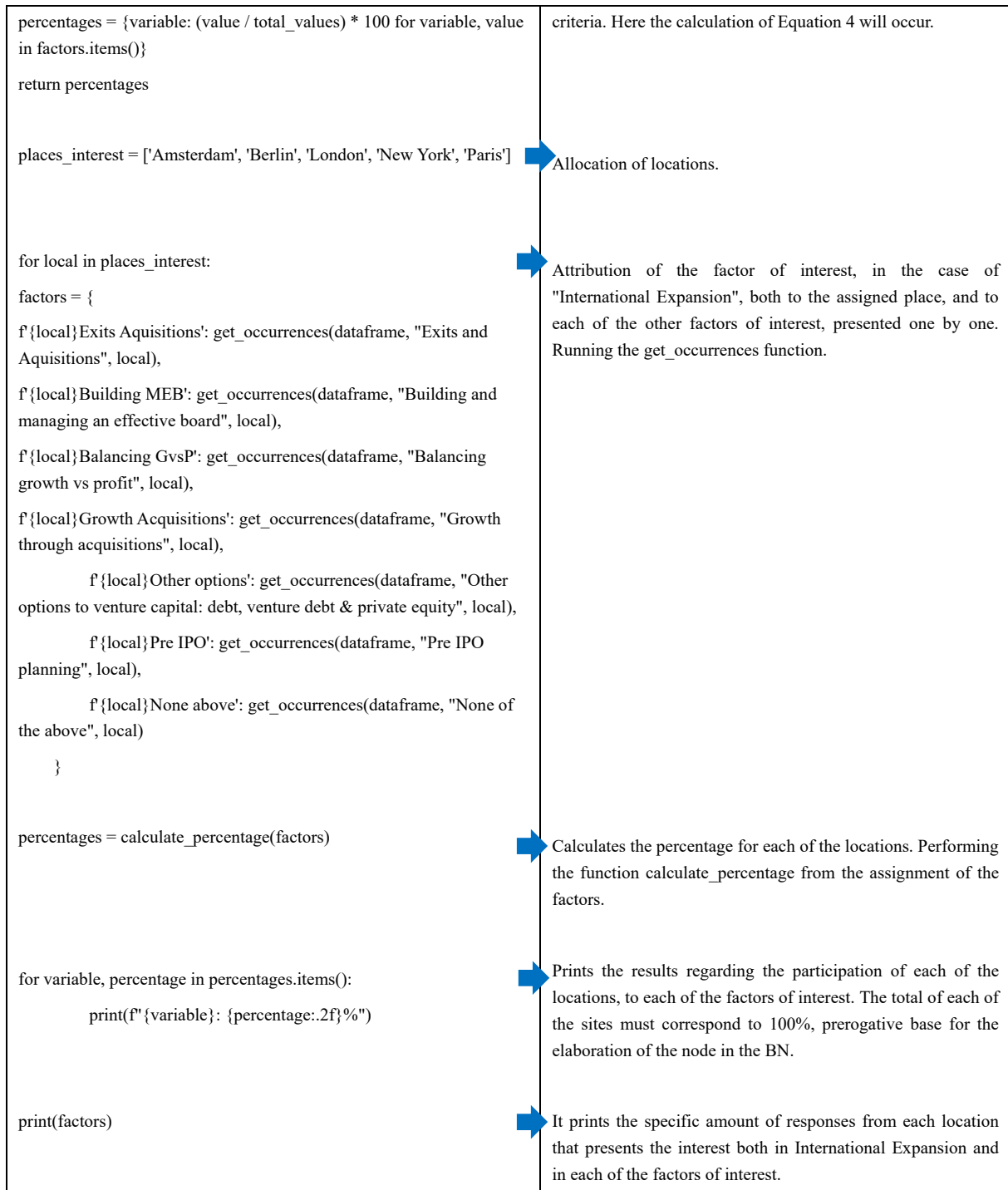


Figure 2. Standardization algorithm of the place joined to International Expansion and the factors of interest

With the acquisition of the algorithms, it is possible to obtain the results for the construction of the BN. The first algorithm grouped respondents from each location to their interest in International Expansion. The result of the execution of this algorithm can be seen in Table 3.

Table 3. Local and international expansion

Gender	Sample	Option for International Expansion	Percentage of participation by option
Amsterdam	264	153	21,16%
Berlin	446	192	26,56%
London	538	282	39,00%
New York	149	40	5,53%
Paris	181	56	7,75%
Total Respondents	1578	723	100%

The second algorithm grouped Location, International Expansion and the other factors of interest to the respondents. As some expansion factors have an extensive nomenclature, these will be renamed a better accommodation of the information, soon: Exits and Acquisitions (Exits Acquisitions), Building and managing an effective board (Building MEB), Balancing growth vs profit (Balancing GvsP), Growth through acquisitions (Growth Acquisitions), Other options to venture capital: debt, venture debt & private equity (Other options), Pre IPO planning (Pre IPO) and None of the above (None above). The result can be seen in Table 4.

Table 4. Location, International Expansion and Interest Factors

Gender	Interest Factor	Sample	Option for the factor and for International Expansion	Percentage of participation by option	of by
Amsterdam	Exits Acquisitions	264	67	19,82%	
	Building MEB	264	75	22,19%	
	Balancing GvsP	264	77	22,78%	
	Growth Acquisitions	264	68	20,12%	
	Other options	264	27	7,99%	
	Pre IPO	264	24	7,10%	
	None above	264	0	0%	
	TotalFactors	264	338	100%	
Berlin	Exits Acquisitions	446	73	16,63%	
	Building MEB	446	87	19,82%	
	Balancing GvsP	446	103	23,46%	
	Growth Acquisitions	446	80	18,22%	
	Other options	446	61	13,90%	
	Pre IPO	446	35	7,97%	
	None above	446	0	0%	
	TotalFactors	446	439	100%	
London	Exits Acquisitions	538	110	15,65%	
	Building MEB	538	153	21,76%	
	Balancing GvsP	538	147	20,91%	
	Growth Acquisitions	538	142	20,20%	
	Other options	538	93	13,23%	
	Pre IPO	538	56	7,97%	
	None above	538	2	0,28%	
	TotalFactors	538	703	100%	
New York	Exits Acquisitions	149	19	17,76%	
	Building MEB	149	19	17,76%	
	Balancing GvsP	149	23	21,50%	
	Growth Acquisitions	149	22	20,56%	
	Other options	149	15	14,02%	
	Pre IPO	149	9	8,41%	
	None above	149	0	0%	
	TotalFactors	149	107	100%	
Paris	Exits Acquisitions	181	28	19,86%	

	Building MEB	181	32	22,70%
	Balancing GvsP	181	26	18,44%
	Growth Acquisitions	181	29	20,57%
	Other options	181	18	12,77%
	Pre IPO	181	8	5,67%
	None above	181	0	0%
	TotalFactors	181	141	100%
Total Respondents		1578	1728	100%

An examination of the tables reveals several noteworthy considerations. First and foremost is the sheer volume of records. The rationale behind Table 4 containing a significantly larger number of observations is rooted in the fact that choices related to the factors of interest are not mutually exclusive. In other words, a single respondent had the option to select multiple factors from a range that includes International Expansion, Exits and Acquisitions, Building and Managing an Effective Board, and Balancing Growth vs. Profit. Conversely, another respondent might have chosen International Expansion alongside factors like Exits and Acquisitions, Other Options to Venture Capital (including debt, venture debt, and private equity), Growth Through Acquisitions, and Balancing Growth vs. Profit.

It is essential to underscore that while the other factors of interest are not exclusive either, their individual quantities should not overshadow the selections for International Expansion, as demonstrated in Table 3. This is particularly salient since, for each location, respondents were expected to opt for International Expansion in conjunction with at least one additional factor of interest from Table 4. At this juncture, the results align with our initial expectations.

For instance, Table 3 reveals that 153 respondents hailing from Amsterdam chose International Expansion as an option. In Table 4, it becomes evident that Growth Through Acquisitions (referred to as Growth Acquisitions) garnered the highest number of selections for the same location, with 68 respondents indicating this factor. This signifies that among the 153 respondents who selected International Expansion, 68 also expressed an interest in Growth Through Acquisitions as one of the associated factors.

In another illustration, consider the New York location: 40 respondents in Table 3 opted for International Expansion. In Table 4, the factor of interest with the most substantial number of selections for the same location is Balancing Growth vs. Profit (termed Balancing GvsP), chosen by 23 respondents. This implies that out of the 40 respondents who chose International Expansion, 23 also identified Balancing Growth vs. Profit as one of their factors of interest.

The modelling and execution of the Bayesian Network for this study were performed using Norsys Software Corp Netica version 6.07. This application comes highly recommended for the development and modelling of Bayesian Networks and is widely embraced within the realm of scientific research. The software offers an intuitive development environment wherein connections between nodes can be established based on singular probabilities (Netica Application, 2022). Once the research development environment is configured, it becomes feasible to conduct an analysis of the anticipated implications within the study and compile any pertinent notes stemming from these results.

3. Results analysis and discussions

After data treatment and standardization, the research advanced the BN modelling: The network structure provided a composition with two nodes, represented by the key factor “International Expansion” (parent node), and the child node represented by “Factors of Interest”. The nodes connected to the network from a single connection (link), generating in total 40 conditional probabilities. The developed BN can be seen in Figure 3.

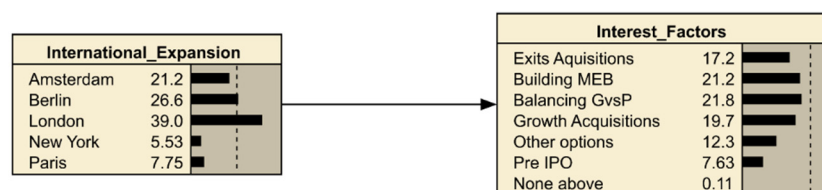


Figure 3. Bayesian network with 2 nodes implemented in Netica version 6.07

As it is a probabilistic tool, the BN standardizes the values to a scale around 100% in each node, and there may be some variation in the last decimal places, due to adjustments in the Netica application. The International Expansion node that presents the proportion of this expansion according to the region presents the values 21.2, 26.6, 39.0, 5.53 and 7.75. The node that displays the factors of interest has the values 17.2, 21.2, 21.8, 19.7, 12.3, 7.63, 0.11. Considering that the present research objective is to identify the factors that influence changes in the choices of the international expansion strategy of fast-growing organizations, according to the region evaluated, it was decided to evaluate the results from the triggers of the factors of interest within the network; thus, we seek to observe the behaviour of international expansion according to the location from seven triggers carried out in the network with the Factors of Interest, as presented in Figure 4.

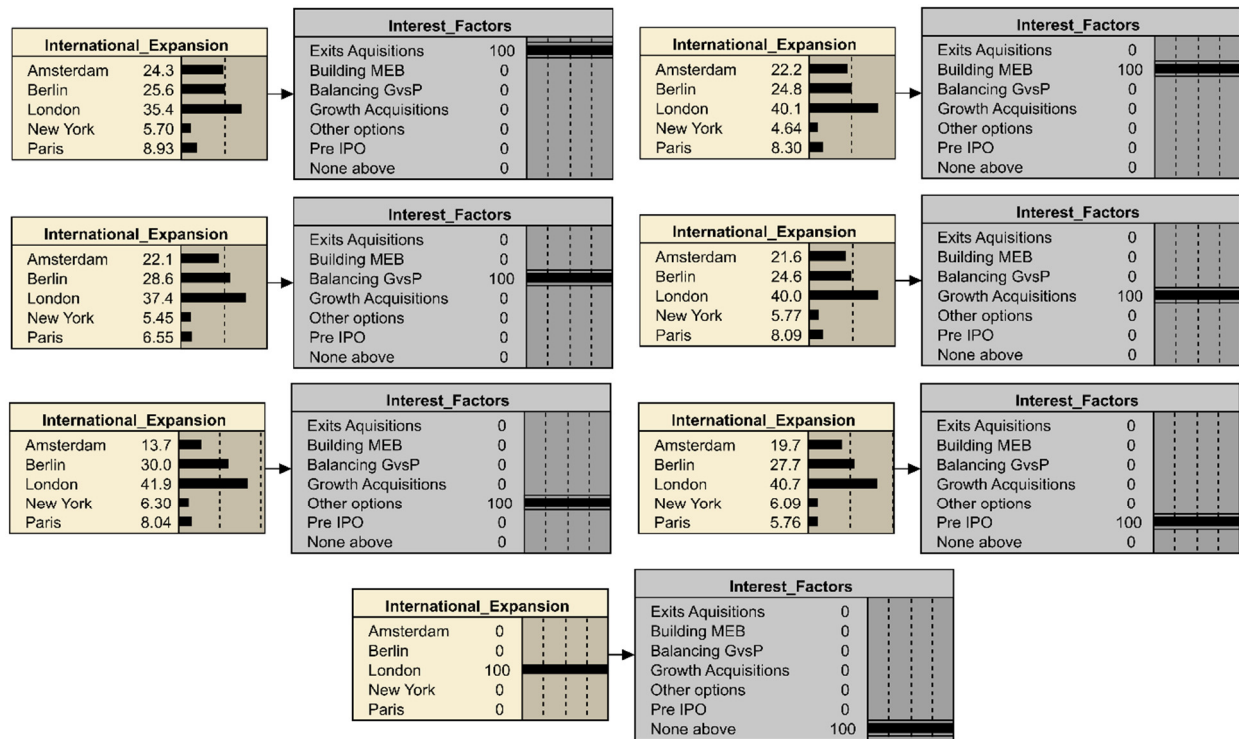


Figure 4. Bayesian networks in Netica version 6.07: triggers in Factors of Interest

Observing the simulation in Figure 4 which presents a 100% trigger in the Exits and Acquisitions parameter (Exits Acquisitions), comparing with the BN in its original state (Figure 3); it is possible to observe that there is a lower influence of the factor on the intention of international expansion in Berlin (26.6→25.6) and London (39.0→35.4). On the other hand, Amsterdam (21.2→24.3), New York (5.53→5.70) and Paris (7.75→8.93) show greater interest in the Exits and Acquisitions factor.

Given that exists and acquisitions are a viable option for organizations seeking accelerated growth (Dai et al., 2012), based on the literature analysed on exits and acquisitions (Pisoni & Onetti, 2018; Wennberg & DeTienne, 2014; Ma et al., 2014; Li et al., 2014; Ries, 2011), it is possible to argue that in the context analysed, investors interested in a short-term liquidity boost based on quick exits, may deem the analysed companies in Amsterdam, New York and Paris as a more interesting investment. From an international expansion perspective, this seems to be the most distinctive strategy within the present study.

On analysing the simulation in Figure 4 which presents a 100% trigger in the parameter Building and managing an effective (Building MEB), comparing with the BN in its original state (Figure 3); it is possible to notice a lower influence of the factor on international expansion in the cities of Berlin (26.6→24.8) and to an extent in New York (5.53→4.64). The cities of London (39.0→40.1), Paris (7.75→8.30) and Amsterdam (21.2→22.2) show greater emphasis on this factor.

Based on what has been presented in the literature review (Kainde, 2019; Cavallo et al., 2019; Monteiro, 2019; Boon et al., 2017; Sasteban & Mauricio, 2017; Quinton, 2016; Wallin et al., 2016; Davila et al., 2003), it is

necessary to access if the companies in Berlin and New York are already more mature in the development of their board, or if that is, in fact, a less pressing issue for those companies when considering international expansion. Companies with more mature boards may be on a more advanced stage in terms of human capital, which may be a key decisive factor to expand internationally and attract further investment.

With regards to the simulation in Figure 4 Balance growth vs. profit (Balancing GvsP), comparing with the BN in its original state (Figure 3); there is a smaller influence of the factor on international expansion in London (39.0→37.4), New York (5.53→5.45) and Paris (7.75→6.55). Whereas in Amsterdam (21.2→22.1) and Berlin (26.6→28.6) the factor seems to have a greater weight.

From what was presented about growth vs. profit (Paik & Woo, 2017; Rosenbusch et al., 2013) the authors would point out to the need to enquiry if the lower impact of that factor on international growth in the London based companies may reflect a greater maturity of the market, or at least, of the sample analysed. Companies that have advanced on the balance between growth and profit, may be able to expand organically on an international level, having a more sustainable strategy.

The simulation on Figure 4 focusing in the Growth through acquisitions parameter (Growth acquisitions), when compared with the BN in its original state (Figure 3); presents a lesser influence of the factor on the international expansion decisions in Berlin (26.6→24.6). The cities of Amsterdam (21.2→21.6), London (39.0→40.0), New York (5.53→5.77) and Paris (7.75→8.09) show a greater relevance of the factor.

The results may indicate a greater access to financial resources or greater liquidity within those regions (Woo, 2020), which is essential to financial expansion and to attract capital at a lower cost.

The simulation in the parameter Other options to venture capital: debt, venture debt & private equity (Other options) in Figure 4, when compared to the BN in its original state (Figure 3), displays very little influence of the factor on the intention of international expansion in Amsterdam (21.2→13.7). On the other hand, Berlin (26.6→30.0), London (39.0→41.9), New York (5.53→6.03) and Paris (7.75→8.04) have stronger results regarding this factor.

The use of external capital is one of the ways that fast-growing organizations use to expand their activities beyond their borders (Paik & Woo, 2017), thus the results indicate that those companies may have very distinct internationalization strategies in those different regions, demanding from investors a customized approach to their portfolio.

Considering the simulation on the Pre-IPO planning parameter (Pre IPO planning) in Figure 4, compared with the BN (Figure 3); a reduced influence of the factor is observed on the international expansion of businesses in Amsterdam (21.2→19.7) and Paris (7.75→5.76). Conversely, the cities of Berlin (26.6→27.7), London (39.0→40.7) and New York (5.53→6.09) show more robust results related to this factor.

Given the importance of IPOs for fast-growing organizations (Woo, 2020; Dai et al., 2012), it is possible to see again indicatives of more mature and competitive businesses in Berlin and London, which may attract different types of investment and offer different levels of risk. Those businesses will also have a more sustainable internationalization strategy, based on organic expansion.

In the last simulation of Figure 4, with None of the above (None of the above), comparing with the original numbers of the BN (Figure 3), the only city that presented, minimally, records for this factor was London (39.0→100,0). The other cities do not have records that meet the study parameters. Perhaps due to the probable superior degree of maturity of the companies, some London organizations are looking for other relevant options for their growth strategy.

4. Conclusion

The present research endeavoured to scrutinize the determinants that wield influence over the decision-making processes regarding international expansion strategies within rapidly burgeoning enterprises, contingent upon their geographical locale. Employing a probabilistic framework, we harnessed the Bayesian Networks method to discern the factors that exert the most pronounced impact on these strategic choices. Our analytical approach, grounded in the scrutiny of simulations, facilitated the identification of factors and their corresponding significance in shaping the outcomes.

Although the network is underpinned by probabilistic mathematical equations within its parameterization framework, we ensured that it remained comprehensible to a broader audience, both in its untriggered state and with individual triggers attributed to each factor. This approach aids in elucidating the model for those unaccustomed to mathematical equations.

In our examination of the results, it came to light that Departures and Acquisitions wielded considerable influence over the international expansion decisions made by CEOs and founders of businesses situated in Amsterdam, New York, and Paris. Conversely, Other Venture Capital Options such as debt, venture debt, and private equity emerged as the most pertinent factors for businesses based in Berlin, London, New York, and Paris. Throughout our study, several indicators pointed towards London and Berlin companies possessing a more mature business model, potentially enhancing their ability to attract investments and establish partnerships.

On the flip side, a closer inspection of factors with diminished influence unveiled that Other Venture Capital Options (debt, Venture Debt, and Private Equity) held little sway over the decision-making processes for internationalization among businesses in Amsterdam. Likewise, the factor of Growth Through Acquisitions exhibited reduced relevance in Berlin. Departures and Acquisitions were less influential in businesses located in Berlin and London, while Pre-IPO Planning held little sway over enterprises in Amsterdam and Paris. The drivers behind these distinctions warrant further exploration in subsequent studies to ascertain whether they are emblematic of the broader market or unique to the analysed sample.

We underscored Bayesian networks as a potent methodology capable of enriching both theoretical and practical dimensions of management research. The approach introduces an alternative to relying solely on past performance, especially given the dynamic nature of the business landscape. By accommodating composite forecasts that incorporate personal judgments alongside empirical data, Bayesian models offer a more responsive framework that mirrors real-world changes.

In terms of contributions, this study holds theoretical significance by showcasing the applicability of Bayesian Networks in dissecting how critical strategic decisions influence the internationalization strategies of digitally enabled, fast-growing businesses. Additionally, it has unveiled variations in international expansion intentions among CEOs and founders across different regions, setting the stage for research dedicated to deciphering these idiosyncrasies. From a practical standpoint, the study has presented a valuable tool for venture capitalists, angel investors, and private equity firms to gauge the perspectives of CEOs and founders regarding international expansion and its short- and medium-term implications. This tool also serves as a benchmarking resource among companies.

Turning to the study's limitations, our network modelling relied exclusively on data derived from business networking events held in various cities between 2016 and 2020. Consequently, the sample was constructed from secondary data sources, potentially introducing some bias compared to the broader start-up landscape in these regions. Expanding the database to include a larger and more diverse set of companies could yield different outcomes. Another limitation pertains to the limited number of factors available for selection by CEOs and founders. It is plausible that other influential factors were omitted. Notably, the "None of the above options" node was included, albeit chosen by a small number of respondents. This implies that critical factors may have been inadvertently omitted from consideration. Lastly, the absence of data beyond 2020 raises questions about the study's applicability to post-pandemic scenarios, given the potential for transformative shifts in the perceptions and perspectives of CEOs, founders, and investors regarding international growth.

Nevertheless, the findings shed light on disparities in growth strategies and their susceptibility to geographical influences. This insight proves invaluable to investors, academics, and policymakers within the market. Future research efforts, drawing from diverse information sources and incorporating a broader array of factors in conjunction with simulations, hold the promise of yielding fresh insights to augment our understanding of fast-growing businesses and their international expansion strategies. Additionally, a comparative analysis of pre- and post-pandemic scenarios could offer insights into the resilience and adaptability of these businesses. Finally, juxtaposing Bayesian Networks with alternative mathematical models on the same dataset could provide a more robust and conclusive perspective.

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Obtained.

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The Publication Ethics Committee of the Canadian Center of Science and Education.

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Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

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