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„The Effect of Institutional Factors on Firm Performance:
A System Dynamics Analysis of Technology Based
Start-Ups in China and Indonesia“

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1. Introduction

The recent global economic crisis has caused many countries to rethink their economic policies and their main ways of income generation. Global economic growth slowed down, even in economies like China, which experienced two-digit growth rates over many years. Policy makers are seeking new sources of income that can provide stability for their national economies, reduce dependencies on other countries and certain business sectors and endure future economic crises. Among the most favoured new economic strategies are the promotion of entrepreneurship, technology and innovation.

Indeed, entrepreneurship is an important driver of economic growth (Acs 2007). Entrepreneurial firms are one of the most important forces in shaping changes in a country's economic landscape (Baumol 1968). Individuals create new businesses and new businesses in turn create jobs, promote competition, increase national productivity and can even advance technological change. The latter is especially the case for technology based start-up businesses. Technology based start-ups promote technological innovation which is a central driver of economic growth (Pathek et al. 2013, p. 2098). They are the prime examples of Schumpeterian innovative destruction as they develop new technologies, advance current ones and, by doing so, disrupt established industries and create new ones (Schumpeter 1934). However, the extraordinary international success of a small number of technology based start-ups distracts from the fact that failure is very common in the technology industry. Many start-ups have difficulties to stay in the market (Quattraro & Vivarelli 2014, p. 3), be it in Silicon Valley (USA), Beijing (China) or Bandung (Indonesia). Much research has focused on the entrepreneurial characteristics and abilities of start-up founders as keys to explaining venture success and failure (Tolbert et al. 2011). However, since firms operate in and interact with a specific political, economic and social environment, the study of personal traits alone does not provide a complete picture of firm performance. The success or failure of entrepreneurial firms is also influenced by the environment they are embedded in. This environment is determined by political, economic and social institutions that define the "rules of the game in the society" and govern human interaction (North 1990, p. 3). Among these institutions are laws, rules and regulations, the country's political situation, the availability of education, financial markets, culture, etc.

The influence of institutional factors on the performance of start-ups and established firms is even more important in emerging and developing economies. In these economies, markets and institutional infrastructure tend to be less developed creating an adverse business

environment that might affect not only the performance of single firms but the efficiency and dynamism of the entire business sector. Underdeveloped and unstable institutions can cause misallocation of resources and market distortions that can eventually lead to substantial productivity losses in the entire economy. Understanding the institutional constraints that firms and in particular technology based start-ups are facing in these economies can create awareness among policy makers and help create a more favourable environment in which technology based start-ups are more likely to succeed.

1.1. Research Questions

This thesis investigates the institutional environment of technology based start-ups in two emerging economies: China and Indonesia. It discusses the institutional factors that have significant impact on the performance of technology based start-ups in these two economies.

The **research questions** this thesis will try to answer are:

- Given the same business model, is a start-up more likely to succeed in China or Indonesia?
- Which are the most critical institutional factors influencing the performance of a technology based start-up in China and Indonesia?

This thesis is therefore a comparative entrepreneurship study with a special focus on emerging economies. China and Indonesia have been chosen because the author of this thesis is very familiar with both countries through personal ties, exchange semesters, internships and extensive travels. China and Indonesia are different in many aspects but also share remarkable similarities which makes a comparative study of these two countries feasible and interesting. China and Indonesia are the largest nations in East Asia with a population of 1.34 billion and 252 million, respectively (The World Bank 2015a; The World Bank 2015b). They have both experienced major political and economic changes in the past decades. In 1949, China's civil war ended and Mao Zedong proclaimed the People's Republic of China. In the same year, the Indonesian war of independence was settled when the Netherlands recognised Indonesia's sovereignty and Indonesia officially became an independent country. After these new beginnings, both countries were dominated by charismatic political leaders: Mao Zedong in China, and Sukarno and Suharto (from 1967) in Indonesia. Until the year 1998, both countries shared various similarities in their political and economic development (Kong 2010). The Asian financial crisis in 1997/1998 changed Indonesia's political and economic situation abruptly while China was less affected. Today, China and Indonesia share similar

development issues such as rapid urbanisation, social-economic disparities and inequality, limited social welfare, corruption and red tape. They can both be defined as emerging economies as they are “low-income, rapid-growth countries using economic liberalization as their primary engine of growth” (Hoskisson et al. 2000, p. 249).

However, China and Indonesia also differ in many aspects. Since the Asian financial crisis, they have been following different political paths. While China is still a socialist republic run by one party, the Communist Party of China, Indonesia has become one of the only democracies in East Asia with a multi-party system. In addition, both countries differ in terms of culture and religion which probably translates into different attitudes about entrepreneurship. Busenitz et al. (2000, p. 1001) argue that some countries tend to have an advantage in developing businesses within a specific industry or with a specific organisational form. For example, small family businesses may be more successful in countries with a certain political, economic and social environment but technology based firms may succeed in countries with a different profile (ibid). This master thesis explores which of the two countries (China or Indonesia) has the ‘better’ profile to develop profitable technology based start-ups.

1.2. Significance

As stated previously, technology based start-ups contribute to economic growth and promote technological change and innovation. However, many start-ups fail and do not have the chance to provide value to their environment. Examining the factors which influence start-up success and failure therefore represents an interesting research area from which the following stakeholders could benefit:

- **Scholars and researchers:** Most research in this area focuses on developed countries, so this thesis contributes to research by examining the institutional environment of technology based start-ups in China and Indonesia. The thesis’ findings may be applicable to other emerging economies as well. In addition, the combination of strategic management, institutional theory and systems theory as the thesis’ theoretical framework contributes to the promotion of interdisciplinary research.
- **Policy makers:** This thesis helps to identify the institutional factors which constrain entrepreneurs and their start-up’s success. The findings may be used to inspire policies addressing these obstacles and providing a fertile ground for technological change and innovation in the country. The focus on China and Indonesia provides insights to the

situation of technology based start-ups in two emerging economies and therefore appeals especially to policy makers in these economies.

- **Entrepreneurs:** This thesis can help entrepreneurs become aware of the institutional factors which could impede their success. It allows them to consider these factors in their planning, better estimate risks and find possible solutions to problems and obstacles.

1.3. Research Design

This thesis is divided into three main chapters. The following chapter (2) discusses the theoretical framework and the method applied in this thesis. The theoretical framework draws on research from the areas of strategic management, entrepreneurship, new institutional economics and system theory. It starts by examining start-ups from a business-level perspective, continues by examining the characteristics of the information technology industry before discussing the role of institutions in regard to start-up performance. At the end of chapter 2, system theory introduces the method applied in this thesis.

Chapter 3 develops an analytical model based on the theoretical framework introduced in chapter 2. The model represents a generic technology based start-up in its institutional environment. Chapter 3 describes the model in detail and discusses the most important variables and institutional factors represented in the model. The model simulates a generic technology based start-up in the Chinese and Indonesian institutional environment over a period of 60 months.

Chapter 4 analyses the results of the model simulation in both institutional environments and examines the differences between the effects of institutional factors on start-up performance in China and Indonesia. First, the country-specific results of China and Indonesia are discussed separately. Differences in start-up performance in the Chinese and Indonesian institutional environment are examined through comparative analysis before the most critical institutional factors influencing start-up performance are identified through sensitivity analysis. On the basis of the obtained results, strategy recommendations for start-ups and policy recommendations are given.

Chapter 5 summarizes the major findings, answers the research questions and draws conclusions.

1.4. State of the Art

In the past decades, extensive research has been carried out on the key drivers of firm success and the effects of firm-specific, industry-specific and external factors on the performance of firms in various countries. However, there is neither consensus on the key factors of firm success nor a universally accepted theoretical framework to examine firm performance. A great number of researchers focus on the business-level perspective of firms and attribute superior performance mainly to firm-specific characteristics such as resources, capabilities and organisational structure. For example, the theories of Grant (1991, 1996), Barney (1991, 2001) and Prahalad & Hamel (1990) have strongly influenced this view. They provide a general framework for determining key success factors and are applicable to firms of all sizes, large multi-national corporations as well as one-person start-ups. External factors such as industry- and country-specific characteristics are only partially taken into account in these frameworks. Other scholars have gone beyond the business-level view of firm performance and developed theories which emphasize the effect of external factors on firm success. Porter's (1980, 1985) five forces model which provides a framework for exploring the effect of industry characteristics on firms is one important example. By including not only industry-specific characteristics but also other external factors, Peng et al. (2008; 2009) and Castrogiovanni (1991) have created a holistic theoretical framework to examine firms in their specific environment. They argue that a firm's success does not only depend on its own resources and capabilities, but also on the industry and institutional environment in which it operates. By considering factors which are beyond the firm's control, these theoretical frameworks borrow concepts from disciplines other than strategic management, such as economics and sociology. In particular, concepts from new institutional economics (North 1990, 2005; Scott 1995) are integrated in the before mentioned holistic frameworks of firm performance.

While there is extensive research on the performance and key success factors of firms in general, theories which focus specifically on start-ups and on firms operating in the information technology industry are less numerous. Amit & Zott (2001), Osterwalder & Pigneur (2004) and Baron & Hannan (2002) examine success drivers of start-ups in the high tech industry from a business-level perspective. In addition, many concepts on the business-level perspective focus on the impact of the founder's personality, attitudes (e.g. entrepreneurial orientation) and human capital on start-up success (e.g. Kreiser et al. 2013; Hechavarria et al. 2012). As for the industry-level perspective, Porter (2001), Shapiro & Varian (1999) and Varian (2001) examine the characteristics of the information technology

industry and include micro and macro-economic concepts in their theories to describe potential start-up success factors. In addition, as with more general theories on the impact of external factors on firm performance, new institutional economics is an important perspective in exploring the connection between start-ups and their environment beyond the industry they operate in (e.g. Bruton et al. 2010; Van de Ven 1993). In particular, institutional theory is used by many scholars to study the institutional factors which have an impact on the entrepreneur's decision to establish a new business and determine market-entry conditions. It is less frequently applied in studies on post market-entry performance of start-ups, particularly technology based start-ups.

Latest research on the key success factors of (technology based) start-ups applies mostly business-level concepts or institutional theory to examine very specific aspects of start-ups and their environment. For example, the role of external funding such as venture capital, angel investors and bank loans is a recurring topic in examining start-up performance (e.g. Colombo & Grilli 2006; Revest & Sapio 2012; Alexy et al. 2012). Furthermore, the effects of locating in clusters or incubators and knowledge spillovers are discussed by many scholars (e.g. Belso-Martinez et al. 2013; Plummer & Acs 2014; Pe'er & Keil 2013; Liu et al. 2010). Popular topics on the business-level perspective of start-up performance are, for instance, personality traits and human capital of start-up founders and the start-up's learning process (e.g. Sommer et al. 2009; Millán et al. 2014; Colombo & Piva 2012). The start-ups discussed in these studies are usually based in the United States of America, the European Union or other developed regions or countries. However, there is a growing number of researchers studying start-ups in emerging economies, too (e.g. Quatraro & Vivarelli 2014; Wright et al. 2005).

The performance of technology based start-ups in China and Indonesia is not yet very well studied. Most research on the key success factors of firms in China and Indonesia is focused on multi-national corporations expanding their business to these countries or small enterprises operating on an informal basis. In the case of China, some scholars have studied the high technology industry (including the information technology industry) and special technological zones (e.g. Wright et al. 2008) and are slowly starting to explore different aspects of technology based start-ups (e.g. Guo & Jiang 2013; Lau & Bruton 2011). In the case of Indonesia, there is a growing number of national studies on technology based start-ups, the information technology industry in general and the impact of external factors such as institutions on start-up performance. These studies are mainly produced by national research institutions such as the School of Business and Management (SBM) and the Institut Teknologi Bandung (ITB) which also publish the Asian Journal of Technology Management.

Research on technology based start-ups is also promoted at the yearly Indonesia International Conference on Innovation, Entrepreneurship, and Small Business (IICIES) that was initiated by ITB in 2009. However, international research on technology based start-ups and the information technology industry in Indonesia is very sparse.

Consequently, extensive research has yet to be made on technology based start-ups and the effect of institutional factors on start-up performance in both China and Indonesia. This thesis aims to make a contribution to research on technology based start-ups in China and Indonesia from an institutional perspective and inspire further research in this area.

2. Theory and Method

This chapter introduces the three most important theoretical concepts used in this thesis. The first section (chapter 2.1.) discusses the strategy tripod, a theoretical framework within the field of strategic management (Peng et al. 2008; Peng et al. 2009). The strategy tripod examines the factors that affect the performance of firms and represents the connection between managerial decisions and the environment. It consists of three perspectives. The firm-level perspective examines firm-specific characteristics of successful technology based start-ups. The industry-level perspective looks at the specifics of the information technology industry while the institutional perspective introduces the influence of the institutional environment on firm performance. The second section (chapter 2.2.) elaborates on the institutional environment of technology based start-ups and discusses the most important formal and informal institutions affecting their performance. The last section (chapter 2.3.) introduces system theory. System theory is essential for the understanding of the model that is developed in the empirical part of this thesis. The model incorporates views from all three theoretical concepts.

2.1. Strategic Management in Emerging Markets

Strategic management is a very diverse and interdisciplinary research area and “lacks a coherent identity” (Nag et al. 2007, p. 935). In general, strategic management is defined as the process of aligning the resources and capabilities of a firm to its external environment in order to create value for its customers, shareholders and society and to achieve competitive advantage over other firms (Nag et al. 2007, p. 946). Thus strategic management is about creating a connection between the firm and its environment. This basic definition can also be found in the special subfield of strategic management in emerging economies. In this subfield, most research has been done on one of the following four areas (Wright et al. 2005, pp. 3-4):

1. Foreign firms from developed economies entering emerging markets
2. Emerging economy firms competing with each other in their home market
3. Firms from emerging economies entering other emerging markets
4. Firms from emerging economies seeking to enter developed economies

The first area dealing with strategy of foreign firms from developed economies entering emerging markets has received most attention in research while the last two strategies have been less researched (ibid). This paper explores the second strategy of emerging economy firms competing in their home market, and focuses on a specific type of firm in a specific

industry: technology based start-ups operating in the information technology industry. Firms from emerging economies competing within their domestic market do not only face a very dynamic environment of rapid economic, political and social changes but also have to deal with relatively underdeveloped or rather ‘idiosyncratic’ product and factor markets such as high stocks of human capital and low stocks of financial capital (ibid, p. 7). Even though strategic management research has long focused solely on firms’ resources and capabilities (resource-based theory) or on industry conditions, a growing number of scholars have started to emphasize the importance of external factors such as the economic, political and social environment of firms (Peng et al. 2008, pp. 931-932). Such external factors are often named ‘institutional’ factors as they represent formal and informal constraints which firms are confronted with. Peng et al. (2008) developed a theoretical framework which allows examining and structuring the factors that influence a firm’s strategic choices and therefore helps explain its performance and profitability. This theoretical framework includes the resources and capabilities of the firm, the industry conditions the firm is faced with as well as the institutional setting it is embedded in. The resource-based as well as the industry-based view of the firm have both been criticised for not taking into account the firm’s context (Peng et al. 2009, p. 65). By including a third perspective, the “strategy tripod” (Peng et al. 2008) allows for a holistic way to examine a firm’s performance. The strategy tripod includes (Peng et al. 2009, pp. 71-72):

- The resource-based view which argues that firm-specific resources and capabilities create competitive advantage (Barney 1991)
- The industry-based view which suggests that the firm’s performance is influenced by the degree of competitiveness of the industry it operates in (Porter 1980)
- The institution-based view which emphasizes the impact formal and informal institutions have on firm performance (Peng et al. 2008; Peng et al. 2009)

The final performance of the firm is probably a combination of factors from all of these three perspectives (Peng et al. 2009, p. 72).

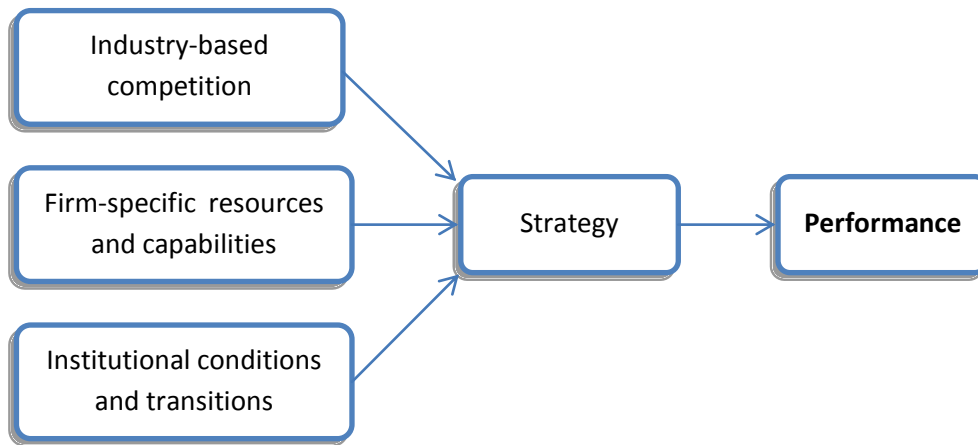


Figure 1: The institution-based view: a third leg of the strategy tripod (Peng 2009, p. 15)

In regard to new business ventures, Tsai et al. (1991, p. 21) found that the environment (industry and institutional factors) as well as the firm's ability to align its strategy with its environment are both critical determinants of the firm's success. Clarysse et al. (2011, p. 137) confirm this finding for young technology based firms.

2.1.1. The Resource-Based View

The resource-based theory of the firm (Barney 1991) has been one of the key theories in research on entrepreneurship, strategic management and emerging markets (Bruton et al. 2010, p. 422; Wright et al 2005, p. 7; Clarysse et al. 2011, p. 138). Access to and the quality of resources as well as the capabilities a firm develops from these resources are crucial factors in determining the performance and growth path of new ventures. The initial resources of a start-up influence its strategic choices and business model and the way a start-up arranges its resources is likely to have an impact on its organisational structure. Understanding the resources and capabilities which technology based start-ups need in order to secure their survival and be successful in emerging markets such as China and Indonesia will also allow identifying the external factors which are interrelated with these resources and capabilities and answering the research questions.

According to Barney (1991), a firm's resources and capabilities need to be valuable, rare, imperfectly imitable and non-substitutable in order to create sustained competitive advantage. They include tangible and intangible assets such as knowledge, information, funds, a firm's management skills etc. (ibid). Furthermore, a firm's resources and capabilities have to be understood in the specific environment the firm is embedded in (Barney 2001, p. 52). In this paper, the environment which interacts with a firm's resources and capabilities is taken into consideration by including an industry-based as well as an institution-based view of the firm

(see following sections of this chapter). This section discusses the most important resources and capabilities of technology based start-ups.

Resources of Technology Based Start-Ups

In general, a start-up refers to a newly established business operating in any industry. A technology based start-up is a small firm “whose products or services depend largely on the application of scientific or technological knowledge” (Allen 1992 as cited in Revest & Sapio 2012, p. 179). The most crucial resources for the success of technology based start-ups in emerging markets are human capital, financial capital and social capital (Chorev & Anderson 2006; Clarysse et al. 2011; Colombo & Grilli 2010; Kiss et al. 2012; Lee et al. 2001; Martens et al. 2011; Peng 2001).

- *Human Capital*

The primary role of the firm is to combine knowledge in order to create goods and services and the primary actor in this value creation process is the individual (Grant 1996, p. 112). In technology based start-ups, the individuals who create goods and services are mainly the founders of the start-up (at least in the early stage). Scholars of entrepreneurship generally agree that the human capital of the founders is a key driver for the success of technology based start-ups (Colombo & Grilli 2010, p. 610). The higher the human capital of the founders, the more likely a start-up is to follow a positive growth path (ibid). In particular, studies on entrepreneurial finance suggest that technology based start-ups founded by individuals with higher human capital attract venture capital financing more easily than other firms (ibid). Furthermore, founders with human capital in the form of extensive professional experience have distinctive capabilities which cannot be replicated easily by competitors (ibid, p. 614). In addition, Kiss et al. (2012, p. 277) emphasize the importance of entrepreneurial characteristics such as self-commitment, self-efficacy, dynamism, leadership desire and the entrepreneurs’ ability to overcome constraints and obstacles when founding and managing firms in emerging markets.

Besides the knowledge and experience of founders, another important resource for technology based start-ups in terms of human capital is the knowledge of employees. Core team expertise and diversified knowledge are essential for the success of start-ups (Chorev & Anderson 2006, p. 168). Hiring and training highly educated employees with expertise in diverse areas will increase the likelihood that these employees will generate new knowledge for the firm (Smith et al. 2005, p. 355) which can in turn become a source of competitive

advantage (Baron & Hannan 2002, p. 30). Furthermore, start-ups are generally built on a thin (financial) resource base and must therefore compete on the ability to do more with less (Peng 2001, p. 103). Consequently, making the most of their human capital as in hiring, training and investing in the best talents as well as retaining such valuable human capital becomes critical for success (ibid). Baron & Hannan (2002, pp. 30-32) even suggest start-ups to build a brand in the labour market in order to attract high potentials and win the “war for talent”. In order to sustain the competitive advantage gained from the founders’ and employees’ knowledge, start-ups are advised to adopt knowledge creating and sharing practices within their organization (Martens et al. 2011, p. 5799). This becomes even more critical in dynamic and complex environments such as emerging economies where change is frequent (ibid).

- *Financial Capital*

Financial resources are another key resource for technology based start-ups (Clarysse et al. 2011, p. 139; Colombo & Grilli 2010, p. 610). Financial resources can be generated by the start-up itself, borrowed from banks or similar financial institutions (e.g. factoring companies), or obtained from external investors such as venture capitalists and angel investors. Most technology based start-ups rely on internal financing, i.e. equity brought into the firm by the founders (Colombo & Grilli 2007; Revest & Sapió 2012). Only a minority of new technology based ventures obtains outside financing like bank loans (Colombo & Grilli 2007, p. 25). This may be explained by the fact that technology based start-ups lack tangible assets which can be collateralised (Revest & Sapió 2012, p. 179). In addition, their track record is short (ibid). Venture capital is also difficult to obtain but may become critical for the start-up’s long term success (Clarysse et al. 2011, p. 139). Venture capital investors do not only provide start-ups with financial resources but also with additional resources such as management skills and industry expertise (Colombo & Grilli 2010, p. 611; Lee et al. 2001, p. 634). As venture capitalists invest equity in start-ups, they have a strong incentive to help the venture succeed and therefore provide them with additional resources and capabilities (Lee et al. 2001, p. 634). This might be critical for the start-up’s growth since the founders often come from a science or technology background and lack management expertise.

- *Social Capital*

Lee et al. (2001, p. 633) consider the relationship to venture capital investors as part of the start-up’s social capital and found that, for Korean technology based start-ups, the linkage to these investors is the only significant predictor of performance. Other social capital indicators

such as linkages to universities, government and venture networks were not found to have significant influence on venture performance (ibid). However, this is different in emerging economies. Social networks are more important for new business activities in emerging than in developed economies since they substitute for the lack of institutional infrastructure (Danis et al. 2011, p. 394; Hoskisson et al. 2000, pp. 256-257). When institutions are weak and uncertain and access to information is limited, entrepreneurs in emerging economies build relationships with other actors in their environment in order to gain access to knowledge and experience (Danis et al. 2011, p. 402). Network relationships may even become a source of competitive advantage for firms in emerging economies (Hoskisson et al. 2000, p. 257). For technology based start-ups, relationships to key customers prove to be of particular significance (Yli-Renko et al. 2001, pp. 607-609). Key customers can help in knowledge acquisition by providing valuable information and introduction to other customers (ibid). By leveraging this knowledge start-ups can develop greater technological distinctiveness and improve their product operations which are both potential sources of competitive advantage (ibid).

Even though all of the above mentioned resources are key drivers of a start-up's success in emerging economies, their real values lie in their combination and the specific environment which the start-up operates in. Furthermore, the lack of resources does not prevent a start-up from being successful (Clarysse 2011, p. 151). Start-ups can compensate for resource constraints by developing superior capabilities from other resources (ibid, p. 152). Wu (2007, p. 553) found that this applies even more to start-ups in an unstable environment.

Dynamic Capabilities, Core Competencies & Organisational Structure

Resources represent the basis of a firm's capabilities, competencies and products. Capabilities are built by combining and enhancing resources and used to develop core competencies in specific areas as well as products. Zahra et al. (2006, pp. 923-935) distinguish between substantive capabilities (the ability to create new products) and dynamic capabilities (the ability to change the way new products are created within the firm). Dynamic capabilities are especially valuable when the external environment is changing frequently and/or rapidly such as high technology industries and emerging markets. They ensure that the firm successfully adapts to growth. Dynamic capabilities are created when the firm deals with the challenges of reconfiguring, developing and enhancing its substantive capabilities. In addition, dynamic capabilities also evolve when the firm acquires new internal and external knowledge.

Dynamic capabilities are the basis for core competencies which are difficult for competitors to imitate. Non-imitable core competencies are “the collective learning in the organization, especially how to coordinate diverse production skills and integrate multiple streams of technologies” (Prahalad & Hamel 1990, p. 81) and spawn competitive products (ibid).

Technology based start-ups in emerging markets do not only operate in a high velocity industry but also in a rapidly changing and uncertain political, economic and social environment which makes their ability to develop dynamic capabilities and unique core competencies even more critical for venture success. They need to be able to build, at lower cost and more quickly than their competitors, dynamic capabilities and core competencies necessary to create competitive products and/or services (ibid; Wu 2007, p. 553). In addition, these dynamic capabilities and core competencies need to be continuously updated and extended to ensure venture growth (Peng 2001, p. 103; Wright et al. 2005, p. 7).

Building capabilities and core competencies is closely related to the firm’s organisational structure (Prahalad & Hamel 1990, p. 81; Grant 1991, p. 122). The ability of the firm to achieve cooperation and coordination within its team and establish smooth-functioning organisational routines are key ingredients in developing capabilities and core competencies (Grant 1991, p. 122). Start-ups are business organisations of small size and informal structure with no or only a few organisational boundaries. As a result, cooperation and coordination can be achieved more easily in start-ups than medium-sized or large enterprises. Baron and Hannan (2002, pp. 18-19) studied the organisational structure of Silicon Valley companies over several years and found that it greatly influenced their performance. Despite the fast-paced nature of the high technology industry the start-up’s organisational structure is path dependent even when it faces dramatic events such as an IPO, merger or rapid growth (ibid). Its early organisation-building activities have significant influence on firm performance and changes in its organisational blueprint are very destabilising and adversely affect labour turnover, financial performance and even survival (ibid).

Business Model

A firm’s business model is the translation of resources, capabilities, competencies and organisational structure into operational and physical form and describes the blueprint of how a firm does business (Osterwalder et al. 2005, p. 2). It is about how a firm works as a system to create and deliver value to its customers as emphasized in the following definition:

“A business model is a conceptual tool that contains a set of elements and their relationships and allows expressing the business logic of a specific firm. It is a description of the value a company offers to one or several segments of customers and of the architecture of the firm and its network of partners for

creating, marketing, and delivering this value and relationship capital, to generate profitable and sustainable revenue streams.” (Osterwalder et al. 2005, p. 10)

Business models can be described in a very abstract and general way in order to capture a large number of firms across countries and industries but they can also be focused on a small number of firms or even on one specific firm (e.g. the “Dell” business model) (ibid). This thesis uses the framework for e-business (electronic business) models developed by Osterwalder and Pigneur (2004) in order to describe how technology based start-ups create and deliver value to their customers. The e-business model is situated somewhere in between abstract and specific business models since it describes firms operating in the information technology industry. It is based on four blocks: product innovation and value proposition, customer relationship, infrastructure management and financial aspects (Osterwalder & Pigneur 2004, pp. 71-80). These four blocks also serve as the basis of the start-up model which is developed in the empirical part of this paper.

- *Product Innovation and Value Proposition*

This block gives an overview on what a firm has to offer, i.e. its bundle of products and services. It describes how the firm provides value to a specific segment of customers and differentiates itself from its competitors (ibid. pp. 71-72). The firm’s offering of products and services is for example characterised by: life cycle, value level, price level, etc. These characteristics may help the firm position its products and services in the market (ibid).

- *Customer Relationship*

This block describes who the firm targets with its value proposition and product offerings, how it gets in touch with customers and what kind of relationship it wants to establish with them (ibid, pp. 74-78). Effective customer segmentation allows the firm to choose a specific group of customers and enables it to allocate its investment resources to the customers that will be most attracted by the firm’s value proposition. For technology based firms, the most general distinction of target customers is between business and individual customers (B2B and B2C) (ibid). The distribution channel describes how these target customers are reached, either directly (for example through a website or sales force) or indirectly (through intermediaries such as brokers, resellers, etc.) (ibid). Furthermore, the firm must carefully define what kind of relationship it wants to establish with its customers in order to maximize customer equity (i.e. profits from customer relationships). Customer equity may be increased by acquiring new customers (acquisition), enhancing the profitability of existing customers

(add-on selling) and extending the duration of existing customer relationships (retention) (ibid).

- *Infrastructure Management*

Infrastructure management is about how the firm creates value and manages its customer relationships (ibid, p. 82). Thus it describes the abilities necessary to provide value and create product offerings. It includes the firm's resources as well as its capabilities and core competencies and specifies the activities necessary to deliver the value proposition. This block also takes into account outside activities which the firm may perform in collaboration with or outsource to partners or other businesses (ibid). The inside and outside activities combined form the value configuration process.

- *Financial Aspects*

This block describes how the firm generates profits through the former three blocks. It includes the revenue flow and pricing mechanism of a firm (ibid, p. 70). Common revenue models of technology based firms are transaction and commission based models, subscription/membership models, advertising, and licensing (ibid, p. 66). In addition, this block also takes into account the firm's costs in the value configuration process. In technology based firms, major costs are R&D expenses, operating and marketing expenses (ibid).

Product innovation and value proposition, customer relationship, infrastructure management and financial aspects describe how a technology based start-up does business. It draws on start-up's resources, capabilities and core competencies and includes the critical elements of the start-up's business operations. As mentioned previously, these four blocks form the basis of the system dynamics start-up model that is developed in the empirical part of this thesis.

Differences between Start-Ups and Traditional Companies

The previous paragraphs discussed characteristics which are specific to technology based start-ups. Many of these characteristics distinguish technology based start-ups from traditional companies. Even though *traditional company* is a very vaguely defined term, this thesis refers to a traditional company as an established, profit-oriented company of at least five years of age that either employs more than 10 people or does not solely operate in the information technology industry. Taking into account this definition, a technology based start-up differs from a traditional company in at least one of the following aspects:

Resources: In terms of resources, technology based start-ups rely mostly on the human capital of their founders and employees (Chorev & Anderson 2006, p. 168; Colombo & Grilli 2010, p. 610). Start-up founders and employees do not only provide knowledge and expertise but also entrepreneurial characteristics such as self-commitment, self-efficacy, dynamism and leadership desire (Kiss et al. 2012, p. 277). Even though human capital is also important to traditional companies, the ratio of tangible and intangible resources (e.g. human capital) in traditional companies is likely to be different. Established companies which have been in business for more than five years and do not operate in the technology industry might place greater importance on tangible assets such as machines, land, buildings, inventory, etc. This applies especially to companies in capital-intensive industries (e.g. manufacturing companies). On the other hand, service based businesses and established companies in the information technology industry rely on intangible resources to a similar extent as start-ups.

Products: Different kinds of resources and capabilities result in different kinds of products. Technology based start-ups offer intangible, non-physical products and services such as software programs, mobile applications, network services, etc. Many technology based start-ups enter the market with a ‘minimum viable product’, that is a product developed cost-efficiently and lacking certain features which will be added in a later phase. The purpose of a minimum viable product is to test the market response and wait for customer feedback before integrating new product features. In contrast, traditional companies in the information technology or another industry generally spend a significant amount of time researching and developing a product that is already sophisticated and comes with a certain amount of product features.

Funding: Technology based start-ups rely mostly on internal funding and only rarely obtain outside financing (Colombo & Grilli 2007; Revest & Sapio 2012). Due to their young age, they lack a track record which makes it difficult to obtain bank loans (Revest & Sapio 2012, p. 179). What is more, they do not possess tangible assets that could be collateralised (ibid). This distinguishes them from established companies in the information technology industry and from established companies in other industries. Established companies generally have a proven business model and a longer track record than start-ups. In addition, they have tangible assets such as buildings, machines and land which they can use as collateral security to obtain bank loans. Due to their track record and reputation, they can also attract outside investors (e.g. private equity and venture capital companies) more easily than start-ups.

Size: Due to financial constraints, technology based start-ups generally cannot afford to employ a lot of personnel. The start-up founder(s) oftentimes take on different functional roles in the start-up to compensate for the lack of employees. As a result, their organisational structure tends to be simple and non-hierarchical which enables them to make decisions and take action quickly. Traditional companies generally can afford to employ more personnel and tend to have clear definitions of the roles of their employees. This may result in a more hierarchical organisational structure as compared to start-ups.

Risk: Technology based start-ups are businesses in an early stage of development. Their products and business models have not yet been thoroughly validated and their market potential can only be estimated. Furthermore, they may lack operational, managerial or technological experience and have a short track record (Revest & Sapio 2012, p. 179). This results in start-ups being high risk ventures. In contrast, traditional companies have been in business for a longer period of time and therefore have been able to grow a substantial customer base. They have more business and industry experience as start-ups and oftentimes a better understanding of the market. Thus they are considered less risky than start-up ventures. However, established companies can still carry a considerable level of risk by operating in risk-prone industries or making high-risk investments.

Summary

Resources, capabilities and core competencies are central considerations in formulating a firm's strategy (Grant 1991, p. 133). As they place constraints upon the firm's operation (upon what the firm is able to produce and sell), they determine, to some extent, the firm's overall profitability (ibid). Consequently, it is important that firms have access to valuable resources and develop unique, non-imitable capabilities and core competencies. For a technology based start-up, the most important resources are human resources as it heavily depends on technological knowledge to create unique capabilities and competitive products. As a result, the start-up's performance is closely linked to the quality of its human resources. Managing its human resources efficiently and getting the most value out of them is equally crucial and may even substitute for a lack of resources in other areas. The start-up's organisational structure plays an important role in this regard as it affects cooperation and coordination within teams which are both crucial for developing capabilities and core competencies. Finally, the start-up's resources, capabilities, core competencies and organisational structure need to be translated into tangible business operations, i.e. a business model. The start-up's business model describes how it does business and which actors are involved in delivering its value

proposition. However, a firm does not do business in a vacuum, so its resource, capabilities and business operations need to be understood in the specific industry and the political, economic and social environment it operates in. The following chapters are dedicated to discussing these topics.

2.1.2. The Industry-Based View

The focus of this thesis is on technology based start-ups operating in the information technology industry, e.g. start-ups selling software products and services, developing internet based networks, etc. The previous section described the firm-specific characteristics of technology based start-ups. This section will discuss the industry-specific characteristics of the information technology market. It is the second pillar in the strategy tripod developed by Peng et al. (2008; 2009).

The industry-based view argues that the firm's performance is influenced by the degree of competitiveness of the industry it operates in (Porter 1980). The information technology industry is subject to the same market forces as other industries (Varian 2001, p. 3). However, some market forces are particularly strong in the information technology industry (ibid). Firms operating in high technology industries face intense rivalries, constantly changing technologies, instant imitators and low barriers to entry (Almeida & Fernando 2008, p. 162). Gardner et al. (2000, p. 1074) identify the following characteristics of the high technology market environment: earlier stage of the industry life cycle, greater degree of turbulence, higher product differentiation, higher market growth rate, shorter expected life cycle, easier entry to the market, more diverse suppliers, more visible future for technology, and higher level of consumer involvement in purchase decisions. Since information technology is considered a segment of the high technology industry, information technology based start-ups face similar challenges. The following sections discuss these challenges in greater detail.

Competition

Competition within a particular industry is heightened when the number of firms operating in this industry increases. Since firms require resources to grow and survive and resources are limited, every industry has a carrying capacity of firms it can support (Woolley 2014, p. 724). In a new industry, firms are created until the carrying capacity is reached (ibid). At this point, resources become scarce, firm mortality rates increase and the number of newly founded ventures decreases (ibid). The time until the carrying capacity is reached depends on the barriers of entry to the industry. Entry barriers to the information technology industry are

relatively low (Porter 2001, p. 5). This is due to several reasons. First, the fixed costs of developing information technology products (e.g. software) are declining since information available on the internet, advances in software architecture and development tools make it easier to create information technology products (Porter 2001, p. 11). Second, the internet facilitates distribution and mitigates the need for an established sales force and access to existing channels (ibid, p. 5). Third, the number of information technology professionals such as software engineers and programmers is rising which results in a greater pool of skilled labour.

In addition to low barriers of entry, the global expansion of information technology increases competition as well (ibid). Information technology products may be offered across geographic markets. This does not only increase potential market size but also brings many more firms into competition with one another. The information technology industry is considered a high growth industry which increases market attractiveness (Li 2001, p. 186). New firms may enter the market hoping to achieve above average returns on investment. This increases competition within the industry and reduces the average profit of firms (Tsai et al. 1991).

Product Life Cycle & Intellectual Property

Firms operating in the information technology industry face rapidly changing and instable environments. The life cycle of technology is continually shortened and competing technologies appear frequently (Wu 2007, p. 551). As a result, product development is increasingly accelerated and the life cycle of products is significantly shortened (ibid). Furthermore, information technology products have a higher degree of mobility because they are built from information-based resources and capabilities. They are therefore prone to increased value migration and reduced sustainability (Amit & Zott 2001, p. 497).

Product value may be further reduced due to copycats. If information technology products can be produced cheaply (see next section), they can be copied or imitated cheaply, even in markets with extensive regulations on intellectual property rights (Shapiro & Varian 1999, p. 4). Patents may provide some protection from imitators. However, competitive firms may attempt to invent around a patent and create similar products (Varian 2001, p. 14). Some firms give (parts of) their products away for free in order to counter copycats and imitators (Shapiro & Varian 1999, p. 86).

Cost Structures

The production of information goods involves high fixed costs but low or even zero marginal costs (Shapiro & Varian 1999, p. 3). Accordingly, information is expensive to produce but cheap to reproduce (ibid). This is not only true for pure information based products but also for a number of physical high technology goods such as chips (Varian 2001, p. 4). Setting up a fabrication plant (fixed costs) can be very expensive but producing an incremental chip is cheap (marginal costs). High fixed costs and low/zero marginal costs are typical for high technology industries (ibid). In addition, there are no natural capacity limits for information products and distribution mostly takes place online which reduces distribution costs (Shapiro & Varian 1999, pp. 22, 84). This kind of cost structure (high fixed cost and low marginal cost) can lead to significant market power and even create natural monopolies (Varian 2001, p. 13).

Differentiation of Prices and Products

Since marginal costs are low or (close to) zero, information technology products are priced according to customer value and not according to production cost (Shapiro & Varian 1999, p. 3). In addition, information technology allows for a close observation and analysis of customer behaviour. This permits various kinds of pricing and marketing strategies which were previously rather difficult to carry out.

- *First Degree Price Discrimination*

First degree price discrimination is also known as ‘personalisation’ or ‘mass customisation’ and refers to selling to each customer at a different price. Firms will charge the highest price possible to each customer, thereby capturing the entire customer surplus. Knowing the customer’s willingness to pay is essential for personalized pricing. In information technology businesses, the customer’s willingness to pay may be estimated by learning about customer demographics, interests, and purchase history and by analysing click stream and search behaviour (Shapiro & Varian 1999, p. 43). In internet based commerce, fine-tuning prices is relatively easy (ibid, p. 34). For example, the US online retailer Amazon was accused of offering different prices on its DVDs to different customers depending on their behaviour (Varian 2001, p. 5). However, Amazon abandoned this practice after short time due to a customer backlash.

There are two possible economic effects of first degree price discrimination: the enhanced surplus extraction effect as mentioned above and the intensified competition effect (ibid, p. 6). The enhanced surplus extraction effect translates to higher prices for customers but still

according to what customers are willing to pay. The intensified competition effect describes an increase in competition within the industry as more firms will enter the market. When customer tastes are not very different, the intensified competition effect is found to dominate the surplus extraction effect (ibid). Consequently, customers will benefit and firms will suffer as competition increases.

- *Second Degree Price Discrimination*

Second degree price discrimination is also known as ‘versioning’. It is about offering a product line and let customers choose the version of the product which best accommodates their needs. This form of price discrimination is not only widely used in the information technology industry, but also in physical product markets (Varian 2001, p. 7). For example, books may be offered in different versions: as hardback, paperback, e-book, library rental, etc. Software is often available in different versions as well: online and offline versions, higher priced versions with better features, etc. The objective of versioning is to accommodate as many customers as possible and maximise the total value of the product (Shapiro & Varian 1999, p. 54). A potential drawback for firms offering different versions of their products may arise when customers with high willingness to pay are attracted by lower-priced versions which are targeted towards customers with lower willingness to pay (Varian 2001, p. 8).

A special type of second degree price discrimination is bundling. It refers to the practice of selling two or more products (a ‘bundle’) together for a single price. Bundling reduces dispersion in customers’ willingness to pay. It is a particular attractive pricing structure for information technology products since the marginal cost of including additional products in a bundle is negligible (ibid, p. 10). In general, firms benefit from bundling in terms of increased profits and efficiency while customer surplus is reduced (ibid). Bundling may even reduce competition within the industry as it raises the barrier to entry (ibid).

- *Third Degree Price Discrimination*

Third degree price discrimination is referred to as group pricing and means setting different prices for different groups of customers. Student and senior citizen discounts are an example of group pricing. The concept of group pricing is based on differences in price sensitivity among customers. Group pricing is a common pricing strategy for information technology products which are sold internationally (Shapiro & Varian 1999, p. 45). However, the internet can be a threat to differential international pricing since customers can easily access and compare information on products and prices (ibid). A possible solution is to localise

information technology products so that different versions of a product are targeted to different countries (see the previous section on second degree price discrimination for more details) (ibid).

Network Effects

While cost structures are also called supply side economies (average cost decreases with scale), network effects are referred to as demand side economies with the average revenue (demand) increasing with scale. A product exhibits network effects when the demand for the product depends on how many other people purchase it. In other words, customer utility increases with the number of people using the same product. An example for a product with network effects is the telephone. Economists distinguish between direct network effects (as in the telephone example) and indirect network effects. Apple's iTunes app store is an example for a product with indirect network effects: as the number of users of the iTunes app store increases, more applications become available which increases customer utility and will attract even more users. Indirect network effects are common in information technology and high technology industries (Varian 2001, pp. 16-18). In addition, as the number of users increases, the general willingness to pay for the products also increases (ibid). When network effects are significant, they can even raise the barriers to entry (Porter 2001, p. 8). However, in the information technology industry, it is difficult for a single firm to control and capture the benefits of network effects (ibid). Large investments are required to create network effects which may offset future benefits (ibid).

Switching Costs

Switching costs are negative costs that consumers incur when changing products. They affect customer relationship by increasing customer retention. For some information technology products such as software environments switching costs can be very high (Varian 2001, p. 11). For some products, they can even be so high that customers find themselves in a lock-in situation where switching suppliers is unthinkable (ibid). Lock-in situations may be a burden for firms as well since they may make it difficult for them to change their pricing strategy. For example, a firm would like to sell at a high price to its current customers (the locked-in customers) but it would also like to sell at competitive (lower) prices to new customers (ibid, p. 12). When switching costs are high, customers' bargaining power decreases and the barriers of entry to the industry rise (Porter 2001, p. 7). However, Porter (ibid, p. 7) argues that for internet based products, switching costs are likely to be lower than for traditional

ways of doing business. This may be due to the fact that the internet increases customers' bargaining power by providing easy access to information about products and suppliers (ibid, p. 5).

Summary

Industry structure is a determinant of firm profitability (Porter 2001, p. 5). This chapter examined the industry-based view of firm profitability and discussed the characteristics of the information technology industry. Firms operating in the information technology industry face intense competition and significant uncertainty. The life cycle of information technology products is short and technologies change rapidly. Due to easy access to information, customers' bargaining power is increasing and barriers of entry are decreasing. Information technology products have high fixed costs but very low marginal costs which makes first time production expensive but reproduction comparatively cheap. As a result, the imitation and copying of information technology products are easy as well which can lead to infringement of intellectual property. The cost structure of information technology products facilitates different pricing strategies: personalized pricing, versioning and bundling as well as group pricing. Besides pricing strategies, network effects and switching costs may also affect demand for a specific information technology product. Network effects and switching costs may be very advantageous for firms but they are difficult to create.

All of the above mentioned characteristics of the information technology industry may be opportunities and threats for firms. Firms respond to these opportunities and threats by creating competitive strategies. Their final success will not only depend on the quality of their strategies (their specific resources and capabilities) but also on the institutional environment that they are part of.

2.1.3. The Institution-Based View

This chapter discusses the relationship between firms and their political, economic and social environment. The influence of the environment on firms has long been acknowledged by scholars (Peng et al. 2009, p. 65). However, most research has favoured a task environment view which focuses mainly on objective economic factors such as market demand (ibid). In contrast, the institution-based view does not focus solely on economic factors, but tries to provide a holistic picture by including political and social factors as well. It calls these factors 'institutions' and draws on institutional theory as outlined by North (1990) and Scott (1995). North (1990, p. 3) defines institutions as "the rules of the game in a society or, more formally,

[...] the humanly devised constraints that shape human interaction” and states that institutional theory focuses on the role of the political, economic and social systems in shaping the behaviour of firms. The sociologist W. Richard Scott (1995, p. 33) defines institutions as “regulative, normative, and cognitive structures and activities that provide stability and meaning to social behaviour”. They provide a complementary view on institutions which includes both formal and informal components.

The Role of Institutions

North (1990) classifies institutions as formal and informal constraints. Formal constraints refer to constitutions, laws, regulations, property rights, etc. of a specific country or region. Informal constraints can be customs, traditions, codes of conduct and sanctions. In comparison, Scott (1995) distinguishes between three types of institutions: regulatory, cognitive and normative. Regulatory institutions are what North defines as formal institutions: laws, regulations, property rights etc. Cognitive institutions refer to the knowledge of the people in a specific country while normative institutions describe their values and norms. Cognitive and normative institutions are considered informal institutions. The main role of institutions is to reduce uncertainty and transaction costs by establishing a stable structure that facilitates interactions (North 1990; Scott 1995). The existence of stable formal and informal institutions discourages opportunistic behaviour. In economic terms, stable institutions promote economic activity by providing a clear structure for business transactions, reducing information asymmetry and laying out the consequences of opportunistic behaviour such as fraud. What is more, the institution-based view of the firm argues that institutions also affect the strategy and performance of firms (Peng et al. 2008, p. 929).

Firm Strategy and Institutions

Firms interact dynamically with institutions. Peng (2010, p. 37) argues that firm behaviour is often a reflection of the formal and informal constraints of the institutional framework the firm is embedded in. Firms therefore need to take into account the influences of these formal and informal ‘rules of the game’ in addition to firm-level and industry-level conditions when defining their strategy (Peng et al. 2009, p. 70). In fact, the competitiveness of firm strategy highly depends on its institutional environment (Martens et al. 2011, p. 5795). For example, a firm might possess resources and capabilities which are favoured in a certain institutional environment while in another institutional environment they would be of no value.

Consequently, firms need to align their resources and capabilities and their overall strategy with the institutional environment they are operating in (ibid).

Institutions in Emerging Economies

Some scholars have argued that institutional theory is the most applicable theory for explaining firm behaviour in emerging economies (Hoskisson et al. 2000, p. 253). However, a stable institutional framework has long been taken for granted and formal and informal institutions have been considered only as ‘background’ (Peng et al. 2009, p. 66). In developed economies where institutions generally work smoothly and are almost invisible, assuming away institutions as background may be reasonable in some cases (ibid). By contrast, in emerging economies as well as in developing economies institutions are often unstable and underdeveloped and may have greater influence on various forms of economic activities (Tracey & Phillips 2011, p. 26). For example, formal as well as informal institutions may have significant impact on strategic choices of managers in existing emerging economy firms and influence the creation of new business ventures (ibid, p. 36). Furthermore the degree of influence of formal and informal institutions in emerging economies differs from developed economies. Emerging economies rely more heavily on informal institutions to facilitate transactions and combat opportunism than developed economies because their formal institutions are often underdeveloped (Peng et al. 2009, p. 69). In addition, there are variations between emerging economies in terms of institutional environment. Firms within one institutional environment tend to be similar but firms differ across institutional environments (Peng et al. 2009, p. 69). Consequently, technology based start-ups might be similar within China and within Indonesia but there might be significant differences between Chinese technology based start-ups and Indonesian technology based start-ups due to their different institutional environment. The differences and similarities between institutions in two or more countries, regions or economies are summarized as ‘institutional distance’ (Phillips et al. 2009, p. 339). Institutional distance is commonly measured by comparing the institutional profiles of countries, regions or economies (ibid, p. 342). This thesis tries to investigate the consequences of institutional distance between China and Indonesia for the performance of technology based start-ups. It seeks to determine which institutional environment (China or Indonesia) is more favourable to the success of technology based start-ups.

Summary

This chapter introduced the institution-based view of the firm, defined institutions and discussed why institutions matter for firm performance. The institution-based view argues that there is dynamic interaction between firms and their institutional environment. The institutional environment puts constraints on the behaviour of the firm and has influence on firm strategy and performance. It defines the 'rules of the game'. In emerging economies, institutions are often weak and unstable. Formal institutions can be underdeveloped so informal institutions play a more significant role in reducing transactions costs and opportunism. However, not all emerging economies are the same and the structure and significance of institutions may vary significantly.

2.2. Entrepreneurship and Institutions

This chapter goes into greater details on the institution-based view of the firm introduced in the previous section and discusses why and how institutions matter for newly founded firms. The two subchapters investigate the formal and informal institutions which are likely to affect technology based start-ups and describe them in detail. Institutional theory has proven to be very helpful not only in strategic management and international business research (see previous chapters) but also in entrepreneurship literature (Bruton et al. 2010, p. 421). First, institutions may encourage or discourage entrepreneurs to found new firms and can therefore impact the rate of new venture creation. They provide the setting for founding new firms. Second, institutions influence the choices entrepreneurs make to build and grow their businesses and have impact on the outcome of these choices.

If somebody becomes an entrepreneur and decides to establish a new business depends on the institutional environment which can be facilitative or detrimental (Fogel et al. 2006, pp. 540-541). It determines not only the setting but also the legitimacy of entrepreneurship (Thai & Turkina 2014, p. 505). Among the institutions determining the creation of new ventures are, for instance, rules and regulations, the quality of government, the availability of education and the ambient culture (Fogel et al. 2006, p. 544). If these institutions impede information flow, raise transaction costs and fail to combat opportunism, entrepreneurial activity will be limited (ibid). Specific examples for institutional features limiting entrepreneurial activities are weak property rights, inefficient judiciary and ambient corruption (ibid). In addition, the institutional environment can also have indirect effects on new business creation. For example, detrimental institutions can retard capital market development which dampens entrepreneurial activities (ibid).

The institutional environment imposes constraints on the actions of entrepreneurs. Prevailing institutions have considerable influence on decisions about appropriate structures, practices and behaviours of entrepreneurial ventures (Tolbert et al. 2011, p. 1336). They also impact entrepreneurial outcomes, i.e. if a venture is successful. Initial entrepreneurship research has focused much on the role of personal traits and dispositions of founders as keys to explaining entrepreneurial outcomes (ibid, p. 1332). In recent years, the focus has slightly shifted to institutions as one of the key determinants of venture performance (ibid). However, most research in this field has been conducted in developed economies and may not readily apply to the relationship of entrepreneurship and institutions in emerging economies. Wright et al. (2005, p. 9) state that there “is little IT [institutional theory] research on local startups in emerging economies”, even though institutional theory has been identified as a useful way of conceptualising emerging economies and institutions have been found to impact entrepreneurship in emerging economies (Tracey & Phillips 2011, p. 25). Entrepreneurial choices and outcomes in emerging economies are not only affected by the absence of certain institutions but also by existing institutions which are not deeply institutionalised (ibid, p. 28). These institutions lack self-reinforcing mechanisms which encourage predictable patterns of behaviour and reduce risk and uncertainty (ibid). Risk and uncertainty can be even higher for entrepreneurial activities in rapidly changing industries such as the information technology industry. The information technology industry is a comparatively new industry in emerging economies and lacks cohesive institutional structures and legitimacy (Woolley 2014, p. 722). However, Tracey & Phillips (2011) argue that institutional uncertainty can also provide significant opportunities for entrepreneurs in emerging economies. Entrepreneurs can capitalise on institutional uncertainty and create value in different ways. Furthermore, they also act to shape their institutional environment (Bruton et al. 2008, p. 11). For example, entrepreneurs have been able to create substitutes for weak legal structures and insubstantial capital markets in markets with underdeveloped legal systems and financial markets (ibid). Their challenge is to continue working within the systems as it is and, at the same time, to act as institutional entrepreneurs and encourage institutions to facilitate entrepreneurial activities (ibid). The following sections discuss which institutions have the greatest significance for entrepreneurial activities in emerging economies and in the information technology industry.

2.2.1. Formal Institutions

Formal institutions form the regulatory dimension of the institutional environment. They include, for example, laws, regulations and government policies which provide support for

new and existing firms, reduce the risks of starting and operating a business, and facilitate the efforts of entrepreneurs to acquire resources (Busenitz et al. 2000, p. 995). Busenitz et al. (2000, p. 1001) suggest to couple several institutions of the regulatory dimension in order to gain a more thorough understanding of a country's or a region's institutional environment for entrepreneurship. This thesis tries to follow their suggestion by investigating several formal (and informal) institutions. This section discusses the most significant formal institutions for entrepreneurship in emerging markets and the information technology industry according to literature. The empirical part of this paper then combines them to see how they interact and affect the performance of technology based start-ups in China and Indonesia.

Property Rights, Regulations and the Legal System

Property rights, rules, regulations and their enforcement are important determinants of entrepreneurial activities (Fogel et al. 2006, p. 541). They affect transactional trust which is defined as “the degree of trust the parties to a business transaction place in each other” (ibid). Transactional trust is crucial for entrepreneurial activities as they entail long term transactions such as employees investing their time and investors investing their money now for rewards in the future (ibid). Well enforced property rights, rules and regulations reduce uncertainty and strengthen transactional trust. They facilitate the detection and punishment of opportunistic behaviour and let people commit to “verifiable honesty” (ibid, p. 548). Examples of these rules and regulations include legal contracts, disclosure requirements, specified investor and creditor rights, definitions for performance clauses in trade contracts, etc. (ibid). Johnson et al. (2002) investigated entrepreneurship in transition economies and found that weak property rights discourage entrepreneurs not only from creating new firms but also from reinvesting their profits in the firm even if potentially profitable reinvestment opportunities exist. Ineffective courts and lack of faith in the courts have the same adverse impact on entrepreneurial activities (ibid). Interestingly, not only the quality but also the type of legal system affects entrepreneurship. Stephen et al. (2005, pp. 415-417) investigated the influence of five broad legal ‘families’ (English Common Law, French Civil Law, German Civil Law, Scandinavian Civil Law and Socialist Legal Systems) on entrepreneurship and found that countries within the English legal family have higher levels of entrepreneurship, *ceteris paribus*, than countries within other legal families. They argue that a possible explanation could be the extent to which these legal systems protect property rights in general and investor and creditor rights in particular. In high technology industries, efficacy of legal

protection mechanisms is considered a factor which provides stability in a highly dynamic and rapidly changing environment (Clarysse et al. 2011, p. 140).

Government, Corruption & Bureaucracy

The government of the country or region a firm is operating in matters because it creates and enforces property rights, rules and regulations. An efficient and ‘good’ government increases transactional trust and thus facilitates entrepreneurship (Fogel et al. 2006, p. 541). In contrast, an inefficient and insufficient government fails to protect property rights and discourages entrepreneurship. The government can also interfere in the market by, for instance, setting prices and imposing price controls. Direct government interference with market price mechanisms is found to discourage entrepreneurship (ibid, p. 568). Frye and Shleifer (1997, p. 354) divided governments into three different groups and characterized them by an invisible hand, a helping hand or a grabbing hand. In the invisible hand model, they describe the government as benevolent, efficient and uncorrupted. It limits itself to providing basic public goods and services, such as contract enforcement and law and order while it leaves most decisions in regard to market allocation to the private sector. In the helping hand model, the government actively promotes economic activities and pursues industrial policy. It supports some firms and impedes others. Corruption exists but it is relatively limited and organised. Bureaucrats often have close economic and family ties to entrepreneurs. The government is also interventionist in the grabbing hands model. However, it is less organised and consists of a large number of bureaucrats who act rather independently and pursue their own agendas, including taking bribes (ibid). Entrepreneurial activity depends on how well property rights are protected from the ‘grabbing hands’ of the government and other influential agents with political power (Fogel et al. 2006, p. 548). An efficient and ‘good’ government which protects entrepreneurs’ property rights is found to encourage formal entrepreneurship while discouraging informal entrepreneurship (Thai & Turkina 2014). Not only the absence of laws and regulations and/or their weak enforcement can raise the risks and costs of founding and operating a business. Excessive laws and burdensome regulations are also found to discourage entrepreneurship (Fogel et al. 2006, p. 550). For example, the number and complexity of regulatory procedures on the path to establish a new firm seem to be critical in the decision to start a new, officially registered firm (Stephen et al. 2005, p. 414). Djankov et al. (2002, pp. 1, 35) document the number of regulatory procedures to start a small business in 85 countries and find that entry regulations are particularly burdensome in countries with high corruption and large unofficial economies. This may be one of the reasons why entrepreneurs in such

countries tend to establish informal firms, i.e. firms that are not officially registered (Van Stel et al. 2007, p.183). In emerging economies, informal firms are found to have limited access to important resources such as technology investments and entrepreneur's higher education (Siqueira & Bruton 2010, p. 48). They also tend to have lower levels of productivity than formal firms (ibid). Thus the firm's short term benefits from avoiding burdensome registration procedures might limit their growth potential in the future. In addition, burdensome regulations create growth bottlenecks for small firms (Aterido et al. 2009, p. 22). Since the management time dealing with authorities and bureaucracy increases significantly with firm size, small firms prefer to remain small to keep below the radar of officials (ibid, pp. 4, 29). What is more, Aidis (2005, p. 314) finds that burdensome, ambiguous and frequently changing tax policies are significant institutional barriers to the development of small- and medium-sized enterprises.

Macroeconomic Conditions

Macroeconomic conditions such as inflation rates, interest rates, government budgets, GDP growth, and economic sectors can affect entrepreneurship. A stable macroeconomic environment reduces risk and uncertainty which promotes future and long term transactions such as investments in new ventures (Fogel et al. 2006). Stable macroeconomic conditions as well as high levels of economic development are also found to encourage formal entrepreneurship (Thai & Turkina 2014, p. 490). Entrepreneurship is also influenced by global and national business cycles (Koellinger & Thurik 2012, p. 1151). Entrepreneurial activity is higher during a national recession because start-up costs for qualified human resources and borrowing financial resources tend to be lower during recessions (ibid). Entrepreneurship might also be an alternative for people who were dismissed during a recession. They become entrepreneurs out of necessity. However, this paper does not consider necessity entrepreneurship since technology based firms are usually the result of opportunity entrepreneurship. What is more, during national recessions new firms innovate more vigorously than established firms (ibid, p. 1153). Global business opportunities such as newly invented technologies, geopolitical developments and changes in commodity prices are found to increase opportunity entrepreneurship (ibid, p. 1151). The macroeconomic environment does not only impact the creation of new firms but also their performance over time. New firms are part of an economic system and exposed to the same economic changes as established firms. Kiss et al. (2012, p. 278) argue that macroeconomic differences dominate explanations of new venture growth. As entry and exit rates of firms are positively correlated

(Quatraro & Vivarelli 2014, p. 4), an economic recession does not only cause many new firms to enter but also to exit the market. During times of low macroeconomic growth the survival ability of firms, in particular of small firms decreases (Box 2008, p. 390). The influence of other macroeconomic factors on firm performance depends on firm characteristics and the industry it is operating in. For example, the impact of inflation rates on firm performance might be different for firms that operate domestically or internationally. What is more, the impact of the interest rate level depends on the type of the firm's financial resources. The interest rate level might especially affect firms which rely on external capital.

Financial Markets

Financial markets are an essential element of a market based economic system and provide a variety of financial services to individuals and firms seeking investments or financing. In theory, start-up ventures can obtain external funds from financial markets to invest in their operations and accelerate growth. However, in practice, newly created small firms and technology based start-ups in particular, suffer from credit constraints and a lack of financial capital (Quatraro & Vivarelli 2014, p. 10; Revest & Sapió 2012, p. 181). Credit constraints and a lack of financial capital limit not only the entry rate of new firms but also their likelihood of survival and growth (Quatraro & Vivarelli 2014, p. 10). There are several reasons why technology based start-ups have difficulties in obtaining external funds. First, their default probability is relatively high and they mostly possess only intangible assets which cannot be collateralised and are difficult to redeploy in case of default (Revest & Sapió 2012, p. 181). Second, transaction costs related to debt and equity financing of technology based start-ups are considered to be higher than those of large and mature firms (ibid). Third, there are substantial information asymmetries between the start-up founders and outside investors (ibid). This is due to the short track record and early growth stage of the start-up. In addition, investors and lending institutions often have limited understanding of technically complex and innovative projects (ibid). How these credit constraints can be softened depends on the country's type of financial system. Market-based financial systems (e.g. USA, UK) may offset information asymmetries responsible for credit constraints by improving information flow and strengthening investor rights (ibid, p. 184). In bank-based financial systems (e.g. Germany) credit constraints may be softened by start-up's greater reliance on social networks and long term relationship with creditors (ibid). As these findings are based on financial systems in developed economies, it is unclear if they are applicable to emerging economies in the same way. Social capital of start-up founders has been found to be a

powerful tool to overcome financial constraints (ibid). This might be even more so in emerging economies that rely more heavily on informal than on formal institutions and where financial markets are not well-developed. What is more, some studies have found that the role of credit constraints in new firm growth has been overemphasised (Quatraro & Vivarelli 2014, p. 10). In fact, the majority of technology based start-ups and new firms in emerging economies rely on internal financing such as entrepreneurial saving plans and funds from family members (ibid; Revest & Sapio 2012, p. 184). If technology based start-ups resort to external financing such as bank loans, the sum obtained is generally small (Colombo & Grilli 2007, p. 25). Furthermore, increased access to external finance has a larger positive effect on firm growth in economies with more developed financial systems and/or better rule of law (Aterido et al. 2009, p. 29).

A special institution providing technology based start-ups with funds are venture capital investors. They are specialised in high risk investments and can give start-ups access to funds when banks loans and stock market flotation are unattainable. Venture capital represents only a minority of the capital in developed economies and it plays an even smaller role in emerging economies (Bruton et al. 2008, p. 4). However, the number of venture capital investments in emerging economies has been growing significantly in recent years (The Economist 2012). Venture capital investors in emerging economies have the same goals of substantial annual return on investment as in developed markets (e.g. Silicon Valley) but their actions to achieve these goals are different (Ahlstrom & Bruton 2006, p. 314). Since formal institutions are not yet well established in many emerging economies, venture capital investors generally use informal institutions such as personal relationships and networks with entrepreneurs and government officials to substitute for formal institutions (ibid, pp. 312-313). In the future, however, institutions in emerging economies are expected to become more formal and venture capital practices are expected to change as well, albeit at varying speeds (ibid).

The Labour Market

The labour market represents a country's pool of available human resources from which firms can appoint managers and employees. The characteristics of a country's labour market depend, for instance, on national labour laws and regulations such as hiring and firing practices, minimum wages and working hour restrictions. In addition, the educational system (see next section) also has significant influence on the country's labour market. Constraints due to strict employment laws are found to hinder entrepreneurship (Fogel et al. 2006, p. 566). This applies particularly to unskilled labour. Firms are more likely to sustain competitive

advantage and remain profitable when labour laws permit to reduce their workforce quickly (Chacar 2010, pp. 1126, 1135). Consequently, institutions which give firms greater power over their workforce are likely to contribute positively to firm growth (ibid) and thus let more firms survive (Kılıçaslan & Taymaz 2008, p. 221). However, this might have an adverse effect on national productivity levels since less productive firms are more likely to survive as well (ibid, pp. 220-221). What is more, in countries with very restrictive employment laws industries that are more volatile tend to be less developed (Aterido et al. 2009, p. 6). Strict labour laws and regulations might therefore have negative impact on the information technology industry as it is inherently volatile. Another factor affecting a country's labour market is unemployment. High unemployment can reflect low economic growth rates which may affect small firms in a positive or negative way (Fritsch et al. 2004, p. 8). On one hand, when unemployment is high, firms can choose from a larger pool of available human resources when appointing new managers and employees. In addition, labour costs might be lower during times of low or negative economic growth. On the other hand, as high unemployment often indicates times of economic downturns, new firms' risk for death increases (Box 2008, p. 382). Unemployment can also lead to a large share of new ventures out of unemployment, i.e. entrepreneurship out of necessity (Fritsch et al. 2004, p. 8).

Not only the quantity but also the quality of available labour characterises a country's labour market and can impact the performance of firms. Firms in new technology industries such as the information technology industry rely on competent labour (Woolley 2014, p. 725). However, when the number of skilled workers in the labour market is high, knowledge might move more easily across firms (Chacar 2010, p. 1126). As stocks of skilled workers increase, their knowledge becomes less distinctive and they can be replaced by outside talent more easily. Firms which rely heavily on unique knowledge-based capabilities for superior performance might lose competitive advantage because knowledge becomes available to their competitors (ibid). Information technology based start-ups rely on the knowledge of skilled labour to generate profits and grow but if knowledge becomes widely available, their competitive advantage might dissipate. A possible strategy for start-ups could be creating an employer brand in the labour market in order to attract the best talent with rare abilities and knowledge.

Education & Innovation

Human capital plays an important role in increasing the likelihood of firm survival and growth, especially in technology industries (Quatraro & Vivarelli 2014, p. 11). The

entrepreneur's human capital is a key driver of growth of technology based start-ups (ibid). Entrepreneurs with higher levels of education, both (upper) secondary and tertiary, are not only more likely to survive as business owners but they also have higher earnings compared to those with only primary education (Millán et al. 2014, p. 621). If entrepreneurs with tertiary education are more likely to succeed than those with secondary education depends on the country's stage of development. Quatraro and Vivarelli (2014, p. 12) argue that there is a country-specific threshold effect of education. For example, small firms founded by secondary school graduates in African countries might grow faster than their counterparts in Latin America. In Latin America, the threshold effect is at the university level. If small firms in Latin America are to experience the same growth rate as African small firms, their founders need to have a university degree. In addition to the founder's human capital, the education level of employees also affects firm performance (Millán et al. 2014, p. 627). Employees with a higher level of education tend to be more productive (ibid). Stocks of employee knowledge are related to the process of knowledge creation within the firm and thus play an important role in establishing and sustaining competitive advantage (Smith et al. 2005, p. 355). Technology based firms are advised to hire and train well-educated employees with varying functional expertise, in particular scientists and engineers, as they are more likely to combine and exchange their ideas to create new knowledge and innovative products (ibid). What is more, the education levels of consumers also impact the performance of an entrepreneurial firm by shaping the demand function for its products (Millán et al. 2014, p. 612). Higher educated consumers increase the demand for more differentiated and innovative products and services (ibid, p. 613). As a consequence, new (niche) business opportunities may emerge from which entrepreneurial firms are likely to benefit (ibid). Since technology based firms tend to be more innovative than firms in traditional industries, they may benefit more from a large number of highly educated consumers.

Education is also closely linked to innovation. It provides the foundation from which technological invention and innovation can occur (Woolley 2014, p. 725). Innovation is generally a growth driver for firms and a positive predictor of survival (Quatraro & Vivarelli 2014, p. 13). If the underlying motivation to start a new firm is linked to innovative products, firm performance tends to be above-average (ibid). Furthermore, early investments in R&D increase the growth rates of technology based firms (Stam & Wennberg 2009, p. 86). The information technology industry is at the frontier of innovativeness and technological development and firms operating in this industry often enjoy an 'innovation premium' in survival time (Quatraro & Vivarelli 2014, p. 13). However, the positive impact of innovation

on firm performance is strictly related to the differential patterns of specialisation of countries (ibid). Emerging economies are not necessarily specialised in innovation-driven industries and can therefore be far from the technological frontier. In addition, technology based firms in emerging economies often face greater resource constraints and have higher levels of informality than their counterparts in developed economies (Siqueira & Bruton 2010, p. 39). These two factors probably mitigate any positive effect of innovation and R&D investments on firm performance (Quatraro & Vivarelli 2014, p. 13).

Infrastructure & Technology

Infrastructure includes the development of transportation systems, sanitation, electricity as well as information technology services such as telecommunication networks and internet access. A lack of infrastructure often represents a major constraint for entrepreneurs in emerging economies (Tracey & Phillips 2011, p. 26). It prevents entrepreneurs from entering the market and also hinders small and young firms from growing (Quatraro & Vivarelli 2014, p. 5). A lack of infrastructure hits especially technology based start-ups since their products are based on the use of computers, mobile devices and the internet. They do not only need basic infrastructure such as electricity but also access to technological infrastructure. In fact, technology based start-ups are likely to have higher earnings the greater information technology diffusion in the country since they will be able to reach more customers. Emerging economies vary in their digitalisation levels, i.e. adoption of information and communication technology. A key driver of digitalisation in emerging economies is the availability of basic infrastructure as well as economic growth (Billon et al. 2010, p. 65). In addition, a country's technology adoption also rises with education levels, in particular as concerns internet adoption (Corrales & Westhoff 2006, p. 915). A barrier to technology adoption can be restrictions of political liberties such as internet censorship (ibid, p. 930). Authoritarian regimes tend to develop restrictive policies on internet usage. They may promote information technologies only as long as they can control content (ibid). Even though higher levels of income can enable citizens to overcome barriers to connectivity imposed by authoritarian states (ibid), technology entrepreneurs might still have difficulties in becoming aware of recent technological developments and accessing knowledge. As a consequence, they are hindered in identifying and realising new business opportunities or perceive the net gains from new technologies to be lower than they actually are and decide not to seize new opportunities (Pathak et al. 2013, p. 2093).

Business Groups & Clusters

Large business groups are ubiquitous in emerging markets. They usually consist of legally independent firms which operate in multiple, sometimes unrelated industries and are oftentimes family-owned. Their role and impact on business in emerging economies is controversial. On one hand, business groups substitute for weak institutions and missing markets for resources such as capital and labour (Bhaumik & Zhou 2014, p. 15). They often enjoy close ties to the government and may even help the government with the development of several industry sectors (Khanna & Yafeh 2007, p. 359). On the other hand, they can use their political influence to lobby for their interests and manifest their position in the market. In fact, business groups often enjoy considerable market power and may, under some circumstances, drive their competitors out of markets (ibid, p. 361). Business groups often outperform independent firms because they can obtain rare human and financial resources from group affiliated firms. In terms of innovation and technological change, groups provide infrastructure needed to support innovation and technological development when market based institutions are weak (Mahmood & Mitchell 2004, p. 1361). This may result in greater innovation and higher productivity in group affiliated firms (Bhaumik & Zhou 2014, p. 3). At the same time, groups tend to converge in their technological variety and therefore restrict possible innovations in their industries (Mahmood & Mitchell 2004, p. 1361). Independent firms can expand the range of possible innovations with their ideas and products. However, the entry barriers for independent firms tend to be high in industries dominated by large business groups (ibid). The final trade-off in terms of innovation will vary depending on development and availability of market based innovation institutions in the country. If institutions are weak, business groups can provide infrastructure and promote innovation in their industries. However, if institutions are available and/or a variety of technological opportunities arise, business groups tend to inhibit innovation by creating entry barriers for independent firms (ibid). As a consequence, technology based start-ups in emerging economies may profit from infrastructure and the innovation threshold created by business groups as long as market based innovation institutions are weak. When institutions improve, innovation variety increases and a greater number of technological opportunities arise, technology based start-ups will be limited in exploiting these business opportunities as large business groups dominating the industry create high entry barriers.

Market based innovation institutions are, for instance, economic clusters. Clusters are specific geographic locations where economic activity tends to be concentrated. Information technology or high technology clusters in general are often created by universities and

research foundations locating in a few specific areas. They attract highly skilled employees, financial investors (e.g. venture capitalists) and new technology based start-ups. Start-ups located in clusters may not only benefit from a larger pool of available talent but also from a larger number of specialised suppliers to work with (Pe'er & Keil 2013, p. 354). In addition, a larger number of customers may be attracted to clusters and thereby making it easier for start-ups to form customer relationships (ibid). Start-ups with below average resources tend to benefit more from clusters than their competitors as the improved access to labour, suppliers and customers may compensate their lack of internal resources (ibid). Accordingly, technology based start-ups in emerging economies which often suffer from a lack of resources may improve their chances of success by locating in clusters, especially if they operate internationally and face global competition.

Summary

This section discussed the most relevant formal institutions to technology based start-ups in emerging economies. Previous research in the area of entrepreneurship in high technology industries has focused on opportunity creation and recognition and taken the institutional context for granted (Woolley 2014, p. 741). It has been assumed that once an entrepreneur finds an opportunity, the institutional context will be supportive. By looking at the formal institutional context of technology entrepreneurship in emerging economies we can see that the institutional context is not always supportive and can affect the survival and performance of start-ups in various ways. Technology entrepreneurs in emerging economies often have to deal with weak enforcement of property rights, laws and regulations. They may come across corruption and bureaucratic hurdles and face financial constraints due to underdeveloped financial markets. Highly skilled labour can be difficult to find and technological infrastructure is still underdeveloped or even restricted by authoritative governments in some countries. Business groups can provide infrastructure for innovation while at the same time increasing entry barriers. Clusters may help start-ups compensate for a lack of internal resources by providing easier access to highly skilled labour, suppliers and customers. Which formal institutional factors have the most significant impact on the performance of technology based start-ups depends on the country's stage of development (Fogel et al. 2006, p. 546). The empirical part of this thesis will analyse the most critical formal (and informal) institutional factors influencing technology based start-ups in China and Indonesia.

2.2.2. Informal Institutions

The previous chapter investigated the most significant formal institutional constraints that technology based start-ups face in emerging economies. This chapter discusses the most significant *informal* institutional constraints. In terms of entrepreneurship, informal institutions refer to the general knowledge about establishing and operating a new business and the societal attitude towards entrepreneurial activities in a certain country or region (Busenitz et al. 2000, p. 995). Informal institutions can be described by certain cultural factors which impact entrepreneurship and the performance of new firms (Salimath & Cullen 2010, p. 365). Among these factors are, for instance, fear of business failure, social status associated with entrepreneurship, individualism and collectivism, innovativeness and performance orientation. There is evidence for central characteristics of entrepreneurial behaviour that apply across cultural contexts (Autio et al. 2013, p. 337). This provides an important precondition for studying cultural influences and hence informal institutional constraints on entrepreneurship (ibid). However, most research in terms of informal institutions and cultural influences on entrepreneurship focuses on their impact on nascent entrepreneurship, i.e. the entry rates of new firms and the decision of entrepreneurs to start a new business venture. The impact of culture and informal institutions on post-entry entrepreneurial decisions and firm performance has been largely ignored (ibid, p. 335). The following sections discuss the few cultural factors which have been found to have significant impact on the post-entry firm performance of technology based start-ups.

Uncertainty Avoidance & Fear of Failure

Establishing a new firm bears a great number of risks and uncertainties. The entrepreneur needs to invest resources and effort before the outcomes of his or her entrepreneurial decisions are known. He or she often needs to disrupt established and predictable ways of doing business in order to achieve firm growth. These ambiguous situations can be threatening to the individual who avoids uncertainty and seeks security. Uncertainty avoidance is a personal trait of individuals which is likely to be influenced by culture (Autio et al. 2013, p. 337). Thus uncertainty avoidance is also a cultural factor reflecting the level of tolerance for ambiguity within a society (Roxas & Chadee 2012, p. 328). Societies with high levels of uncertainty avoidance tend to have less entrepreneurial ventures compared to societies with low levels of uncertainty avoidance (ibid, pp. 338-339). Entrepreneurship and the pursuit of growth are likely to be seen as abnormal behaviour in high uncertainty avoidance societies (Autio et al. 2013, p. 341). As a consequence, entrepreneurs may be

prevented from taking the risks necessary to grow their business ventures. Establishing and growing their ventures also carry a higher social cost for the entrepreneur in high uncertainty avoidance societies, especially in the case of failure. As occupation is a visible characteristic that presents the individual in society, business failure shames the entrepreneur and can mean a loss of face (Begley & Tan 2001, pp. 538-539). The entrepreneur might lose social status and even have a sense of having let down the family and his or her supporters (ibid). While fear of failure can drive entrepreneurs to strive hard (ibid, p. 540), its effect of preventing entrepreneurs to try out new and untested business approaches and to exploit high growth opportunities is likely to be more dominant (Autio et al. 2013, p. 341). In regard to technology industries, the negative effects of uncertainty avoidance and fear of failure are likely to be even more significant. As discussed in the previous chapter on the industry-based view of the firm, technology industries are characterised by instability, rapid change, high risk and high growth. As a result, technology based start-ups of risk-adverse entrepreneurs who are afraid to fail are likely to experience less growth than those of risk tolerant entrepreneurs.

Performance Orientation

Entrepreneurship is also fundamentally ambitious and competitive behaviour. Entrepreneurs typically need to strive hard to create new products and services. As soon as they enter the market, they need to mobilise resources and overcome competition from established market players. These aspects resonate closely with the cultural concept of performance orientation (Autio et al. 2013, p. 337). Performance orientation reflects the extent to which a society values ambition, hard work and competition (Javidan 2004, p. 239). Performance oriented societies tend to demand high levels of competitiveness and high performance standards from firms and place major rewards on performance improvements (Autio et al. 2013, pp. 341-342; Roxas & Chadee 2012, pp. 326-327). As a result, entrepreneurs are encouraged (or pressured) to have ambitious goals and work hard to achieve them. What is more, performance oriented societies consider time non-renewable and subject to high depletion (Roxas & Chadee 2012, pp. 326-327). They thereby promote a strong sense of urgency in making decisions and meeting challenges which encourages entrepreneurs to aspire for rapid growth. This may have positive implications for the growth of technology based start-ups. As technology industries change rapidly and product life cycles are short, entrepreneurs need to work hard to keep up with changes and constantly develop new and better products and services. Rapid growth ambitions may also enable technology entrepreneurs to capture network effects.

Individualism and Collectivism

Entrepreneurship is considered fundamentally individual-level behaviour and therefore resonates closely with the individualism-collectivism dimension of culture (Autio et al. 2013, p. 337). Researchers have traditionally associated entrepreneurship with individualism arguing that individualistic societies have higher rates of firm creation than collectivist societies (Pinillos & Reyes 2011, p. 23). Collectivism involves the subordination of individual interests to the good of society and emphasises sharing, cooperation, solidarity and harmony within the society. Thus it is believed that entrepreneurship being individual-centred behaviour is not supported by collectivist societies and thereby the entrepreneurship rate is lower in collectivist societies. Recent studies indicate that the relationship between the individualism-collectivism dimension and a country's entrepreneurship rate depends on the country's stage of development (ibid). In fact, the entrepreneurship rate is negatively related to individualism in countries at medium or low levels of economic development (ibid). Thus individualism does not necessarily promote entrepreneurship. What is more, collectivism may even be positively related to firm performance (Autio et al. 2013, p. 357). Once entrepreneurs made the 'individualistic' decision to pursue their own business venture and entered the market, they generate benefits for the broader society, for instance by providing jobs. This creates legitimacy for entrepreneurs in society and encourages them to pursue firm growth (ibid, p. 340). Seeing that their venture's success and the benefit of the broader society are aligned may motivate entrepreneurs to work even harder to grow their ventures (ibid). In the case of technology based start-ups, benefits of the broader society that can legitimate entrepreneurs' growth aspirations do not only include the creation of jobs but also the development of new technologies and innovation.

Media Attention

Media attention is a cultural factor of different dimension compared to those discussed previously and an informal institution which can have significant impact on the performance of technology based start-ups. The media function as information intermediaries and affect what information becomes available and to what extent by selecting a small subset of issues, events, developments and organisations to focus public attention on (Petkova et al. 2013, p. 866). In regard to business ventures, the media represents a form of external relationship and has significant legitimating power (Tolbert et al. 2011, p. 1336). In fact, attracting attention is an important step in the legitimization process of start-ups (Petkova et al. 2013, p. 866). Customers, investors, suppliers and other stakeholders need to notice and recognise a new

business venture as a participant in the market in order to consider it as a potential transaction partner (ibid, p. 867). Since new firms and technology based start-ups in particular tend to be of small size and have limited resources, they can only reach a rather limited number of stakeholders and have difficulties in attracting broader market attention. Media institutions can help solve this problem by exposing new firms to a greater number of stakeholders. New firms gain legitimacy by displaying ties to established institutions in their environment and are therefore more likely to be seen as proper transaction partners by stakeholders (Tolbert et al. 2011, p. 1336). What is more, the media can also place constraints on certain behaviour and expose opportunism (Fogel et al. 2006, pp. 568-569). Uncensored, free media can expose misbehaviour of governments and firms and thereby create social transparency and reduce corruption (ibid). This creates a better political environment for entrepreneurs from which technology based start-ups are likely to benefit (ibid).

Summary

Besides formal institutions, North (1990) also describes informal institutions which place constraints on the behaviour of individuals and organisations. Unlike formal institutions, informal institutional constraints are oftentimes not readily identifiable because they are deeply embedded in society. A nation's culture has been found to embody informal institutional constraints. In regard to entrepreneurship, the informal institutional constraints most prominent in research are cultural factors such as uncertainty avoidance, fear of failure, performance orientation, individualism and collectivism (Salimath & Cullen 2010). High levels of uncertainty avoidance and fear of failure tend to restrict the creation of new businesses and the exploitation of growth opportunities and is thus assumed to have negative impact on firm performance of technology based start-ups in emerging economies. In contrast, performance orientation affects firm performance in a positive way as it spurs entrepreneurs to work hard. Even though collectivism is seen to discourage entrepreneurs from starting their own firm, it may have a positive influence on the post-entry performance of firms. Media attention is another important informal institutional constraint affecting firm performance, albeit in a different way. New firms can gain legitimacy by attracting media attention and benefit from social transparency stimulated by the media. Finally, informal institutions need to be seen together with formal institutions in order to explain firm performance and cross-national differences in entrepreneurship (Busenitz et al. 2000, p. 995). It is a broader set of institutions that guide and constraint business behaviour in emerging economies.

2.3. System Theory

This chapter discusses system theory and its relevance for management and entrepreneurship. System theory is the third main theoretical pillar of this thesis and forms the basis for the methodology of the empirical part. According to Heylighen and Joslyn (1992), system theory can be defined as “the transdisciplinary study of the abstract organization of phenomena, independent of their substance, type, or spatial or temporal scale of existence. It investigates both the principles common to all complex entities, and the (usually mathematical) models which can be used to describe them”. It was first proposed by biologist Ludwig von Bertalanffy in the 1940s and has since then been expanded to other disciplines (e.g. mathematics, computer science, sociology, etc.) and developed a number of different research streams. Chen and Stroup (1993, pp. 448-449) identified the following notions which lie at the core of system theory:

- A system is a combination of interacting parts while the sum of these parts exhibits special behaviour which is not inherent in its single, constituent parts. That is, “the whole is more than the sum of its parts” as Aristotle put it.
- A system can be physical, biological, social and/or symbolic.
- Change, such as growth or decay, is defined as the transformation of the system in time, though conserving the system’s identity.
- The changes observed in the system are characterised by goal directed behaviour. A system is actively organized in terms of its goal(s).
- The mechanism which mediates between the system and its goal(s) is feedback.
- Time is a central variable in system theory and adds dynamics to the system.
- A system may contain subsystems and/or be a part of a greater system itself. The boundary serves to delineate it from its environment and subsystems.
- A system interacts with its environment. These interactions can be defined as the input and output of material, information and energy. The system can be open, closed or semi-permeable to its environment.

Proposing a holistic view and emphasizing synthesis system theory stands in contrast to Descartes’ scientific reductionism. Instead of reducing an entity to the properties of its parts, system theory focuses on the relations between and the arrangement of the parts which create a whole. While reducing complex phenomena to elementary particles and processes is very helpful in understanding processes which can readily be broken down to simple causal chains, the description of multivariable systems can be problematic within this framework (Chen &

Stroup 1993, p. 449). For examining the influence of institutional factors on technology based start-ups in emerging markets, system theory is helpful as it allows the inclusion of several variables in consideration of time.

2.3.1. Cybernetics, Complexity and Management

Natural systems like cells, plants and humans are self-regulating. They possess control mechanisms which regulate their interactions and keep important variables (e.g. body temperature) within certain limits. Systems which are created by humans, such as machines, software programs, and firms, lack the ability to control and regulate themselves naturally. Consequently, control and regulation mechanism have to be found and included into these 'artificial' systems to guarantee their proper functioning. This is what the science of cybernetics is about: it examines the control, regulation and steering mechanism of systems (Malik 2013, p. 51). A system that can be controlled is called cybernetic. Cybernetics was first introduced by mathematician Norbert Wiener in 1948 and provides the foundation to understanding, explaining and using information (ibid). In cybernetics, information is considered to be one of three main parameters in the world, with material and energy being the other two (ibid). Material and energy forms the basis of the system while information organises, arranges and regulates material and energy (ibid). For example, humans are composed of the same materials as chimpanzees but the way these materials are organised in humans is different. This results in humans being different from chimpanzees. Thus it is the way systems are organised, regulated and controlled which contributes most to their characteristics and abilities (ibid, p. 52).

For systems which are not naturally self-regulating, this raises the question of how their materials and energy should be organised, regulated and controlled in order to function properly and to their fullest potential. How should the materials of a pair of scissors be arranged so that it fulfils its purpose of cutting paper when in use? How should an electronic calculator be programmed to produce correct results? How should a start-up design its processes in order to survive in tough market environments and provide the most value to its customers? Beer (1967, pp. 27-34) classifies systems according to their complexity and the probability of their behaviour. According to his classification, a pair of scissors is a simple and determinate system because it is easy to understand and its behaviour is easy to predict. In comparison, an electronic calculator is a more complex system but the number of possibilities of how it behaves to input is still determinate. This is different for start-ups. Firms are very complex and probabilistic systems (ibid, p. 33). Consequently, it is difficult to predict how the

system of a firm will react to certain events and in certain circumstances. The behaviour of very complex systems cannot be determined with certainty but only estimated with probabilities (ibid, pp. 27-28). As a result, the control of such systems becomes a great challenge. According to Malik (2013, p. 50) solving this challenge is what management does in firms. Management is the ability to control complex systems (e.g. a start-up), steer it into a certain direction and influence its behaviour in a way that goals are met (ibid). Control in systems theory and cybernetics is not understood as force, coercion and authority but as regulation, adjustment and guidance.

The Viable Systems Model

The ability to control a firm depends on the firm's organisational structure (Malik 2013, p. 3). With the viable system model, Beer (1984) developed a generic model of a firm's organisational structure that is based on system theory. Inherent control mechanisms in the viable system model replace strict hierarchies and ensure the firm's capacity to respond to familiar events (e.g. customer orders) and unexpected events (e.g. sudden changes in demand) (Espejo & Reyes 2011, p. 92). The latter capacity is the hallmark of the viable system as it makes it more adaptive to changes in the environment and ensures the viability of the firm. The viable system model views the firm as two main parts: the primary activities which focus on operation (production, distribution) and the regulatory, supportive functions which give cohesion and adaptability to the primary activities (e.g. personnel, finance, marketing, etc.) (ibid, p. 97). Both parts interact continuously with the environment.

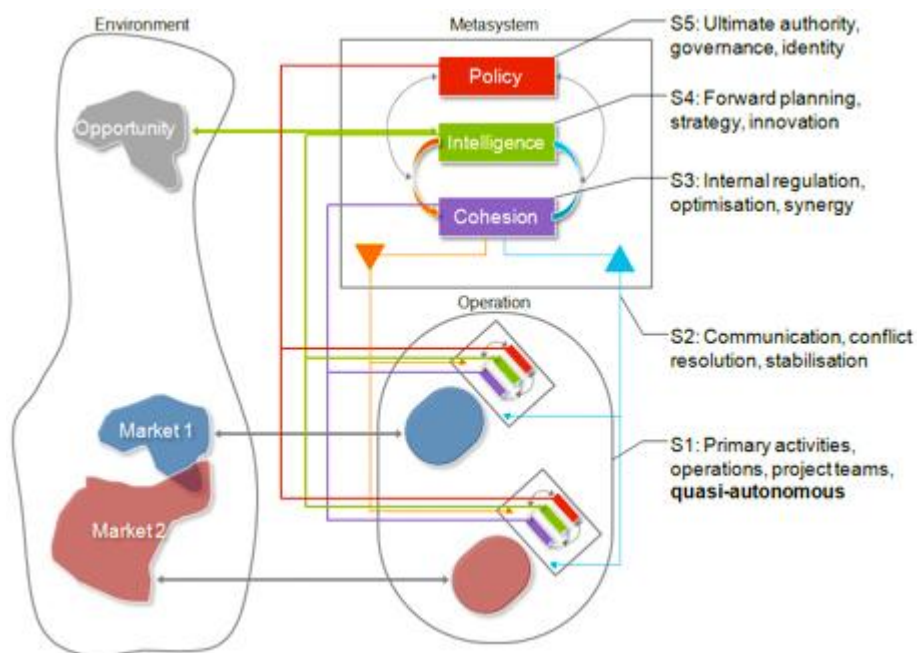


Figure 2: The viable system model (Essman 2010)

Part one (operational units) also corresponds to **system 1** (S1) whose elements are themselves small viable systems (Beer 1984, p. 14). Part two consists of the following systems which are designed to create balance between the environment and system 1 (Walker 2006):

- **System 2** (S2) is charged with the coordination between operational units (systems 1), similar to an air traffic controller coordinating departing and arriving planes at an airport.
- **System 3** (S3) creates cohesion and has to do with management processes which build the primary activities into a greater whole, e.g. financial control, personnel. It provides resources to and oversees the operational units.
- **System 4** (S4) is responsible for future planning in the context of the environment. It ensures the firm's ability to change by looking outside the organisation and into the future. Disciplines are for example financial planning, training, product development.
- **System 5** (S5) is the ultimate authority, the top management, and oversees the entire organisation.

The original version of the viable systems model by Beer (1984) has served as the basis for similar models in research and practice (the St. Gallener Management Model being one important example) most of which focus on large organisations. Since small firms such as technology based start-ups tend to be less complex than large firms and have innately flat hierarchies, all functions (systems) might be done by one person or shared between managers and employees. However, they too are required to create value for their customers and react quickly to feedback from their environment if they are to remain viable. A study by Sommer et al. (2009, p. 119) shows that start-ups are best advised to pursue trial-and-error learning if their environment is highly uncertain. Trial-and-error learning is based on recognising and interpreting feedback and adjusting activities and targets according to information from feedback (ibid). The concept of feedback is essential in system thinking and in methods based on system theory. The following section discusses one of these methods, system dynamics, which is used by researchers and businesses to understand and interpret feedback relationships in their organisation and environment.

2.3.2. System Dynamics

System dynamics is a methodology based on system theory and allows studying systems of complex nature such as organisations operating in a specific environment. It was first proposed by Jay Forrester in the 1950s as an alternative to linear and static methods used in social science (Bloodgood et al. 2015, p. 4). It is fundamentally interdisciplinary and draws on

the theory of non-linear dynamics and feedback control which were developed in mathematics, physics and engineering (Sterman 2001, pp. 9-10). Because of its application to the behaviour of social systems, it also integrates approaches from cognitive and social psychology, organisation theory, economics, and other social sciences (ibid). Organisations such as firms are susceptible to be studied with system dynamics. By interacting with one another, the agents of organisations and their environment create feedback which can generate non-linear effects through time (ibid, p. 11). This leads to dynamics complexities that are seemingly counterintuitive and difficult to capture with traditional static and linear methodologies in social science (ibid). System dynamics integrates the concepts of feedback, time delays, stocks and flows and thereby facilitates the study of dynamic complexities.

Feedback

Feedback models are an alternative to event-oriented, reactionary approaches to problem solving. Systems react to interventions and agents take actions that will define the situation of tomorrow (Sterman 2001, p. 12). Interventions may also trigger delayed reactions and unanticipated side effects. Cause-and-effect models cannot consider these issues. Feedback is not only central to system dynamics but it is also a “primary mechanism of organizational learning” (Blettner et al. 2015, p. 3). The feedback agents (e.g. organisations) receive leads to learning which affect future decisions (Bloodgood et al. 2015, p. 6).

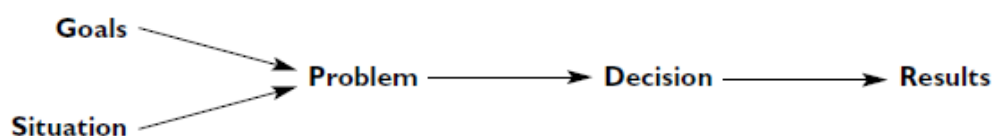


Figure 3: Event-oriented view of the world (Sterman 2001, p. 13)

Time Delays

In simple system, cause and effect are closely related in time and space. However, in complex systems, time delays between taking a decision and its effects on the system are common (Forrester 1996, p. 10). Effects can also occur in different parts of the system (ibid). Delays in feedback create instability and increase the tendency of the system to oscillate (Sterman 2001, p. 13). Agents responsible for decision making often continue to intervene to correct discrepancies in the system even though sufficient corrective actions have already been taken (ibid). System dynamics includes time delays to better reflect the nature of complex systems and predict their behaviour.

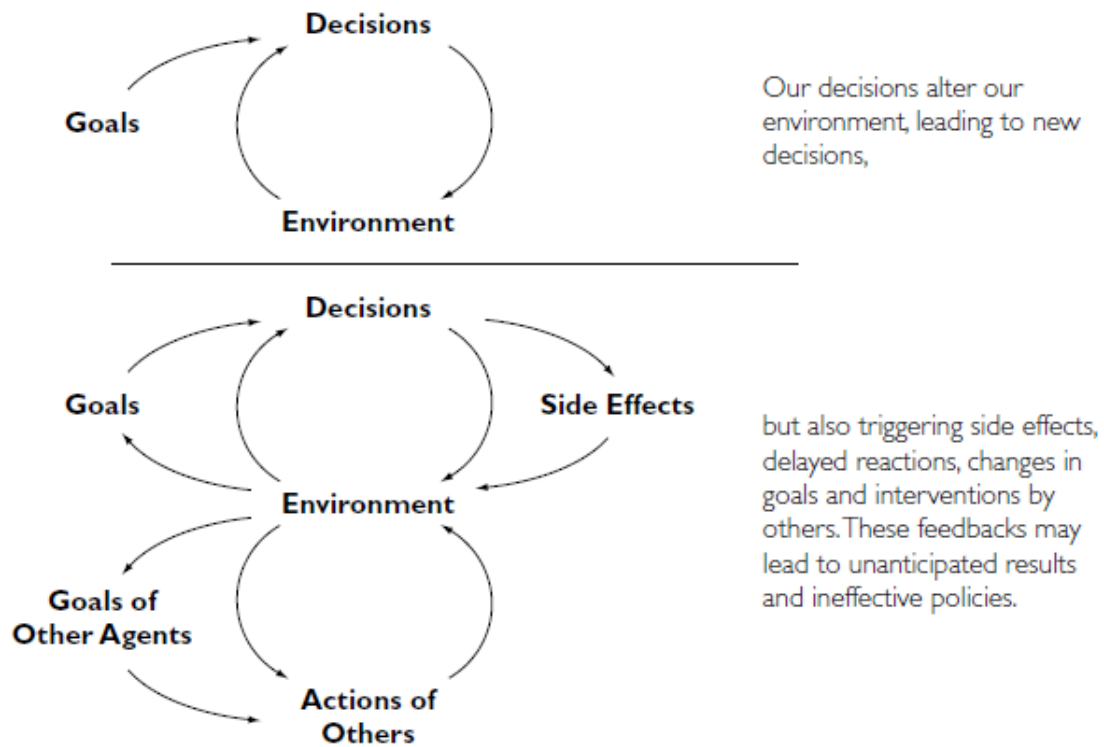


Figure 4: The feedback view of the world (Sterman 2001, p. 14)

Stocks and Flows

Stocks and flows are another central concept in system dynamics and prevalent in complex systems (Sterman 2001, p. 14). A stock is an entity that increases or decreases over time and a flow is the rate at which a stock changes. For example, the inventory of a company represents a stock that is influenced by the company's production (rate of accumulation) and shipments (rate of depletion). The concept of stocks and flows is not limited to tangible resources. Intangible resources such as employee skills, customer loyalty, etc. can be represented as stocks, too (ibid).

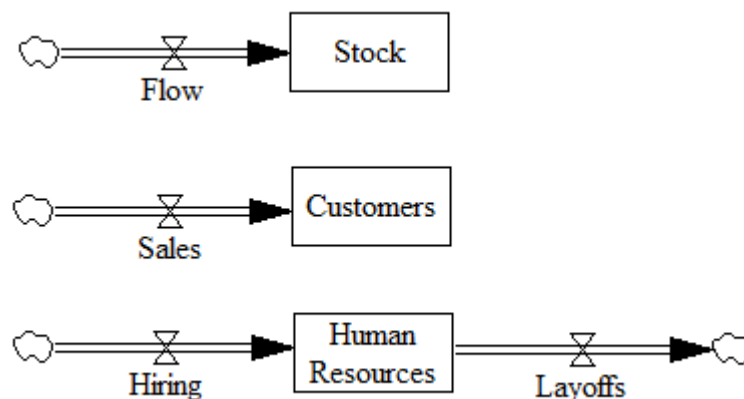


Figure 5: Stocks and flows

Technology based start-ups in emerging economies are part of complex systems whose behaviour is highly dynamic. As discussed previously, the information technology industry has high degrees of change and instability which increases dynamic complexities in the system. In addition, emerging economies are likely to be more complex compared to developed economies. Emerging economies rely more heavily on informal institutions because their formal institutions are often weak and unstable. In contrast, in developed economies, formal institutions are generally stable and well developed. Rules, laws and regulations tend to be unambiguous. As a result, agents within the system may be able to assess the consequences of their decisions better in developed than in emerging economies. Furthermore, feedback, time delays, stocks and flows are prevalent in these systems. System dynamics allows capturing these concepts and is thereby a useful method to study technology based start-ups in emerging economies.

Summary

This section introduced system theory and the concepts of complexity, cybernetics and system dynamics. Understanding the main concepts of system theory and in particular system dynamics is crucial for developing the start-up model in chapter 3 and analysing its results (chapter 4). From a system theory perspective, a technology based start-up is considered a social system that is part of larger systems (the information technology industry, the business sector, the economy, etc.) and constantly interacts with its environment. It is not self-regulating but cybernetic (controllable). Control is exerted by the management (e.g. the founders) that defines targets and organises activities. The pool of possible decisions that the management can make is defined by the interplay of the start-up's resources and capabilities, the characteristics of its industry and its institutional environment. The following section develops a model that simulates this situation. The model simulates a generic technology based start-up that is influenced by industry specific variables and institutional factors.

3. The Start-Up Model

The theoretical framework developed in the previous chapter provides the *theoretical* basis for the creation of the system dynamics model. The strategy tripod explained the three main perspectives on a start-up operating in the information technology business: the start-up business with its resources, capabilities and organisational structure, the start-up's industry and its institutional environment. The latter pillar, the start-up's institutional environment, was described in greater detail by institutional theory as it is the main topic of this thesis. System theory was discussed to connect the three perspectives and introduce the method used to develop the start-up model in this chapter.

The *practical* basis for the creation of the model is the work of Hsueh (2011), Miller (2007) and in particular Saad (2013). They developed similar system dynamics models from which this thesis draws a number of insights. The system dynamics model is built using Vensim, a software program that allows developing and simulating system dynamics models. The model's variables are represented by stocks, flows, auxiliaries and exogenous constants. Consequently, behind every variable is either a function (e.g. an integral, linear function, etc.) or a constant number. Variables are connected to each other allowing the simulation of complex relationships, feedback and time delays. The model simulates the first sixty months of the start-up's operation which allows observing significant changes in key variables and performance indicators (e.g. revenues, net profit, human resources, etc.). The model is split into two parts, the basic model and institutional factors, which are both discussed in the following sections.

3.1. The Basic Model

The basic model simulates the basic structure of a technology based start-up and does not take into account institutional factors. It incorporates theoretical insights from the resource-based and industry-based view of the firm as well as from system theory (e.g. the viable systems model). It represents a generic start-up which could operate in any country (as institutional factors are still left out in the basic model). The generic start-up is assumed to have already identified a potentially profitable business opportunity and found at least one customer. This assumption is important as it allows omitting discussions about personal traits and abilities that enable entrepreneurs to identify business opportunities. Furthermore, the start-up is assumed to operate under a legal form as it pursues a high growth strategy and a rapid expansion of its customer base and plans to obtain external funding.

The theoretical foundation of the model's organisational structure is the e-business model by Osterwalder and Pigneur (2004) which was discussed in chapter 2.1.1 of this thesis. The model is divided into four main blocks which correspond to the four blocks of the e-business model. Each block consists of one main stock and a number of endogenous and exogenous variables. The values of the exogenous variables are taken from Hsueh (2011), Miller (2007) and in particular Saad (2013). The following sections discuss the most important variables in the basic model. For a complete mathematical description of each variable, please see the model documentation in the appendix.

3.1.1. Product Innovation and Value Proposition

This block refers to the products a firm has to offer and the value it provides to customers (Osterwalder & Pigneur 2004, pp. 71-72). In addition, it describes how the firm differentiates itself from competitors (ibid). In the system dynamics model, this translates to the following structure:

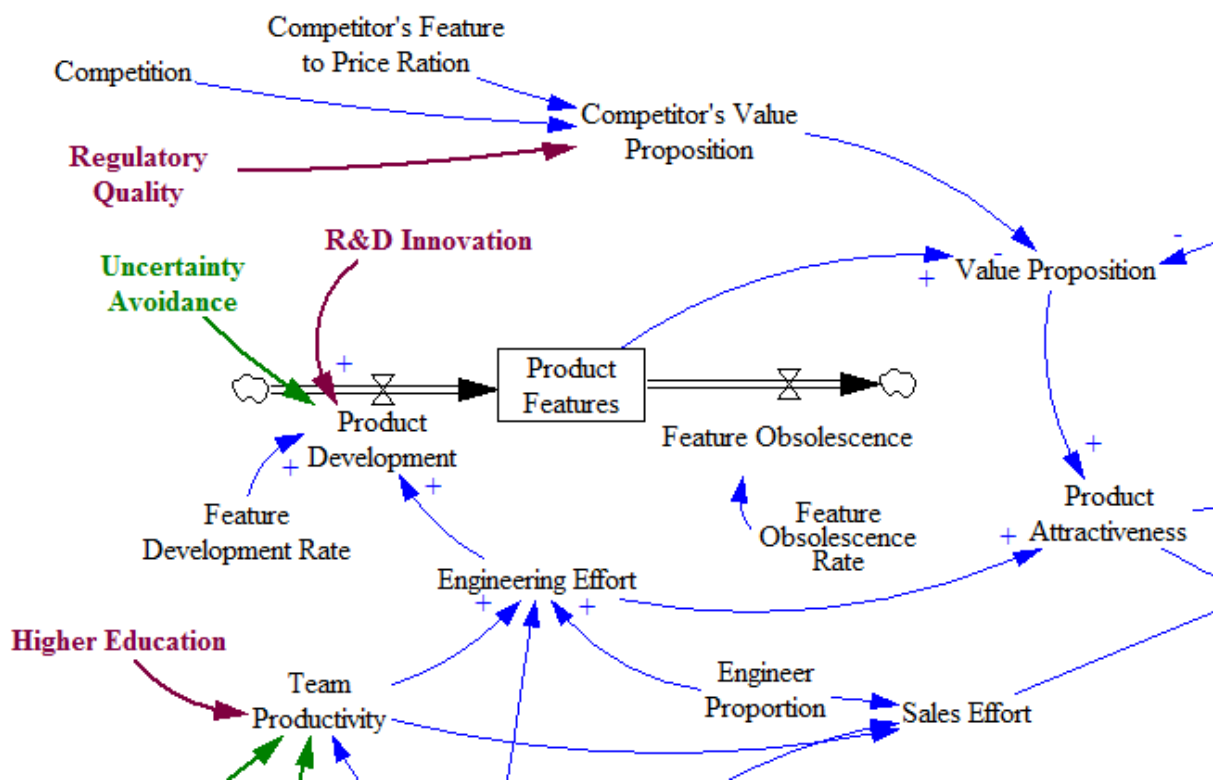


Figure 6: The product innovation and value proposition block

- *Product Features*

Product features is the stock of the product innovation and value proposition area and the most important variable in this area. The start-up is a business like every other firm and therefore has to sell a product and/or a service in order to generate profit. It is assumed to

have one product (e.g. a software program) which can have certain product features. The more features a product has, the more sophisticated it is and the more value it provides to customers. Consequently, the start-up's objective should be the constant development of new product features. The number of product features is increased when new features are developed (represented by *Product Development*) and decreased when features become obsolete (*Feature Obsolescence*) (Hsueh 2011, p. 53; Miller 2007, pp. 89-97; Saad 2013, p. 34). The initial number of product features is one, i.e. the start-up already has a product with one product feature at the start of the simulation in month zero. The maximum number of product features is 100.

- *Product Development*

Product development is a rate which increases the stock of product features and one of the most important variables in the product area of the model. It is measured in features per month and determined by the variables *Feature Development Rate*, *R&D Innovation* (Saad 2013, p. 42) and *Engineering Effort* (Miller 2007, p. 102). The feature development rate indicates the number of new features which can theoretically be developed in a certain time frame. It is assumed that one new feature can be developed every eight months. However, the final rate is influenced by the engineering effort and the institutional factor R&D innovation.

- *Engineering Effort*

This variable refers to the amount of engineering work which goes into the development of new product features (Miller 2007, pp. 102/225; Saad 2013, p. 55). It is measured in hours per month and influenced by the stock of *Human Resources* (i.e. the number of people working in the start-up), *Engineer Proportion* (i.e. the share of engineers in relation total human resources) and *Team Productivity*. A higher number of human resources, engineer proportion and team productivity increase the engineering effort and, as a result, may even increase product development. However, if engineer proportion is high, *Sales Effort* decreases as less staff is available for selling the product. Consequently, a start-up that employs only engineers will have a very sophisticated product (i.e. a product with many features) but few sales due to the lack of sales personnel.

- *Feature Obsolescence*

Product features phase out over time which is simulated by the feature obsolescence rate (Hsueh 2011, p. 53; Miller 2007, pp. 89-97; Saad 2013, p. 34). Feature obsolescence

represents the short life cycles common in the information technology industry and thus refers to the industry-based view of the firm discussed in the theoretical framework. It is assumed that the theoretical feature obsolescence rate is equal to the initial product development rate which is set at one feature every eight months. In other words, every eight months, one product feature becomes obsolete and reduces the stock of product features.

- *Value Proposition*

The start-up's value proposition indicates the value customers receive in relation to the number of product features, the value proposition of competing firms and the price they pay for the product (Saad 2013, p. 42). The higher the number of offered product features, the higher the value proposition. The *Competitor's Value Proposition* as well as *Pricing* are negatively related to the start-up's value proposition. This means that an increase in the competitor's value proposition reduces the start-up's value proposition. The same is true for pricing: the higher the product's price, the lower the value proposition as price sensitive customers will be discouraged from purchasing the product.

- *Competitor's Value Proposition*

This variable represents the aspect of competition of the industry-based view of the firm in the system dynamics model. It simulates the intense level of competition and the low barriers of entry within the information technology industry. The competitor's value proposition (Saad 2013, p. 74) describes the value customers get when purchasing the competitor's product. It is influenced by *Competition* (the level of competition within the industry) (ibid, p. 42), *Regulatory Quality* (an institutional factor), and the *Competitor's Feature to Price Ratio* (ibid, pp. 42/74) which represents the pricing of the competitor's product. The level of competition is assumed to be high, i.e. on a scale between 0 and 10, it is assumed to be at 8 (ibid, p. 74).

3.1.2. Customer Relationship

This area describes the customers that the start-up targets with its product offering and value proposition and the relationship it wants to establish with them (Osterwalder & Pigneur 2004, pp. 74-78). In the system dynamics model, the start-up is assumed to focus on acquiring new customers and give less attention to add-on selling and customer retention. The customer segment the start-up wants to sell to is described as market size in the model. The overall structure of the customer relationship area looks as follows:

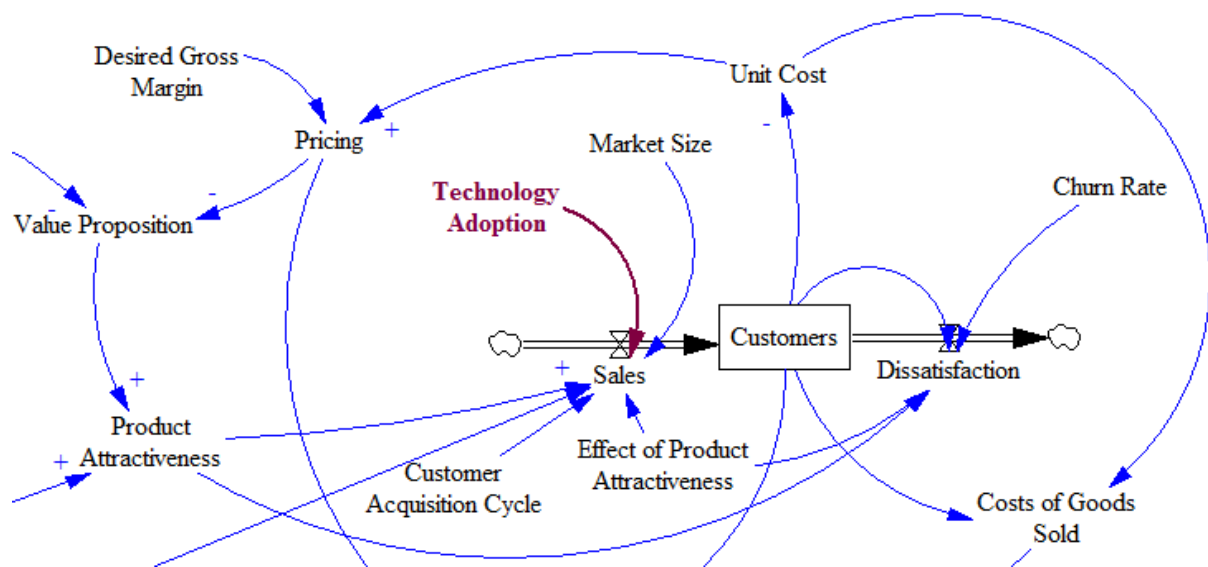


Figure 7: The customer relationship block

- *Customers*

Customers is the stock of the customer relationship area and refers to the number of customers the start-up serves during the simulation period. It is the most important variable in the customer relationship area since no business can survive without customers. The customer stock increases when the start-up sells a product to a new customer. This is simulated by the rate of *Sales* (Hsueh 2011, p. 53). The customer stock can also decrease. This is the case when customers are dissatisfied with the product and indicated by the rate of *Dissatisfaction* in the system dynamics model (Saad 2013, p. 42). The initial value of the customer stock is one. In other words, the start-up is assumed to already have one customer at the beginning of the simulation period (month zero). In addition, the customer stock affects the unit cost of the product. The higher the number of customers, the lower the unit cost of the product is going to be as costs decrease with every new customer.

- *Sales*

Sales indicates the rate at which the start-up gains new customers per month. It is determined by the *Customer Acquisition Cycle* (Saad 2013, p. 42), *Sales Effort* (Hsueh 2011, p. 53), *Product Attractiveness* (ibid), *Market Size* (Saad 2013, p. 42) and the institutional factor *Technology Adoption* (ibid). The customer acquisition cycle is an indicator for the amount of time it takes to attract one customer. In the system dynamics model, it is assumed to take twenty hours of sales effort to attract one customer (ibid, p. 75). Sales effort is the counterpart to engineering effort in the customer relationship area. It indicates how many working hours

go into actively selling the product and is affected by team productivity and engineer proportion (Hsueh 2011, p. 53).

- *Product Attractiveness*

In addition to the effect of customer acquisition cycle and sales effort, the sales rate is also influenced by product attractiveness. The more attractive the product is to customers, the easier it is for the start-up to sell it and increase its customer stock. Product attractiveness is determined by the value proposition and engineering effort. Engineering effort does not only make the product more sophisticated but it also shows the start-up's expertise towards customers. Thus, if the start-up increases its engineering effort, the product will be more sophisticated and more attractive to customers. Similarly, a high value position increases product attractiveness. The more value (potential) customers get for the money they pay, the more attractive the product is going to be.

- *Market Size*

Market size is a constant in the system dynamics model and refers to the number of potential customers in the market that the start-up chose to operate in (Saad 2013, p. 41). As Osterwalder and Pigneur (2004, pp. 74-78) state in the customer relationship block of their e-business model, it is important for the firm to define its target market and perform customer segmentation. The firm will be able to better estimate the number and characteristics of potential customers and use this information as a base for budget planning and marketing activities. In the system dynamics model, target customers are assumed to be individuals (as opposed to firms). Market size is usually determined by the national population and would be different for China and Indonesia since China's population is significantly larger than Indonesia's population. However, this model assumes the same market size for both countries in order to isolate the effect of the institutional environment on the start-up. Further research and modelling would need to differentiate between the information technology market in China and in Indonesia and include the differences (such as market size) in the simulation.

- *Dissatisfaction*

Dissatisfaction is the rate that reduces the stock of customers. It is negatively related to product attractiveness (Saad 2013, p. 42). Consequently, if product attractiveness is high, dissatisfaction will be low as the product is generally viewed desirable and customers are satisfied. Dissatisfaction is also affected by the *Churn Rate* (ibid, p. 74). It describes the rate

of losing customers due to bad performance of the product (e.g. defects, delays in fulfilment, etc.) and competitor's products (ibid). It is assumed that ten percent of customers are lost each month (ibid).

3.1.3. Infrastructure Management

Infrastructure management describes *how* the firm creates value and manages its customer relationships (Osterwalder & Pigneur 2004, p. 82). In the case of a technology based start-up operating in the information technology industry, the most important factor in value creation is human capital. The start-up's employees and managers combine their knowledge, skills and expertise to create competitive products. The start-up's human resources are affected by several variables which are also included in the system dynamics model. The following picture provides an overview of the infrastructure management block represented by human resources in the case of a technology based start-up:

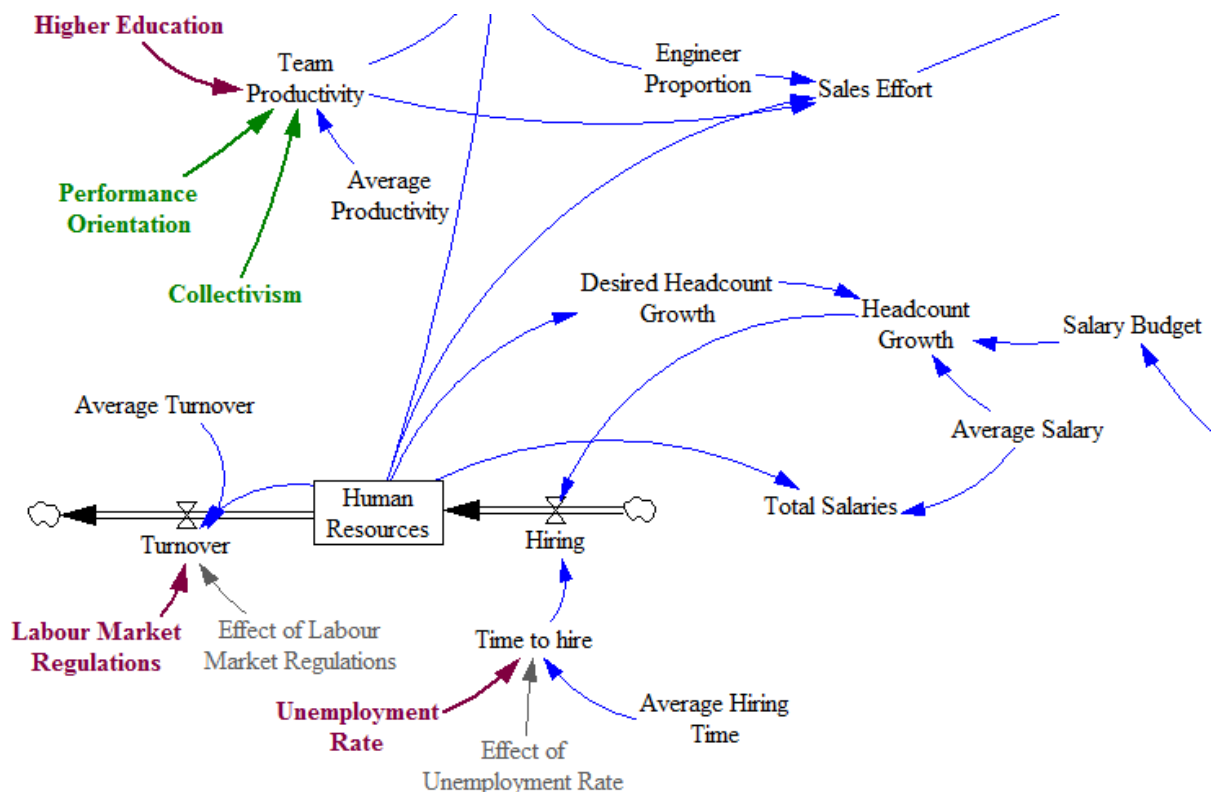


Figure 8: The infrastructure management block

- *Human Resources*

Human resources is the stock in the infrastructure management block and its most important variable. It represents the number of people actively working in the start-up (e.g. founders,

managers, employees). Human resources are increased by the *Hiring* rate and decreased by the *Turnover* rate (Hsueh 2011, p. 53). The initial value of the human resources stock at the start of the simulation period (month zero) is set at one. In other words, the start-up starts its official operation with one staff (the founder).

- *Hiring*

The human resources stock is increased by the hiring rate. The hiring rate is measured in person per month and determined by two variables: *Time to Hire* and *Headcount Growth* (Hsueh 2011, p. 53). The time to hire measures the time it takes to find and employ new staff. It depends on the *Average Hiring Time* which is assumed to be two months (Saad 2013, p. 73) and the *Unemployment Rate* (an institutional factor). Headcount growth indicates the number of new employees the start-up can afford and wants to hire (Hsueh 2011, p. 53). It depends on the *Salary Budget*, the *Average Salary* per employee and the *Desired Headcount Growth* (Saad 2013, pp. 42/73/75). The desired headcount growth is assumed to be twenty percent of current human resources stock every six months until the end of the simulation period (ibid, p. 75). In other words, the start-up plans to increase its human resources stock by twenty percent every six months. However, the final headcount growth also depends on the financial resources (i.e. salary budget) available to hire new staff.

- *Team Productivity*

Team productivity indicates how efficient the start-up team does its work. It is measured in hours per month and person and based on the *Average Productivity* variable with a value of 140 hours per month per person (Saad 2013, pp. 42, 73). Each employee is theoretically expected to work 50 hours per week at a productivity level of 70 percent (ibid). In the model, productivity levels do not only depend on the theoretical average productivity but also on institutional factors. First, productivity is affected by *Higher Education*. The more educated a person, the more efficient he/she is expected to work as he/she possesses a high level of knowledge and expertise and is a fast learner. A high value of higher education therefore increases team productivity. Second, performance oriented employees tend to work harder which is represented in the *Performance Orientation* variable. Third, higher levels of *Collectivism* increase team productivity as well. These three institutional factors are rescaled and weighted so that they have equal influence on team productivity. Chapter 3.2 provides a more thorough description of these three institutional factors.

- *Turnover*

Turnover refers to the fact that employees can leave the start-up or be dismissed. It is simulated by a rate which directly affects the human resources stock. Consequently, when turnover is higher than the hiring rate, the human resources stock decreases. The turnover rate is influenced by *Average Turnover* and *Labour Market Regulations* (an institutional factor) (Saad 2013, p. 42). Average turnover is assumed to be five percent every six months (ibid, p. 73).

3.1.4. Financial Aspects

The financial aspects block describes how the start-up generates profits through the former three blocks. It takes into account the start-up's revenue flow, pricing mechanisms and costs (Osterwalder & Pigneur 2004, pp. 66/70). The start-up is assumed to sell one product for a onetime cost to customers. It does not have recurring revenues as would be the case in transaction based or subscription models. The costs of R&D are not explicitly disclosed in the system dynamics model but included in salary costs. All financial variables are indicated in US dollars. The following structure represents the financial aspects block of the system dynamics model:

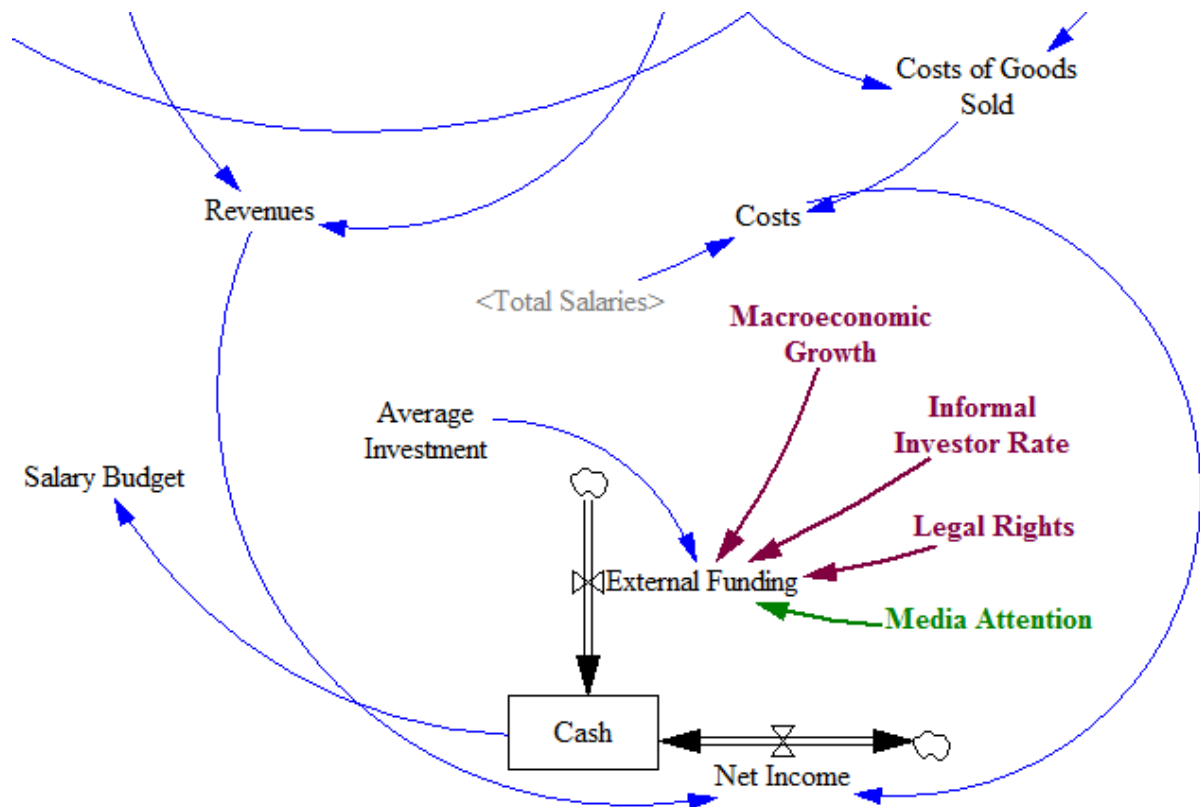


Figure 9: The financial aspects block

- *Cash*

Cash is the stock of the financial aspects block. It is determined by *Net Income* (Hsueh 2011, p. 53) and *External Funding* (Saad 2013, p. 42). The availability of cash is crucial for the start-up's survival and growth. The initial value of the cash stock is assumed at US\$20,000 which are provided by the founder. The initial cash is used to pay for product costs and salaries in case the start-up is not yet generating positive cash flow (e.g. in the first months of operation) or incurs financial difficulties during the simulation period.

- *Net Income*

The net income rate directly affects the cash stock. It is determined by *Revenues* minus *Costs* and can there increase (revenues > costs) or decrease (revenues < costs) the cash stock (Hsueh 2011, p. 53). Revenues are calculated by multiplying *Pricing* with the number of customers while costs consist of *Total Salaries* and *Costs of Goods Sold* (ibid). As a result, net income may only be improved by increasing revenues (e.g. raising the desired gross margin) or decreasing costs. Since human capital is the start-up's major resource and unit costs of information technology products tend to be low, costs can be cut by lowering salaries or employing less staff.

- *Pricing*

Pricing refers to the amount of money customers pay when purchasing the product. It is determined by the cost per one unit of product, the gross margin the start-up adds to the unit cost and competition (Saad 2013, p. 42). The *Unit Cost* and *Desired Gross Margin* both increase pricing. Desired gross margin is assumed to be at 70 percent. As discussed in the industry-based view of the firm, product margins in the information technology industry tend to be high since variable costs are comparatively low. The unit cost therefore depends on the number of customers. If customers are numerous, the unit cost decreases.

- *External Funding*

External funding indicates a rate which can increase (but not decrease) the cash stock (Hsueh 2011, p. 53; Saad 2013, p. 42). It includes all kinds of funds that the start-up obtains from external sources, e.g. bank loans, venture capital, donations, etc. External funding is largely determined by institutional factors. These are the *Macroeconomic Environment*, *Informal Investor Rate*, *Legal System* and *Media Attention* (see the next section for a detailed

discussion). In addition, *Average Investment* (Saad 2013, p. 73) estimates the average sum start-ups generally obtain from outside investors. It is assumed at US\$ 10,000 per month. Depending on the institutional factors mentioned previously, the final sum of external funding may be higher or lower.

Summary

This section described the basic system dynamics model with its internal (resource-based) and industry-based variables. Its structure is based on the four blocks of Osterwalder and Pigneur's (2004) e-business model and its variables are largely derived from the works of Miller (2007), Hsueh (2011) and Saad (2013). Insights from the industry-based view of the firm have been included in the model as well. For example, short product (feature) life cycles, high levels of competition, high fixed costs and low variable costs are either represented by single variables (e.g. *Competition*) or have been integrated in other variables of the model (e.g. *Product Development*). However, some characteristics of the information technology industry such as switching costs and network effects have not been directly addressed in the model. This is due to the fact that, as stated previously, the creation of switching costs and network effects is comparatively difficult and unlikely for start-ups with limited financial resources. In addition, an inclusion of these characteristics would significantly reduce the model's simplicity and therefore make it more difficult to understand and control.

Many variables in the basic model are dependent and hence will change when the exogenous constants are altered to simulate different conditions. They are affected not only by other internal variables but also by institutional factors. The following section describes how these institutional factors are included in the model. The model is then applied to a fictitious start-up in China and Indonesia.

3.2. Institutional Factors

The theoretical foundation for the inclusion of institutional factors in the system dynamics model is North's (1990) institutional theory as discussed in a previous chapter. The institutional factors included in the model are grouped into formal and informal institutions according to North's (1990) definition. Saad (2013) provides practical insights to selecting variables and determining their values for the system dynamics model. All institutional factors in the model are exogenous variables and remain constant during the simulation period. Their values are taken from databases of international organisations such as the World Bank, organisations affiliated with the World Bank, the United Nations Organization, the Global

Entrepreneurship Monitor (GEM) and from the GLOBE study (Gelfand et al. 2004; Javidan 2004; Sully de Luque & Javidan 2004). Even though the use of primary data would be preferred, it is beyond the scope of this thesis to collect and evaluate primary data on the institutional environment in China and Indonesia. Consequently, the institutional factors in the system dynamics model of a start-up are based on secondary data by international organisations and studies. The use of international databases ensures the data's comparability. National databases may use different calculation methods and define indicators differently which can limit the validity of cross-national comparisons. The following pages describe the variables and their values for the two countries of this thesis' comparison – China and Indonesia.

3.2.1. Formal Institutions

Formal institutions describe the regulatory dimension of a country's institutional environment. They include, for example, laws, rules, regulations and government policies and provide a formal framework for the start-up's operation. They may affect the start-up in a direct (e.g. labour laws) and indirect way (e.g. education policies). Following the suggestion of Busenitz et al. (2000, p. 1001), some institutional factors are coupled in the system dynamics model and combined into one variable. This does not only keep the model simple but also allows gaining a more thorough understanding of the start-up's institutional environment as a greater number of indicators can be included in the model.

- *Regulatory Quality*

The first institutional variable which is based on several indicators is regulatory quality. Regulatory quality is calculated by the Worldwide Governance Indicators (WGI) project group which is affiliated with the World Bank. It is defined as an indicator “capturing perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development” (Kaufman et al. 2014a). Among the factors which constitute the regulatory quality indicator are for example: price controls, discriminatory taxes, burden of government regulations, ease of starting a business, effectiveness of anti-trust policy, government subsidies of commodity prices, entry barriers related to administration (e.g. red tape), entry barriers related to already established competitors, etc. (ibid). Thus, the regulatory quality indicator does not only represent burdensome regulations and bureaucracy but also describes if the government has an invisible hand, a helping hand or a grabbing hand. In addition, it indicates if the presence of large business groups hinders firms from entering and operating in the market. A drawback of using

this indicator in the system dynamics model is the impossibility to distinguish between the effects of the above mentioned factors. For example, government subsidies of commodity prices might have a minor impact on the success of a technology based start-up while red tape might affect the start-up's performance significantly. The regulatory quality variable does not take into account such differences. Further research and modelling could reduce this drawback by including separate variables for regulatory quality related factors.

In the system dynamics model, regulatory quality is represented by a constant variable which affects the start-up and its competition. If regulatory quality is high, the power of competition is reduced. There will not be one single powerful competitor or an oligopoly of companies that claim the market for themselves and/or are favoured by or affiliated with the government. The start-up will face equal market conditions and regulations as its competitors. If regulatory quality is low, the market is not free and assumed to be controlled by the government and/or powerful business groups. This limits the start-up's chances of success. A country has perfect regulatory quality if the indicator is at 100 percent. In the case of China, the value of regulatory quality is at 42.6 percent in the year 2013 (latest available data) (Kaufman et al. 2014b). For Indonesia, it is at 46.4 percent in 2013 (ibid). These values are slightly below the average (47 percent in 2013) in East Asia and Pacific and about forty points below the average of OECD countries (88 percent in 2013) (ibid).

- *Legal Rights*

In high technology industries such as the information technology industry, the existence and protection of legal rights are considered an important factor that provides stability in a highly dynamic and rapidly changing environment (Clarysse et al. 2011, p. 140). Besides property rights which are included in the *Regulatory Quality* variable, investor and creditor rights are of great importance for a technology based start-up, too. They are crucial for a proper functioning of financial markets from which the start-up can obtain external funds to grow its business.

In the system dynamics model, the legal rights variable is based on the strength of legal rights index by the World Bank Group (World Bank Group 2015a). The strength of legal rights index "measures the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders and thus facilitate lending" (ibid). It combines the degree of efficacy of a country's legal system with information on the country's financial markets. As a result, it describes not only the country's legal but also financial institutions. It is measured on a scale from zero (lowest possible rank) to twelve (highest possible rank) (ibid). Both China and

Indonesia achieved a value of 4 in the year 2014 (World Bank Group 2015b; World Bank Group 2015c). The average value in East Asia and Pacific as well as of OECD countries was 6 in the same year (World Bank Group 2015d). The values of the year 2014 have been chosen over those of 2013 because the strength of legal rights index has been redefined to include more data and information from 2014 (World Bank Group 2015a). Furthermore, for the years prior to 2014 data is only available for the cities of Shanghai and Jakarta but not on national level (World Bank Group 2015b; World Bank Group 2015c). In the system dynamics model, the values of the strength of legal rights index for China and Indonesia are rescaled and expressed in percentage points. They are represented in the legal rights variable which affects the rate of *External Funding* together with *Average Investment*, *Macroeconomic Environment*, *Informal Investor Rate*, *Social Capital* and *Media Attention*. If the number of the legal rights variable is high, ceteris paribus, external funding will increase as lending is facilitated and the start-up is more likely to obtain external funds from investors (e.g. banks, venture capitalists, etc.).

- *Macroeconomic Growth*

Start-ups are part of an economic system and therefore exposed to economic cycles and changes in the market. For example, the survival ability of firms, in particular of small firms such as start-ups decreases during recessions. It even decreases during times of positive but low macroeconomic growth (Box 2008, p. 390). In the system dynamics model, the variable representing the start-up's macroeconomic environment (Saad 2013, p. 40) is annual GDP growth. Annual GDP growth is a general economic indicator that captures the overall economic atmosphere in the country. A limitation of using annual GDP growth to describe the macroeconomic environment is the fact that not all economic sectors and industries grow equally. The information technology industry might grow faster (or slower) than other industries and its annual growth rate might be higher (or lower) than the country's average annual GDP growth rate. However, some characteristics of the information technology industry are included in variables of the basic model (e.g. *Customer Acquisition Cycle*, *Competition*, etc.) which can capture industry specific scenarios. Macroeconomic growth as represented by annual GDP growth rate affects the rate of *External Funding* in the model. High GDP growth indicates a growing economic environment in which investors are optimistic and looking for riskier investment options and are therefore more likely to invest in technology based start-ups.

The data used in the system dynamics model for the macroeconomic growth variables of China and Indonesia is GDP growth (in percent) as calculated by the World Bank. The World Bank defines GDP as “the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products” (The World Bank 2015c). The annual percentage growth rate of GDP indicates the change of GDP compared to the previous year and is based on constant local currency (ibid). In 2013, China had a GDP growth rate of 7.7 percent while Indonesia’s economy grew by 5.8 percent (The World Bank 2015c). It is unlikely that China and Indonesia will sustain the same growth rates over the next five years (simulation period of the model). For example, China’s annual GDP growth rate slowed down to 7.4 percent in 2014 and is expected to decrease even more in 2015 (Yao & Sweeney 2015). Macroeconomic growth as represented by GDP growth is rescaled and weighted in the system dynamics model in order to account for a potential decrease in growth rates and reduce the impact of minor changes (less than 1 percent).

- *Informal Investor Rate*

The *Legal Rights* variable primarily refers to obtaining external funds through official financial institutions like banks and stock markets. In contrast, the informal investor rate variable describes financing through private investors and less institutionalised organisations such as “business angel investors” and family members and friends of the start-up founders. They are named informal investors as they do not necessarily operate on a professional basis and are oftentimes not officially registered. They are listed under formal institutions as part of the financial market since they do not completely fit the definition of *informal institutions* by North (1990). In the system dynamics model, the informal investor rate variable is based on data by the Global Entrepreneurship Monitor (2015). It is defined as the percentage of the population aged between 18 and 64 years who have personally provided funds for a new business, started by somebody else, in the past three years (ibid). China had an informal investor rate of 4.5 percent in 2014, while Indonesia’s informal investor rate was slightly higher at 5.4 percent in the same year (ibid). The informal investor rate variable is a constant and affects the rate of external funding in the start-up model. If it is high, external funding is increased and as a consequence, the start-up’s cash stock rises. If the informal investor rate is zero, there will be no effect on the rate of external funding.

- *Unemployment Rate*

As discussed in the chapter on institutional theory, the effect of unemployment on the performance of small firms is ambiguous (Fritsch et al. 2004, p. 8). A high unemployment rate can result in a larger pool of available labour and lower labour costs. However, it can also lead to necessity entrepreneurship and increase competition in the market (ibid). Consequently, in the system dynamics model, unemployment does not have a direct effect on firm performance. It affects the *Time to Hire*, i.e. the time it takes to find and employ new staff. If the country's unemployment rate is high, the start-up can find new employees more easily and quickly because labour supply is large. The values of the unemployment rate variable in the system dynamics model are based on data from the World Bank. It is total unemployment in percent of total labour force and refers to the proportion of the labour force that is without employment but available and looking for work (The World Bank 2015d). According to this definition, China's unemployment rate was 4.6 percent in 2013 while it was 6.3 percent in Indonesia (ibid). In the system dynamics model, an unemployment rate of five percent will reduce the time to hire new employees by two weeks. If unemployment is at 10 percent, time to hire is reduced by four weeks and so on.

- *Labour Market Regulations*

When labour laws permit firms to reduce their workforce quickly (e.g. during times of economic recession), firms are more likely to remain profitable and grow (Chacar 2010, pp. 1126, 1135). In addition, highly volatile industries such as the information technology industry are more developed in countries with less strict labour laws (Aterido et al. 2009, p. 6). As a result, not only single technology based start-ups but the information technology industry as a whole profit from less strict labour laws. In the system dynamics model, labour laws are represented by the labour market regulations variable (Saad 2013, p. 40). The labour market regulations variable affects the labour turnover rate of the start-up. Tight labour market regulations slow down the turnover rate and make it difficult for the start-up to dismiss employees. In the start-up model, the indicator measuring the difficulty to dismiss employees is severance pay for redundancy dismissal for an employee with one year of tenure (World Bank Group 2015e). It is expressed in weeks of salary and includes severance payments and penalties that the start-ups incurs when dismissing a redundant employee (ibid). In China, severance pay for redundancy dismissal for an employee of with one year of tenure was 4.3 weeks in 2013 (ibid). In Indonesia, it was with 17.3 weeks in 2013 significantly more than in China (ibid). The labour market regulations variable is like the unemployment rate variable a

look-up function. For example, if labour market regulations are less strict and severance pay for redundancy dismissal amounts to only four weeks, the average turnover rate of 5 percent will only be reduced by 0.5 percent which results in a new turnover rate of 4.5 percent. However, if labour market regulations are tight and severance pay equals sixteen weeks, turnover rate will be reduced by 2 percent. The new turnover rate would then be 3 percent.

Severance pay for redundancy dismissal only covers one kind of labour market regulation which is a limitation to this variable. Other labour market regulations which could affect technology based start-ups are for instance restrictions of working hours and excessive ancillary labour costs. They are only indirectly included in the model as part of the *Team Productivity* variable and the *Average Salary* variable.

- *Higher Education*

The start-up's founders' and employees' human capital in form of education has significant impact on start-up performance (Millán et al. 2014, p. 627). Employees with a high level of education tend to be more productive (ibid) and contribute valuable knowledge to the development of the start-up's competitive advantage (Smith et al. 2005, p. 355). The country-specific threshold effect of education determines what level of education has to be attained in order to leverage these benefits (Quatraro & Vivarelli 2014, p. 12). Since China and Indonesia are middle-income emerging economies, the threshold effect of education in regard to technology based businesses is assumed to be at university level. Consequently, the variable representing education in the system dynamics model is based on data about tertiary education. It indicates the cumulative educational attainment of the population aged 25 years and older in relation to the total population (UNESCO & UIS 2015a). In China, 8.8 percent of the total population aged 25 years and older completed at least short-cycle tertiary education (ISCED 5 to 8; minimum two years of tertiary education) (ibid). In Indonesia the percentage of the population above 25 years who attained at least short-cycle tertiary education amounted to 7.9 percent of the total population (ibid). Although dating back to 2010 (China) and 2011 (Indonesia), these numbers are the latest available. The higher education variable directly affects *Team Productivity* in the system dynamics model (Saad 2013, p. 42). The greater the number of tertiary education graduates in the country, the higher the start-up's productivity level. A higher productivity level then results in a higher rate of product development. It should be noted that the higher education variable can only have a positive (or zero) but no negative effect on productivity. It can only increase but not actively decrease productivity.

- *R&D Innovation*

Innovation is a growth driver for firms and a positive predictor of survival, especially for technology based firms (Quatraro & Vivarelli 2014, p. 13). Investments in R&D can increase their growth rates significantly (Stam & Wennberg 2009, p. 86). However, the positive effect of R&D on firm performance is generally smaller in emerging economies than in developed economies. This is due to the fact that emerging economy businesses are not specialised in innovation-driven industries and are therefore not at the 'technological frontier' (Quatraro & Vivarelli 2014, p. 13). Since R&D and innovation are of great importance in the information technology industry, this thesis assumes a positive effect of investments in R&D and innovation on the performance of technology based start-ups in China and Indonesia. In the start-up model, these investments are represented by the R&D innovation variable (Saad 2013, pp. 41-42). The underlying indicator is the gross domestic expenditure on R&D (GERD) in percentage of GDP. It includes private and public expenditure on basic research, applied research and experimental development (UNESCO & UIS 2015b). China's gross domestic expenditure on R&D was 1.98 percent of GDP in 2012 (ibid). In Indonesia, it was 0.08 percent of GDP in 2009 (ibid). These are the latest statistics from international organisations' databases. There is no data available for the years 2013-2014 (and later than 2009 in the case of Indonesia). This is a limitation that has to be taken into account when analysing the impact of R&D innovation on other variables and final start-up performance in the system dynamics model. The R&D innovation variable directly affects the product development rate (Saad 2013, pp. 41-42). The more the country spends on R&D, the more and better product features the start-up is able to develop. A R&D innovation variable of zero will have no impact on product development.

- *Technology Adoption*

The availability of technological infrastructure is essential for technology based start-ups. Their products are based on the use of computers, mobile phones and/or other technological devices and distributed mainly on the internet. Thus, the greater information technology diffusion in the country, the more customers the start-up is able to reach. In the system dynamics model, the availability of technological infrastructure is represented by the technology adoption variable (Saad 2013, pp. 41-42). It is a constant and indicates the number of internet users per 100 people. Internet users are defined as individuals who have used the internet, from any location, in the past twelve months via a computer, mobile phone or other digital device (The World Bank 2015e). In China, 45.8 out of 100 people had access to the

internet in 2013 (ibid). In Indonesia, this number is significantly lower. Only 15.8 out of 100 people used the internet in 2013 (ibid). These numbers directly impact the *Sales* rate in the start-up model (Saad 2013, pp. 41-42). If the technology adoption variable is low, fewer potential customers can be reached as they do not have access to the internet. If it is zero, the sales rate will be zero as well. Besides internet access, the technology adoption rate also implies the availability of basic infrastructure such as electricity. Thus, infrastructure is not included as a separate variable in the model. Technology adoption does not measure how technology and computer savvy internet users are. However, it is assumed that the start-up's product is easy to use by people who are able to navigate the internet.

3.2.2. Informal Institutions

Informal institutions describe the cognitive and normative dimension of a country and include culture, values, norms, customs, etc. (North 1990; Scott 1995). In regard to entrepreneurship and the post-entry performance of start-ups, the most important informal institutions are culture-related factors (Salimath & Cullen 2010, p. 365). The theoretical part highlighted especially the following cultural institutions: fear of failure and uncertainty avoidance, performance orientation, individualism and collectivism. Another informal institution discussed in the theoretical part is media attention. Media attention is not so much of a cultural factor itself but a channel that conveys values, views and attitudes on certain topics. The three cultural factors and media attention are all included in the system dynamics model as informal institutional factors that affect the start-up in different ways.

- *Uncertainty Avoidance*

Uncertainty avoidance can prevent entrepreneurs from trying out new and untested business approaches. New and untested business approaches may turn out to be failures but at the same time, they can bear high growth opportunities. Fast and high growth is important for technology based start-ups as they face high levels of competition and resource constraints which threaten their survival. As a result, technology based start-ups of risk-adverse entrepreneurs who avoid uncertainties and are afraid to fail are likely to experience less growth than those of risk tolerant entrepreneurs. Uncertainty avoidance tends to inhibit new product development (Sully de Luque & Javidan 2004, p. 618). Consequently, high values of uncertainty avoidance have a negative effect on the rate of *Product Development* in the start-up model. Start-up founders and employees are afraid to pursue new and unusual product development opportunities which results in a lower product development rate.

In the start-up model, uncertainty avoidance is represented by a constant variable that is based on data from the GLOBE study (Sully de Luque & Javidan 2004). GLOBE is an abbreviation for “Global Leadership and Organizational Behavior Effectiveness” and refers to a study about cultural values and practices in business which was conducted in 62 nations over a period of eleven years. It is based on surveys from about 17,300 managers and measures nine cultural dimensions (e.g. uncertainty avoidance) in different segments (country, industry, organization). In order to simulate a general institutional environment, only country-level data is chosen for the start-up model. On a scale from 1 to 7 (higher scores indicating greater uncertainty avoidance), the values for China and Indonesia are 4.94 and 4.17, respectively (ibid, p. 622). Thus, China practices a significantly higher degree of uncertainty avoidance than Indonesia. The final effect of this difference will depend on the other variables in the model and is analysed in chapter 4. A drawback of using the GLOBE study as informal institutional factors in the start-up model is the fact that its study results date back to the early 2000s and are therefore comparatively old. However, informal institutions such as cultural dimensions do not experience very rapid changes over short periods of time (Scott 1995) so that the GLOBE data on cultural values and practices can still be used.

- *Performance Orientation*

Performance orientation reflects the extent to which a society values ambition, hard work and competition (Javidan 2004, p. 239). In performance oriented societies, firms tend to face high levels of competitiveness and performance standards and are rewarded for performance improvements (Autio et al. 2013, pp. 341-342; Roxas & Chadee 2012, pp. 326-327). In those societies, technology based start-ups are encouraged to have ambitious goals and work hard to achieve them. In the system dynamics model, performance orientation is indicated by a variable based on data from the GLOBE study (Javidan 2004). It measures performance orientation practice in different societies including China and Indonesia (ibid). On a scale from 1 to 7 (7 indicating the strongest performance orientation practice), China scores a value of 4.45 while Indonesia is slightly below at 4.41 (ibid, p. 250). The performance orientation variable in the start-up model is a constant and directly affects *Team Productivity*. The more performance oriented the society is, the harder start-up employees will work and the more productive they will be. Subsequently, the rate of *Product Development* will be higher too as increased productivity results in more efficient development of new product features. Low performance orientation (i.e. a score of less than 4) has a negative effect and limits productivity.

- *Collectivism*

Collectivism refers to the subordination of individual interests to the good of society and promotes values such as cooperation, solidarity and harmony within the society. Even though entrepreneurship has long been believed to thrive better in individualist than in collectivist societies, recent studies indicate that this is not necessarily the case: In countries at medium to low levels of economic development (e.g. emerging economies), entrepreneurship is negatively related to individualism (Pinillos & Reyes 2011, p. 23). In addition, some studies found that collectivism is positively related to firm performance (Autio et al. 2013, p. 357). Consequently, a positive relationship between collectivism and *Team Productivity* is assumed in the system dynamics model. Seeing that their start-up's success and the benefit of the broader society are aligned are assumed to motivate start-up founders and employees to work even harder to grow their business. The collectivism variable in the start-up model is a constant and draws on data from the GLOBE study (Gelfand et al. 2004). The GLOBE study measures the level of societal institutional collectivism practices in different societies (including China and Indonesia) on a scale from 1 to 7, with 7 being the highest value of collectivism (ibid, p. 463). China's score of societal institutional collectivism ranks among the highest of all societies under study with 4.77 points (ibid, p. 468). It is statistically different from Indonesia's score of 4.54 points (ibid). Since the relationship between collectivism, individualism and post-entry firm performance is controversial, the collectivism variable in the system dynamics model can only have a positive or zero effect on productivity. In other words, it can only increase but never decrease productivity even if the society tends to be more individualist than collectivist (i.e. values significantly lower than 4).

- *Media Attention*

The media are information intermediaries and play a significant role in affecting what information becomes available in a country and to what extent (Petkova et al. 2013, p. 866). In regard to technology based start-ups, the media represents a form of external relationship and has significant legitimating power (Tolbert et al. 2011, p. 1336). They can help start-ups get noticed by customers and investors and generally affect the society's attitude towards entrepreneurship. In the system dynamics model, the media and their influence is represented by the media attention variable (Saad 2013, p. 42). It is based on data from the Global Entrepreneurship Monitor (GEM) and defined as the percentage of the population aged between 18-64 years who agree with the statement that in their country, the public media

often publishes stories about successful new businesses (Global Entrepreneurship Monitor 2015). In China, 71 percent of the 18-64-year old population agreed with this statement in 2013, while in Indonesia it was 75 percent (ibid). Even though this indicator is based on subjective perceptions and not objective measures, it still carries validity since perceptions or reality-as-perceived have been found to affect business growth motivation and direct behaviour (Aidis 2005, p. 314). The media attention variable directly influences the rate of *External Funding* in the start-up model (Saad 2013, p. 42). If the number of the population who agree with the above statement about successful new business stories in the media is high, more external investors (e.g. venture capitalists) are assumed to actively seek start-up businesses to invest in. As a result, the start-up is more likely to receive external funding.

Summary

This section discussed the formal and informal institutional factors that influence the technology based start-up in the system dynamics model. Some institutional factors are based on more than one indicator (e.g. *Regulatory Quality*) while others only draw on data from a single source. Some institutional factors are based on objective measures, while others (in particular informal institutional factors) depend on subjective perceptions. Their underlying values are all obtained from international organisations which ensures comparability between China and Indonesia. All institutional factors are constant variables and do not change their values over the simulation period of 60 months. This is one of the model's major limitations. China's and Indonesia's institutional factors are likely to change over the course of five years. For example, China's GDP growth is expected to decline and improvements in regulatory quality, legal rights and other institutional factors are likely to occur in both countries. What is more, the values of uncertainty avoidance, performance orientation and collectivism date back to the year 2004. This is a limitation to the validity of the model and its results as the value and practice of China's and Indonesia's society in regard to these institutional factors may have changed in the past ten years. Despite these limitations, the start-up model is expected to deliver valuable results which allow answering the research questions of this thesis. The following figure depicts the entire system dynamics model:

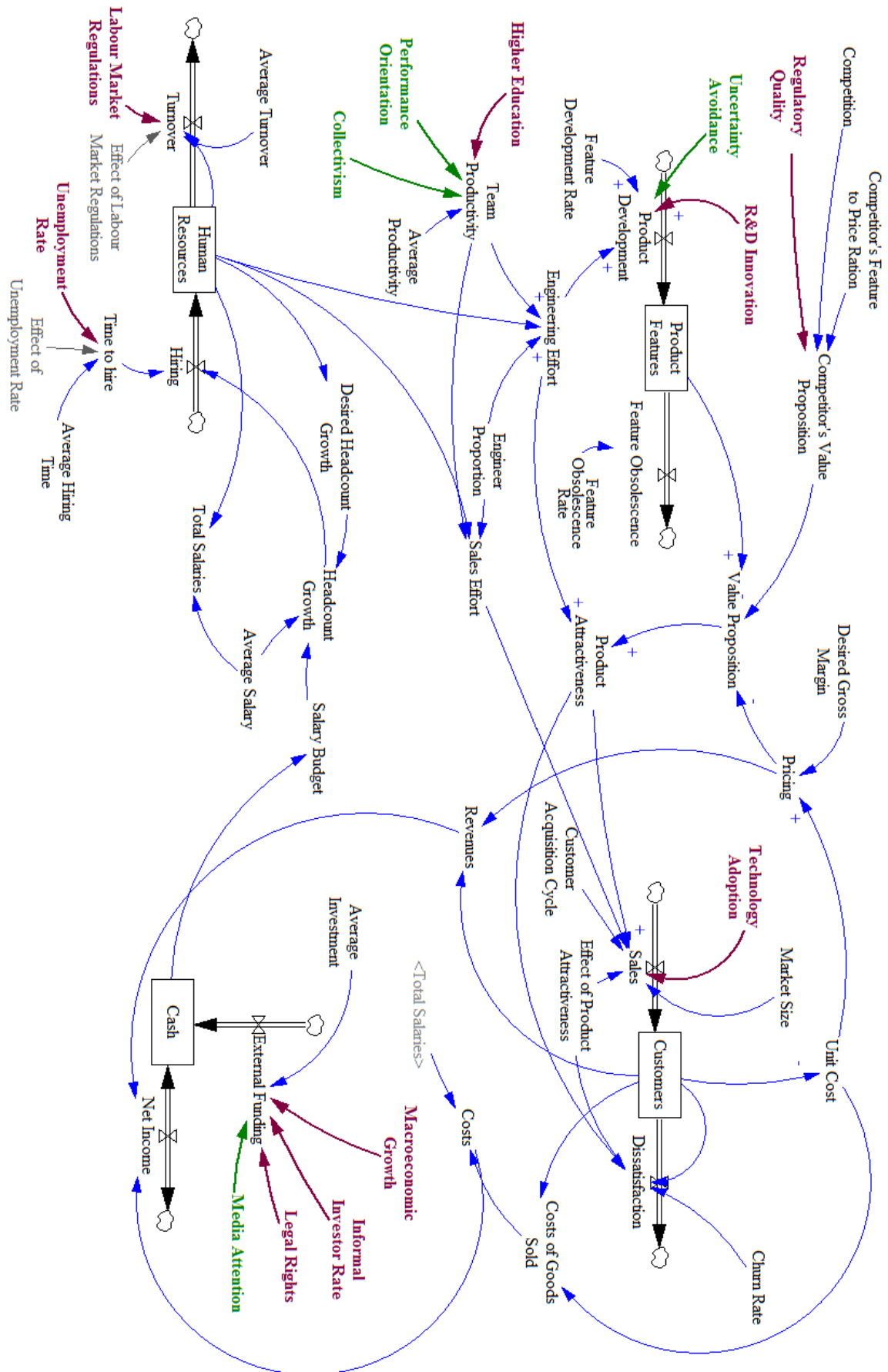


Figure 10: The system dynamics model of a generic technology based start-up

4. Model Results and Analysis

This chapter discusses the results of the system dynamics simulation of a start-up for the countries under study, China and Indonesia. The initial firm-specific conditions of the start-up are the same for both country simulations but the institutional factors are different. This allows monitoring and comparing the effect of the institutional environment. The country-specific results of the simulation are discussed separately for China and Indonesia after an introduction to the technology based start-up landscape in both countries. They are grouped according to the four blocks of the start-up model with particular emphasis on the firm performance indicators. In the later sections of this chapter, China's and Indonesia's results are compared and the most significant institutional factors are identified through sensitivity analysis.

4.1. Country-specific Results

4.1.1. China

This section first gives an overview of the general technology based start-up landscape in China before discussing the results of the start-up model for China. Understanding the general situation of technology based start-ups in China allows seeing the model results in a broader context and drawing more profound conclusions about the effect of institutional factors on start-up performance in China.

General Start-Up Landscape

The start-up landscape in China is relatively young compared to the ones in the United States of America, Western Europe and Japan as the distribution of the internet and related innovative technologies in China happened later and, at least in the beginning, more slowly. However, China is catching up at a very fast rate. Today, the Chinese information technology industry and start-up ecosystem are characterised by very intense competition and rapid changes which makes it difficult for local technology based start-ups and established foreign companies to succeed (Yuan 2015). A great number of large foreign technology companies failed in China, among them are Google, Facebook, Amazon, Ebay. While some of these failures can be attributed to tight government regulations and censorship (e.g. Google, Facebook), many foreign tech companies failed at understanding the Chinese information technology industry and adapt their products, services and business models to the Chinese market. Instead of large foreign companies, the Chinese market is dominated by local tech giants known as "BATS". BATS is an acronym for the companies Baidu (search engine),

Alibaba (e-commerce), Tencent (games, social media) and Sina (social media). Founded in the late 1990s or early 2000s, they rapidly grew into large corporations that are today listed on the stock exchange. Among other successful Chinese tech companies are Youku (video streaming), 360buy (e-commerce) and Xiaomi (mobile phones). With the exception of Alibaba and Xiaomi, these Chinese tech companies are almost exclusively operating in China.

The major technology hubs in China where the above mentioned established tech companies and many small start-ups are located are Beijing (especially 中关村 Zhōngguāncūn which is also referred to as the Silicon Valley of China), Shanghai and Shenzhen. In addition, technology communities in other regions such as Sichuan, Zhejiang and Jiangsu and in second tier cities (e.g. Chengdu) are becoming more popular since these regions are expected to experience a significant growth in internet usage, mobile penetration and income levels (Chen 2013; ZhenFund 2013, p. 10). They also set the trend in mobile application development. For example, Android has a market share of about 90 percent in tier 2-5 cities and rural China. In order to serve the population living in these regions, technology based start-ups developing mobile applications will have to focus on Android. Apple's iOS is more common in the top tier 1 cities Beijing, Shanghai, Guangzhou and Shenzhen where competition is higher than in smaller cities (Zhenfund 2013, p. 10). An ongoing trend in regard to start-up business models is freemium. Freemium has been common in China since many years and continues to be an important business model for technology based start-ups in China (Evdemon 2013).

China's start-up ecosystem also faces a number of challenges. Start-ups have difficulties in assembling a complete and complementary team and hiring top talent because many skilled university graduates prefer working for established technology companies (ibid). In addition, the Chinese education system tends to promote discipline and obedience over leadership and risk-taking which might inhibit entrepreneurship (Chen 2013). Consequently, a career as entrepreneur or working for a newly founded business is less attractive to young Chinese graduates. In regard to start-up funding, China is seeing constant growth in investments from venture capital companies and angel investors. However, there is limited attention of venture capitalists to start-ups in early stages as VCs often lack technical, product or market understanding to evaluate early-stage opportunities (Evdemon 2013). Among other challenges that Chinese start-ups are facing are weak property rights (Gai 2011, p. 9), slow internet speed and a lack of start-up service companies (ZhenFund 2013, pp. 30-31).

The Chinese government has announced a number of policies to promote technology entrepreneurship and innovation and ease some of the difficulties Chinese start-ups are facing. In 2013, the Chinese Premier Li Keqiang introduced the "Internet plus" policy, an action plan

on the development and integration of mobile internet, big data, e-commerce, internet banking and industrial networks (The State Council of the People's Republic of China 2015). In June 2015, the Chinese government specified several parts of this action plan and announced one hundred measures to help start-ups entrepreneurs get easier access to loans, pay less tax and receive free psychological counselling in case their start-ups fail (Gao 2015). Experts appreciate the efforts of the Chinese government to drive technology entrepreneurship and innovation but highlight that they have been without much return so far (Embley 2015).

Start-Up Model Results

Since the initial firm- and industry-specific variables of the simulated start-up are the same for both countries, the only differences lie in the institutional environment. The following table summarises all institutional variables of the start-up model in the Chinese environment:

Institutional Factor	Value	Year	Source
Regulatory Quality	42.6%	2013	Kaufman et al. 2014b
Legal Rights	4 (out of 12)	2014	World Bank Group 2015b
Informal Investor Rate	4.5% of population	2014	Global Entrepreneurship Monitor 2015
Macroeconomic Growth	7.7%	2013	The World Bank 2015c
Unemployment Rate	4.6%	2013	The World Bank 2015d
Labour Market Regulations	4.3 weeks	2013	World Bank Group 2015e
Higher Education	8.8% of population	2010	UNESCO & UIS 2015a
R&D Innovation	1.98% of GDP	2012	UNESCO & UIS 2015b
Technology Adoption	45.8 people (out of 100)	2013	The World Bank 2015e
Uncertainty Avoidance	4.94 (out of 7)	2004	Sully de Luque & Javidan 2004
Performance Orientation	4.45 (out of 7)	2004	Javidan 2004
Collectivism	4.77 (out of 7)	2004	Gelfand et al. 2004
Media Attention	71% of population	2013	Global Entrepreneurship Monitor 2015

Table 1: Institutional factors of the start-up simulation in China

These factors stay constant during the simulation period but since they interact with other variables, they can have significant influence on firm performance indicators. The start-up in the Chinese institutional environment did not fail and it achieved constant growth. The following sections discuss the behaviours of the four main blocks in detail.

Product Innovation and Value Proposition

The most important variables in this block are *Product Features*, *Product Attractiveness* and *Value Proposition* in relation to *Competitor's Value Proposition*. As figure 11 indicates, all variables except Competitor's Value Proposition (a constant) increased over the simulation period:

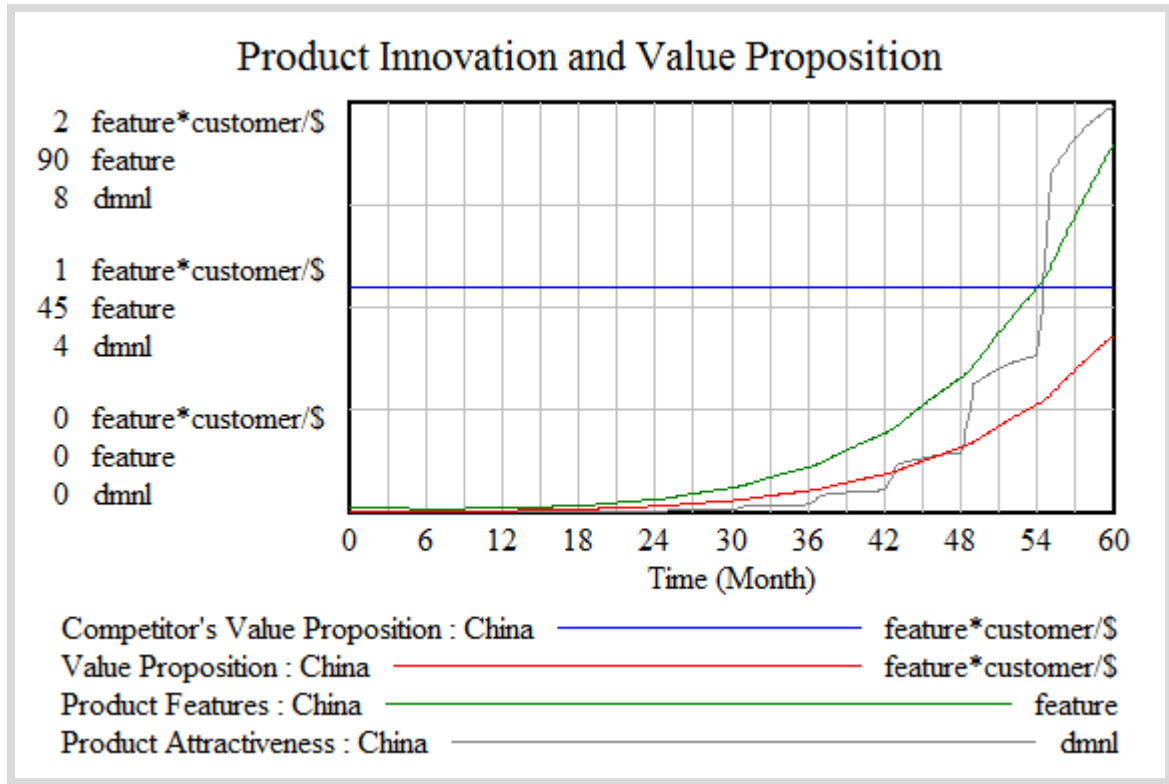


Figure 11: Behaviours in the product innovation and value proposition block (China)

The stock of product features rises only slightly in the first 24 months of the simulation period and remains close to one feature. By month 30, it reaches 5.4 features. Afterwards, it increases exponentially, from 15 products features in month 40 to 36 product features in month 50. At the end of the simulation, the stock of product features amounts to 80.8 features. The *Product Attractiveness* variable reflects this behaviour. The degree of product attractiveness is low in the first months of the simulation and after month 30, it increases exponentially. In particular, there is steep growth in months 54-55. The start-up's *Value Proposition* increases with the number of product features as well. However, its growth is smoother and less steep as compared to product attractiveness. What is more, the *Competitor's Value Proposition* remains higher than the start-up's value proposition during the entire simulation period. This indicates that the start-up does not gain a higher market

share than the competition and does not establish network effects that would make the competition's product offers less attractive to customers.

Customer Relationship

The most relevant performance indicators in the customer relationship block are *Sales* rate and the stock of *Customers*. They display the following behaviours over the simulation period:

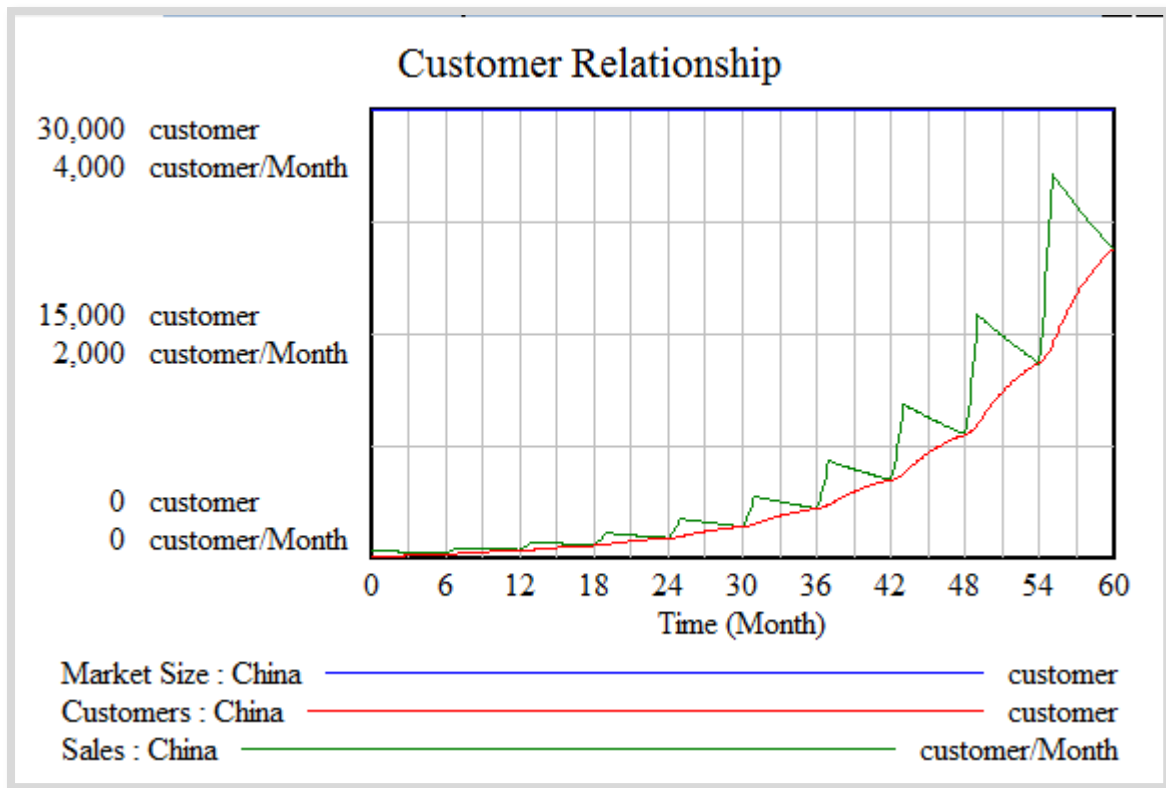


Figure 12: Behaviours in the customer relationship block (China)

At the beginning of the simulation, the start-up has one customer. As the sales rate increases continuously and becomes greater than the churn rate, the number of customers rises. From month 18, customer stock experiences exponential growth and at the end of the simulation period, it reaches its highest value at 20,714 customers. In other words, the start-up in the Chinese institutional environment has 20,714 customers after five years of officially being in business. The customer stock reflects the behaviour of the sales rate which also increases exponentially after the first one and a half to two years of the simulation. The zigzag pattern of the sales rate is a result of changes in the stock of *Human Resources* which affects the sales rate through the *Sales Effort* variable. The highest value of the sales rate is at 3424 customers in month 55. This corresponds to about 11.4 percent of the market size (30,000 customers per month; blue line at the top of the diagram in figure 12). Market size refers the demographic to

which the start-up actively markets its product. It is limited by the institutional factor *Technology Adoption*. As the technology adoption rate is less than 50 percent in China, the number of customers that the start-up can theoretically reach is less than 15,000 people per month. This will represent a significant limitation if the sales rate reaches a value of 15,000 customers per month. However, technology adoption in China is expected to improve with the increasing development of technological infrastructure. The potential customer pool with internet access is therefore very likely to increase significantly in the next years.

Infrastructure Management

The infrastructure management block describes the start-up's human resources situation. In combination with financial capital, human resources are the start-up's most important resources. The following figure shows behaviours of the three main human resource variables:

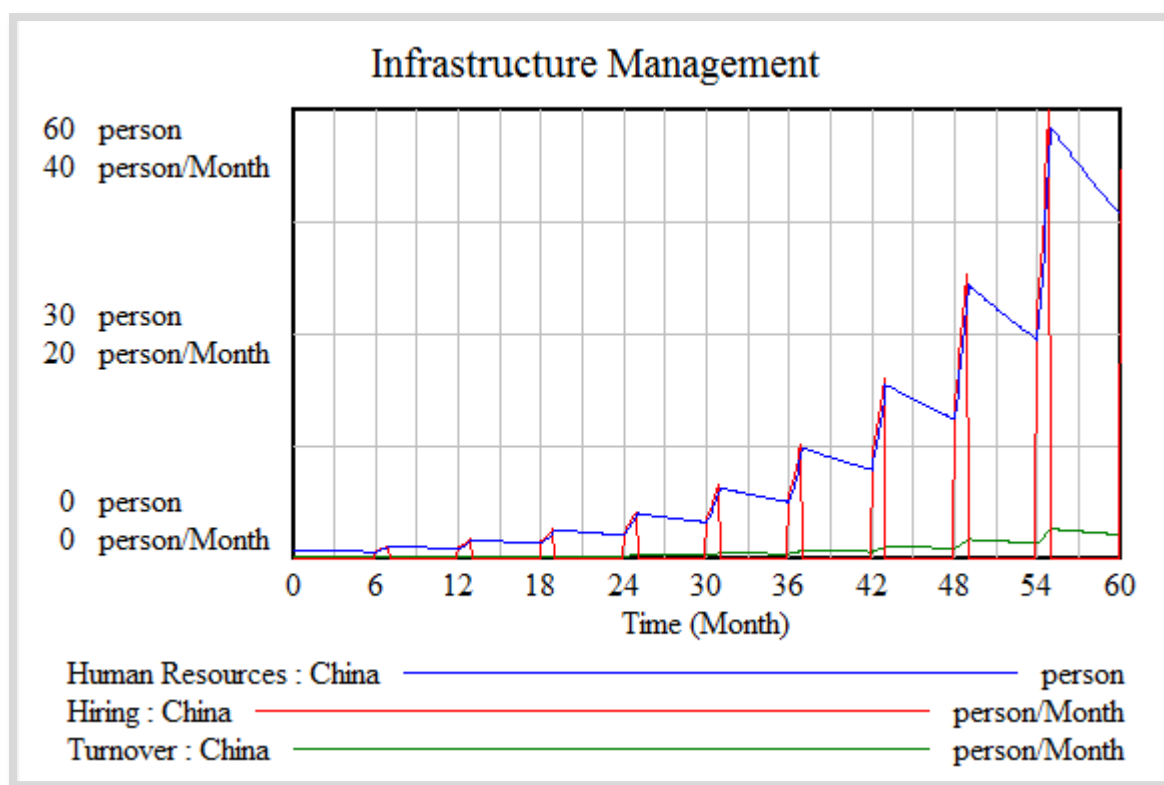


Figure 13: Behaviours in the infrastructure management block (China)

The Chinese start-up began its business operation with one staff (the founder). Its final number of staff as represented by the *Human Resources* stock is 46 people in month 60. Throughout the simulation period, the *Human Resources* stock grows continuously and shows exponential growth especially from the second half of the simulation. It reaches its highest value at 57 people in month 55. However, it experiences occasional decreases too. This is due to the *Turnover* rate which increases in the second half of the simulation period as well. The

zigzag pattern in the human resources stock is caused by the *Hiring* rate which is affected by the start-up's desired headcount growth. The start-up wants to hire new employees (20 percent of current human resource stock) every six months. The final hiring rate is below the desired headcount growth since the relatively low unemployment rate in China makes it difficult for the start-up to find employees and extends the time to hire. What is more, the behaviour of the human resource stock is reflected in the variables *Engineering Effort* and *Sales Effort*. They too reach their highest values in month 55 at 8240 and 3531 hours per month respectively.

Financial Aspects

Financial indicators are generally the most common indicators for measuring the performance of a firm. The most important financial indicators in the start-up model are the *Revenues*, *Costs*, the *Cash* stock, *Net Income* as well as *External Funding*. They show the following behaviours over the start-up simulation period:

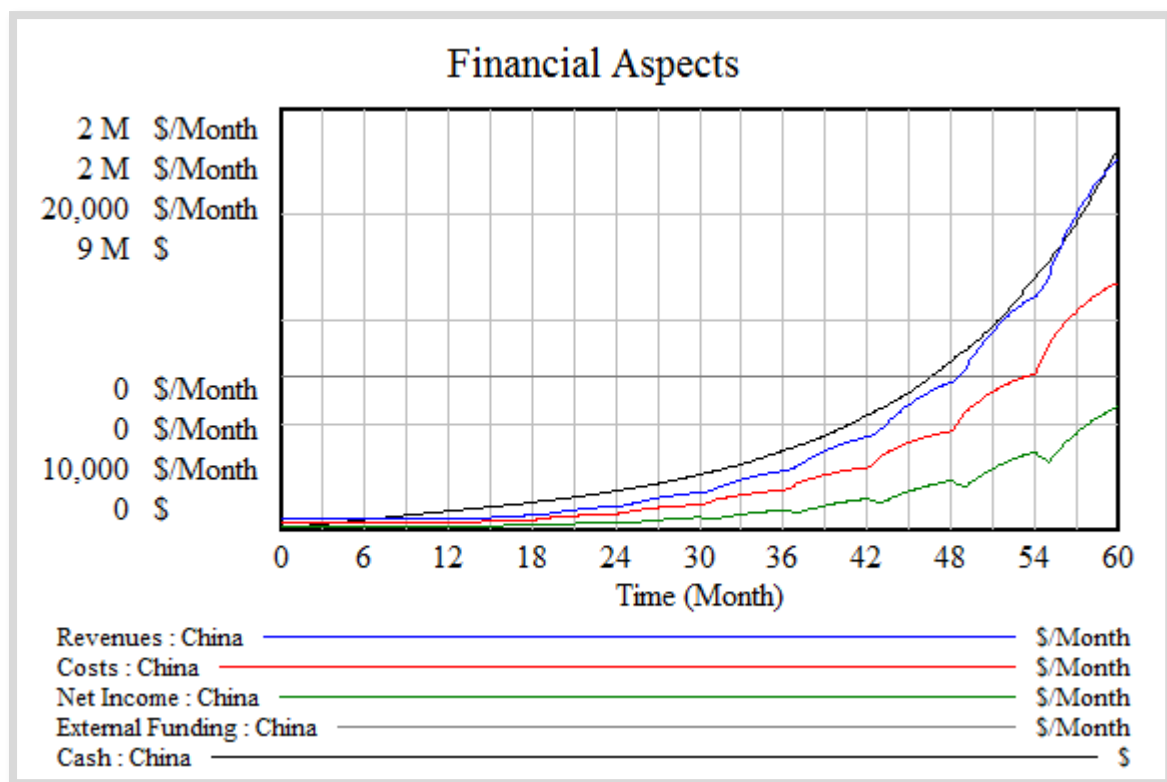


Figure 14: Behaviours in the financial aspects block (China)

Since the start-up gains customers very quickly, the initial fixed costs of US\$ 30,000 for the development of the initial product can already be recovered at the beginning of the simulation. *Revenues* increase constantly and reach their highest value at US\$ 1.7 million in month 60. The *Costs* variable exhibits similar behaviour and reflects the zigzag pattern of the *Hiring* rate

through the influence of the *Total Salaries* variable. The salary expenses constitute between 9 and 17 percent of the total costs, with the *Costs of Goods Sold* making up the remaining part. This is contrary to theoretical findings on the cost structure of start-ups in the information technology industry (see chapter 2.1.2). Human resource expenses are generally higher than product costs in information technology firms, in particular if the initial fixed costs of product development have already been recovered. However, the situation is likely to be different in emerging economies like China. In these economies, the wage level tends to be considerably lower than in developed economies.

Revenues and costs constitute the start-up's *Net Income* which is positive throughout the simulation period. From month 30, it grows significantly and reaches its highest value at US\$ 586,951 at the end of the simulation period. Net income directly affects the start-up's *Cash* stock. Consequently, the cash stock displays a growth pattern which is very similar to the net income rate. The initial value of the cash stock is US\$ 5,000 which are savings invested by the founder. In the first few months of the simulation, a significant part of the cash stock is provided by *External Funding*. The rate of external funding has a value of US\$ 13,657.8 per month and stays constant during the entire simulation period. As soon as the customer stock of the start-up increases, the profits it generates from product sales become greater than the external funds. With the increase in sales and profits, the start-up's cash stock rises significantly and reaches its maximum in month 60 at a value of US\$ 8,148,210.

4.1.2. Indonesia

This section gives a brief overview of the general tech start-up landscape in Indonesia before discussing the results of the start-up model for Indonesia. As stated in the previous chapter on China, understanding the general situation of technology based start-ups in Indonesia is crucial for connecting the model results with reality and drawing more profound conclusions about the effect of institutional factors on start-up performance in Indonesia.

General Start-Up Landscape

Like in China, the start-up landscape in Indonesia is relatively young compared to the ones in the United States, Western Europe and other developed regions. Only a small percentage of Indonesia's population uses the internet regularly and less than 10 percent of Indonesians own a PC or laptop (Zain 2013). Thus the technology based start-up landscape in Indonesia is still immature but very diverse (Kusuma 2012). Even though technology adoption is relatively low compared to other emerging economies, the products and services of foreign technology

based companies such Facebook, Twitter and Instagram are very popular in Indonesia. The number of Indonesian Facebook users surpasses those of the UK and France (Zain 2013). Another important foreign technology based company is Rocket Internet. Originally from Germany, Rocket Internet implements technology based business models from the USA or Europe in Southeast Asian countries and also operates as a venture capital firm. In Indonesia, it operates several ecommerce websites such as Zalora (fashion), Lazada (consumer goods) and FoodPanda (food delivery). Besides foreign tech companies, there are also several local technology based firms which started out as small businesses and grew into popular tech companies with a large customer/user base. Among them are Tokopedia, Berniaga, Bhinneka (all ecommerce) and Traveloka (travel). Tokopedia, an online marketplace connecting buyers and sellers, recently raised US\$ 100 million financing from Japanese conglomerate SoftBank and the American venture capital firm Sequoia Capital (Cosseboom 2014). Similarly, the online wedding marketplace Bridestory and food delivery service Berry Kitchen received mid-range funding in a US\$ single-digit million amount from foreign investors (Freischlad 2015; Shu 2015). Indonesian business groups and conglomerates are investing in technology based start-ups too. Some (e.g. Djarum, Kompas Gramedia, Sinar Mas, Salim) are doing so through established venture capitalists or their own venture capital firms while others place direct investments into local start-up businesses (e.g. Bakrie, Emtek) or offer support and mentoring programs to entrepreneurs (e.g. Ciputra Group) (Boediman 2015). Boediman (2015) concludes that “there’s enough funding for the tech industry and the trend is growing at a rapid pace even without government support”.

The major start-up hubs in Indonesia are Jakarta, Bandung, Yogyakarta and Bali. Jakarta is the political and economic capital of Indonesia and with a population of more than 10 million a large market by itself (The World Bank 2015f). Bandung is well-known for its engineering institutes and, together with Yogyakarta, has become home to various developer communities and attracted production teams of international companies (Boediman 2015). Bali has a rapidly growing start-up scene, too, and is especially popular with foreign entrepreneurs (ibid). The businesses that entrepreneurs are working on in those cities are for instance localised clones of successful start-ups in other countries (mainly USA), mobile applications, (mobile) games, news and content portals, ecommerce platforms and advertisement platforms (Kusuma 2012). Another major trend in the Indonesian start-up scene is fintech (financial technology). Only 36 percent of the Indonesian population over the age of 15 has a bank account in the formal financial sector (The World Bank 2014). In addition, the number of credit card users in Indonesia is only about 8 million unique users (Boediman 2015). Paired with the thriving

smart phone sector in Indonesia, this can be an opportunity for start-ups creating alternative banking infrastructure that is able to offer accessible, simple and affordable financial services even in remote areas (ibid). A key driver for online financial services and digital money is the Indonesian government. After terminating fuel subsidies in 2014, the Indonesian government created BLNT, a direct cash subsidy system to support underprivileged citizens (ibid). It is distributed through electronic money in order to reduce distribution cost and educate citizens about digital financial services (ibid).

Indonesia's start-up ecosystem also faces a number of challenges. Start-ups have difficulties in finding experienced talents, in particular engineers (Davis 2014). As a result, some Indonesian tech companies work with foreign talents. For example, Tokopedia announced to hire engineers in China, Vietnam and India (ibid). Furthermore, the development of internet infrastructure and internet adoption in Indonesia are significantly lacking behind other emerging economies in Southeast Asia (Boediman 2015). This limits the potential market size for products and services of start-ups in Indonesia. What is more, the administrative procedures for starting and operating start-ups, general bureaucracy and corruption are still major problems in Indonesia which inhibit technology entrepreneurship and investments in start-up businesses (Kusuma 2012).

The Indonesian government has announced various measures to address these issues. For example, investments in infrastructure aim at accelerating internet penetration and improving the general transportation network which is crucial for ecommerce businesses (Boediman 2015). In addition, Indonesia's minister of communication and information technology Rudiantara wants to raise US\$ 1 billion from national and international conglomerates and established companies in 2015 (Widiartanto 2015). He plans to place the funds in a privately managed venture capital firm which then invests in local technology based start-ups (ibid). What is more, Indonesia's President Joko Widodo pushed through a one-stop national office for business permits which is expected to facilitate the process of registering new businesses and obtaining business licences (Davis 2014).

Start-Up Model Results

The Indonesian start-up begins its business operation with the same firm- and industry-specific conditions but in a different institutional environment than the Chinese start-up. The following table provides an overview of the institutional variables and their values for the Indonesian start-up environment:

Institutional Factor	Value	Year	Source
Regulatory Quality	46.4%	2013	Kaufman et al. 2014b
Legal Rights	4 (out of 12)	2014	World Bank Group 2015c
Macroeconomic Growth	5.8%	2013	The World Bank 2015c
Unemployment Rate	6.3%	2013	The World Bank 2015d
Labour Market Regulations	17.3 weeks	2013	World Bank Group 2015e
Informal Investor Rate	5.4% of population	2014	Global Entrepreneurship Monitor 2015
Higher Education	7.9% of population	2011	UNESCO & UIS 2015a
R&D Innovation	0.08% of GDP	2009	UNESCO & UIS 2015b
Technology Adoption	15.8 people (out of 100)	2013	The World Bank 2015e
Uncertainty Avoidance	4.17 (out of 7)	2004	Sully de Luque & Javidan 2004
Performance Orientation	4.41 (out of 7)	2004	Javidan 2004
Collectivism	4.54 (out of 7)	2004	Gelfand et al. 2004
Media Attention	75% of population	2013	Global Entrepreneurship Monitor 2015

Table 2: Institutional factors of the start-up simulation in Indonesia

Product Innovation and Value Proposition

The institutional factors of the Indonesian environment result in the following behaviours of the main variables in the product innovation and value proposition block of the start-up.

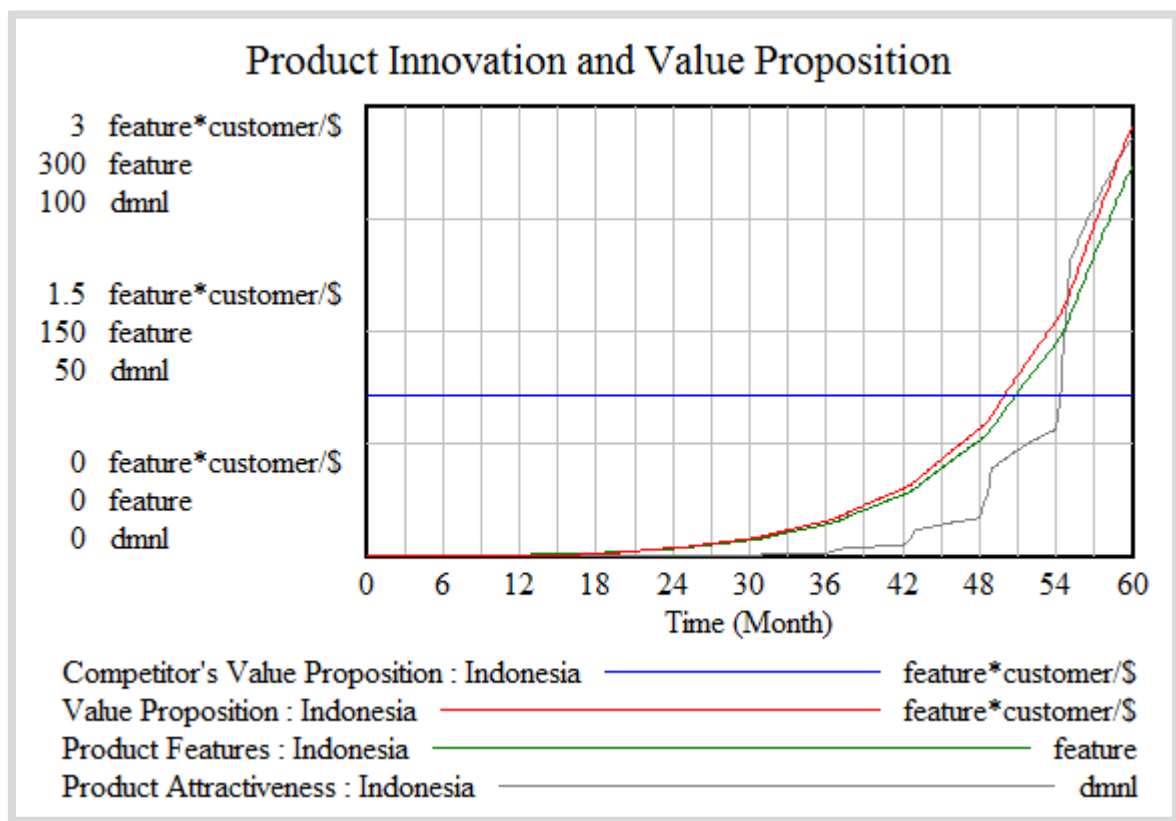


Figure 15: Behaviours in the product innovation and value proposition block (Indonesia)

In the first 24 months the simulation period, the stock of *Product Features* is relatively low and stays below 6 product features. However, from the second half of the simulation and in particular in the final months, the number of product features increases exponentially. The maximum is reached in month 60 with a stock of 259 product features. As a result of the exponential growth in product features, the start-up's *Value Proposition* and *Product Attractiveness* also increase significantly in the second half of the simulation period. The start-up's value proposition even outperforms the *Competitor's Value Proposition* from month 50. This is an indication for considerable market power of the start-up which can, for instance, result in network effects or switching costs for customers. The product attractiveness variable reflects the growth of product features and value proposition, albeit slightly delayed in time. A particularly notable period is month 54-55 when product attractiveness more than doubles from a value of about 28 to 64 (dimensionless).

Customer Relationship

In the customer relationship block, the behaviour of the main customer performance indicators in the Indonesian institutional environment looks as follows:

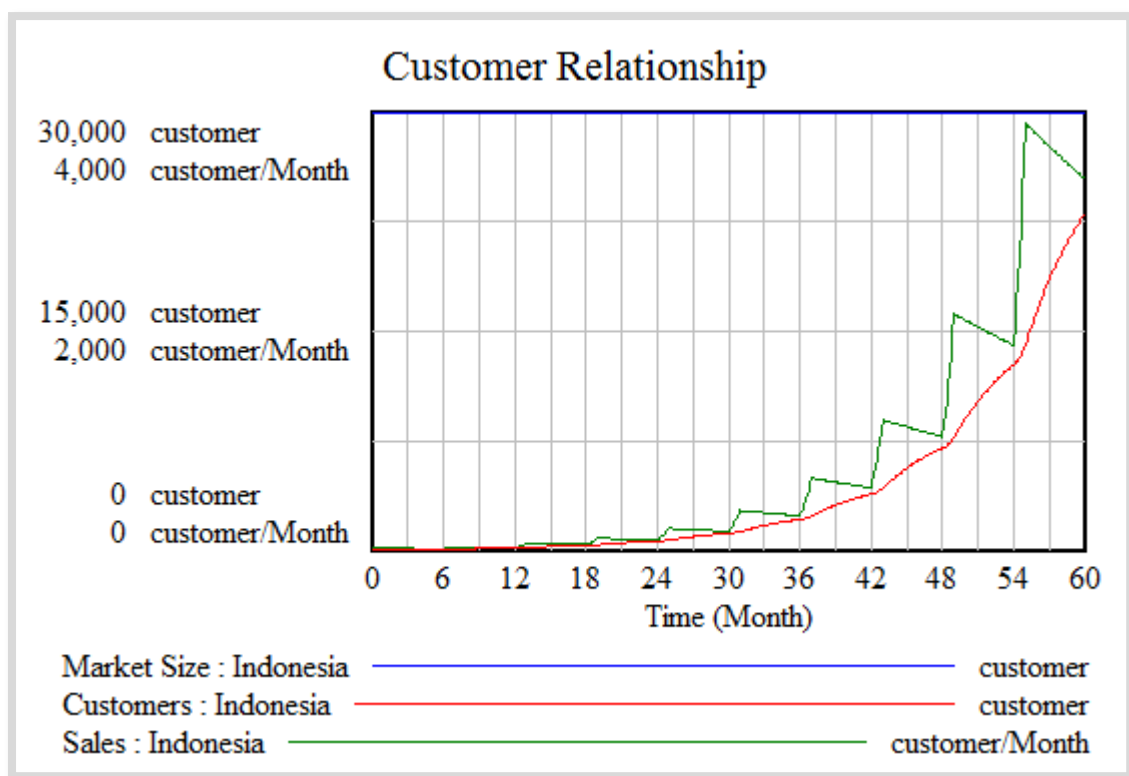


Figure 16: Behaviours in the customer relationship block (Indonesia)

The Indonesian start-up takes several months to substantially grow its *Customers* stock. From month 30, the number of customers slowly starts to pick up and grows exponentially in the

last third of the simulation period. The highest number of customers is reached in month 60 at 23,042 people. The *Sales* rate shows a similar behaviour, however, it experiences decreases too. These decreases are a result of changes in the *Human Resources* stock which affects the sales rate mainly through the *Sales Effort* variable. The start-up starts out with a sales rate of 19 customers per month in month 1 and achieves its highest sales rate number in month 55 with 3896 customers per month. This corresponds to about 13 percent of the theoretical market size which is 30,000 customers per month (see blue line in figure 16). The theoretical market size is limited by the institutional factor *Technology Adoption*. Since technology adoption is rather low in Indonesia, the resulting effective market size (the number of potential customers the start-up can reach per month) amounts to only 4740 customers per month. Consequently, the start-up sells to 82 percent of effective market size in month 55 when its sales rate is highest. Towards the end of the simulation period, the sales rate decreases continuously and reaches a value of 3390 customers per month in the final month.

Infrastructure Management

Infrastructure management is the third block in the start-up model and includes the human resource related performance indicators *Human Resources* stock, *Hiring* and *Turnover* rate. They display the following behaviours in the Indonesian institutional environment:

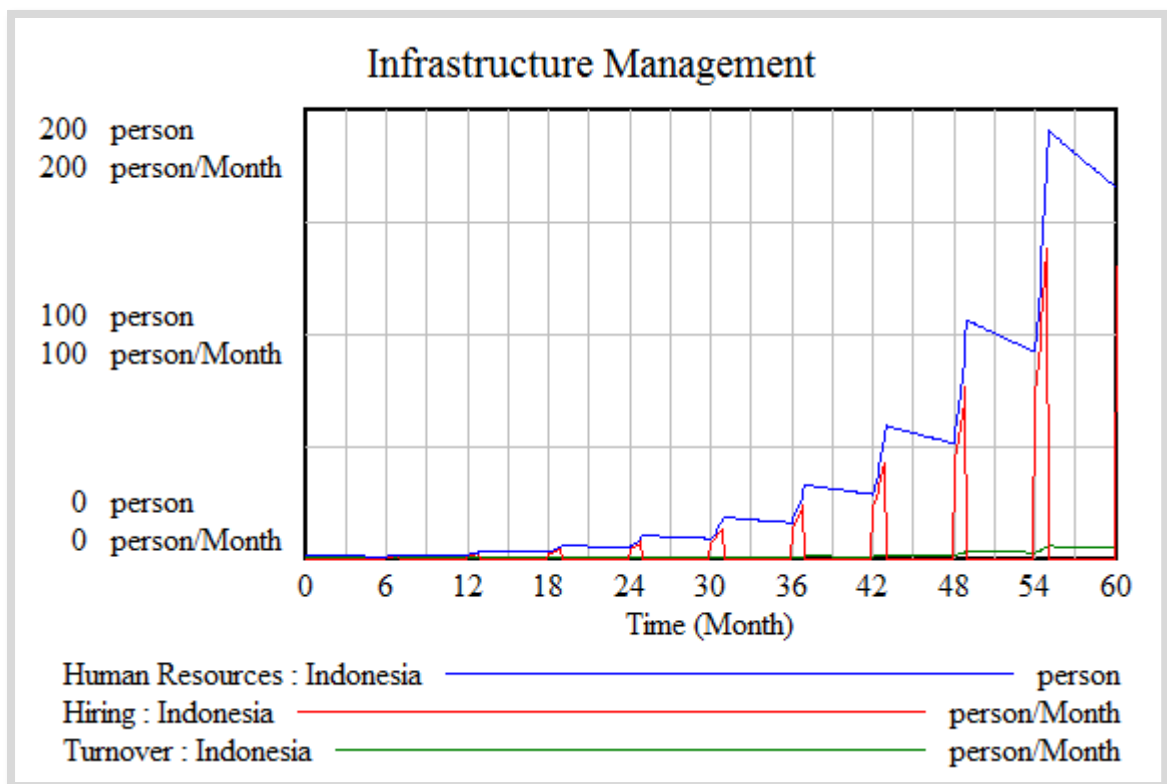


Figure 17: Behaviours in the infrastructure management block (Indonesia)

The start-up begins its business operation in month 0 with one staff (the founder) and hires its first employee only after one year of being in business, i.e. in month 12.5. Afterwards, growth in the human resources stock happens mainly in 6 month intervals as determined by the hiring rate. In the last third of the simulation period, the human resources stock increases significantly and reaches its maximum of 190 people in month 55. In the last month of the simulation, the start-up has a total of 165 employees. Decreases in human resources are due to dismissal of employees as reflected in the turnover rate. The turnover rate of the Indonesian start-up is rather low, especially during the first half of the simulation period. This is due to the institutional factor *Labour Market Regulations* whose value of 17.3 weeks of severance pay for redundancy dismissal is relatively high and discourages the start-up from dismissing employees. What is more, the hiring rate increases continuously throughout the 60 months of simulation and contributes to the growth of the human resources stock. The hiring rate's growth pattern and intervals of 6 months are determined by the variables *Desired Headcount Growth*, *Headcount Growth* and *Time to Hire*. The time to hire is about 9.5 days below the average time to hire of 2 months due to the *Unemployment Rate* of 6.3 percent in the Indonesian institutional environment.

Financial Aspects

The financial aspects block measure the value created by the other three blocks in financial terms. In the Indonesian institutional environment, the main financial variables of the start-up develop as follows during the simulation period:

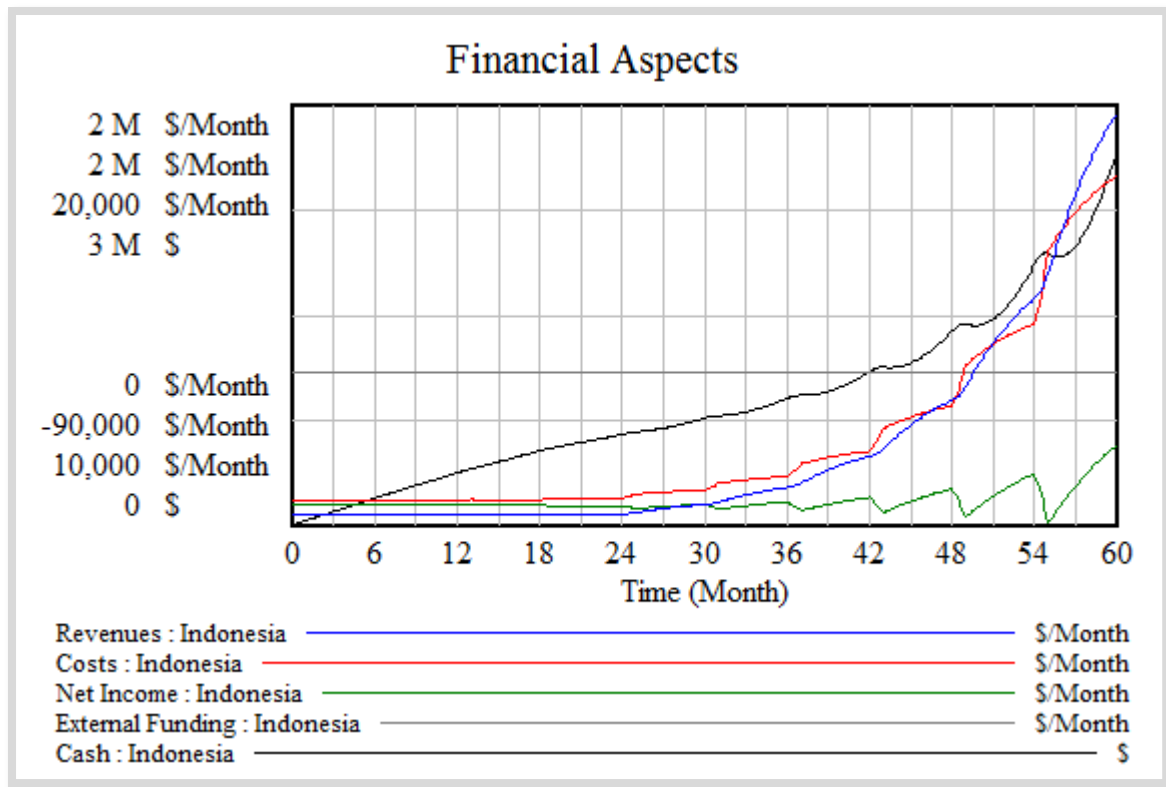


Figure 18: Behaviours in the financial aspects block (Indonesia)

In month 0, the start-up's *Cash* stock amounts to US\$ 5,000 which are provided by the founder as initial investment. From the very beginning, the cash stock increases continuously and experiences particularly steep growth in the final 24 months of the simulation. Its final value in month 60 is US\$ 2,666,840. The cash stock's growth behaviour is caused by two variables *Net Income* and *External Funding*. The latter is a rate of US\$ 13,623.7 per month and stays constant throughout the simulation period. In other words, external investors such as venture capitalists provide funds worth US\$ 13,623.7 to the start-up every month. External funding plays a major role in the first 24 months of the simulation when the start-up's *Net Income* has not yet increased significantly. In fact, the initial net income of US\$ 18,000 stays almost constant in the first few months of the simulation and even decreases slightly after month 6. Afterwards, net income alternately increases and decreases, with increases being greater than decreases. The lowest value of net income occurs in month 55 with US\$ -80,022 while its value is highest in month 60 at US\$ 310,146. The reason for the alternating growth and decline in net income is changes in the *Costs* variable. The rising stock of human resources increases *Total Salaries* which in turn affects the costs variable. Costs reach its highest value in month 60 after rising exponentially from the second half of the simulation period. The *Revenues* variable behaves similarly and is in some months greater, in other

months lower than the costs variable. This results in the above discussed net income rate that alternates between positive and negative values.

Financial performance indicators present an interesting picture of the Indonesian start-up. While cash stock increases relatively constantly throughout the simulation period, the behaviour of the net income variable is fluctuating significantly. In the first few months, these fluctuations are balanced by the constant external funding rate. From the second half of the simulation, the difference between net income increases and decreases become greater and hence the impact of external funding as a balancing factor becomes less important.

4.2. Comparative Analysis

The country-specific results for China and Indonesia provided a general overview of start-up performance in these specific institutional environments. This section compares the results and explores potential reasons for differences and similarities between start-up performance in the two institutional environments. The comparison of results is structured according to the four organisational blocks of the start-up.

4.2.1. Production Innovation and Value Proposition

Offering a sophisticated product which provides value to customer is essential to start-up success. However, an attractive product alone does not necessarily result in extraordinary profit and firm growth. The final firm performance also depends on other variables of the start-up. The Chinese and Indonesian start-up show very different behaviours in the product innovation and value proposition block. At the end of the simulation period (in month 60), they generate the following results:

	China	Indonesia
Product Features	80 features	259 features
Product Development	5 features/month	19 features/month
Engineering Effort	6,588 hours/month	23,354 hours/month
Value Proposition	0.86	2.87
Competitor's Value Proposition	1.099	1.069
Product Attractiveness	8	93

Table 3: Product related performance

The performance of the Indonesian start-up is clearly superior to the performance of the Chinese start-up in terms of product features and development. After 60 months of being in business, the product of the Indonesian start-up has 259 different features which corresponds to 3.25 times more features than its Chinese counterpart. The Indonesian start-up team

develops 14 more product features per month than the Chinese start-up team. The reason for these significant differences lies mainly in the engineering effort variable. Engineering effort as measured in hours per month directly affects the product development rate and is significantly higher in the Indonesian start-up than in the Chinese start-up. The Indonesian start-up team puts 23,354 hours of engineering effort per month into the development of new product features. In contrast, the Chinese start-up team only reaches 6,588 hours of engineering effort per month. However, this does not necessarily give any indication on how efficient and productive the two start-up teams work. A high number of engineering effort can be the result of a large human resources stock as well as a high level of productivity. In the case of the Indonesian start-up, it is a large stock of human resources (see section 4.2.3 Infrastructure Management for greater detail).

Since the Indonesian start-up produces more product features, its value proposition is also higher than the one of the Chinese start-up. Thus, customers perceive the Indonesian product to provide more value than the Chinese product. However, value proposition is also dependent on what the competition offers to customers. In the Chinese case, customers find the competitor's value proposition more attractive than the start-up's value proposition. This does not necessarily mean that the product of the Chinese start-up is worse than the competition's. It can indicate that, due to less regulatory quality, the Chinese market is dominated by only a small number of firms which enjoy important market power and therefore have better access to customers. In fact, there are slight differences in China's and Indonesia's regulatory quality which translates into differences in competitor's value proposition.

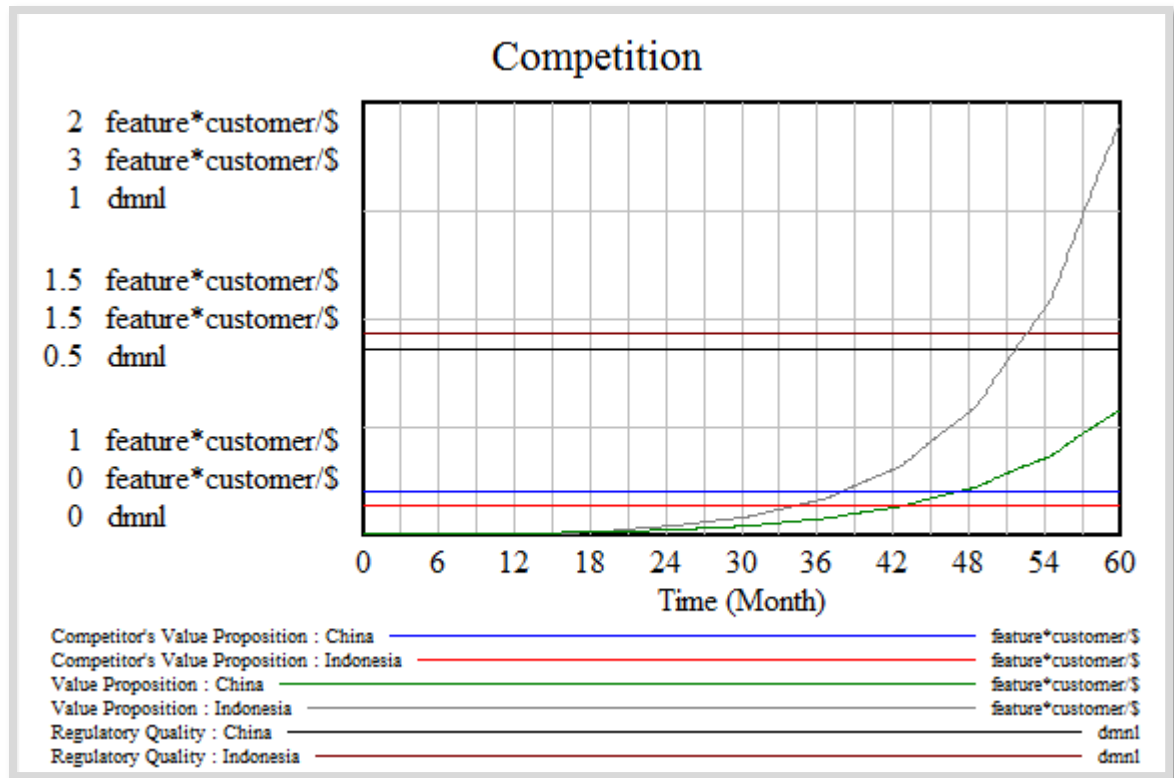


Figure 19: Competition related behaviours in the Chinese and Indonesian start-up environment

The start-up's value proposition and engineering effort result in product attractiveness. The product attractiveness of the Indonesian start-up is higher than the one of the Chinese start-up since its value proposition and engineering effort are also higher (see above). The more engineering goes into developing product features and the better value customers get for purchasing the product, the more attractive the final product. Accordingly, the product attractiveness of the Indonesian start-up amounts to 93 (dimensionless) while it is only 8 (dimensionless) in the Chinese start-up case. Product attractiveness affects the sales rate in the start-up model. Thus, the differences in product attractiveness of the two start-ups can result in disparities in sales and customer related performance indicators. This is the subject of the following section.

4.2.2. Customer Relationship

The customer relationship block indicates how many product units the start-up actually sells and how successful it is at selling them. Both the Chinese and the Indonesian start-up have a predefined market size of 30,000 people per month. In other words, they can theoretically sell to 30,000 potential customers per month. In practice, this number is significantly lower. Not all potential customers can be reached as they do not have internet access or are simply not

interested in the product. At the end of the simulation period (month 60), the customer situation of the Chinese and Indonesian start-up looks as follows:

	China	Indonesia
Customers	20,714 customers	23,042 customers
Sales	2,741 customers/month	3,390 customers/month
Dissatisfaction	2,034 customers/month	2,236 customers/month
Product Attractiveness	8	93
Sales Effort	2,823 hours/month	10,009 hours/month
Technology Adoption (institutional factor)	45.8	15.8

Table 4: Customer related performance

The product attractiveness affects the start-ups' sales rate and being higher in the Indonesian case, it contributes to a higher sales rate of the Indonesian start-up as compared to the Chinese start-up. In addition, the sales rate is also influenced by sales effort. When the start-up spends more hours on trying to market and sell its product, it is more likely to achieve a higher number of sales. The difference in sales effort between the Chinese and Indonesian start-up is significant. The Indonesian start-up team spends about 10,000 hours per month on marketing and selling its product, while the sales effort of the Chinese start-up team amounts to only 2,823 hours per month. As a result, the sales rate of the Indonesian start-up is higher than the one of its Chinese counterpart. However, the vast differences in product attractiveness and sales effort would have one expect significant differences in sales rate as well. This is not really the case. Even though the Indonesian start-up's sales rate is higher than the Chinese start-up's sales rate, the difference is only about 650 customers per month. The reason for this comparatively small difference is the institutional variable technology adoption. Technology adoption represents the number of potential customers which have access to the internet and therefore to the start-ups' product. In China, this is about 45.8 percent of the population (45.8 out of 100 people) while it is only 15.8 percent of the population in Indonesia. This limits the number of reachable Indonesian customers considerably.

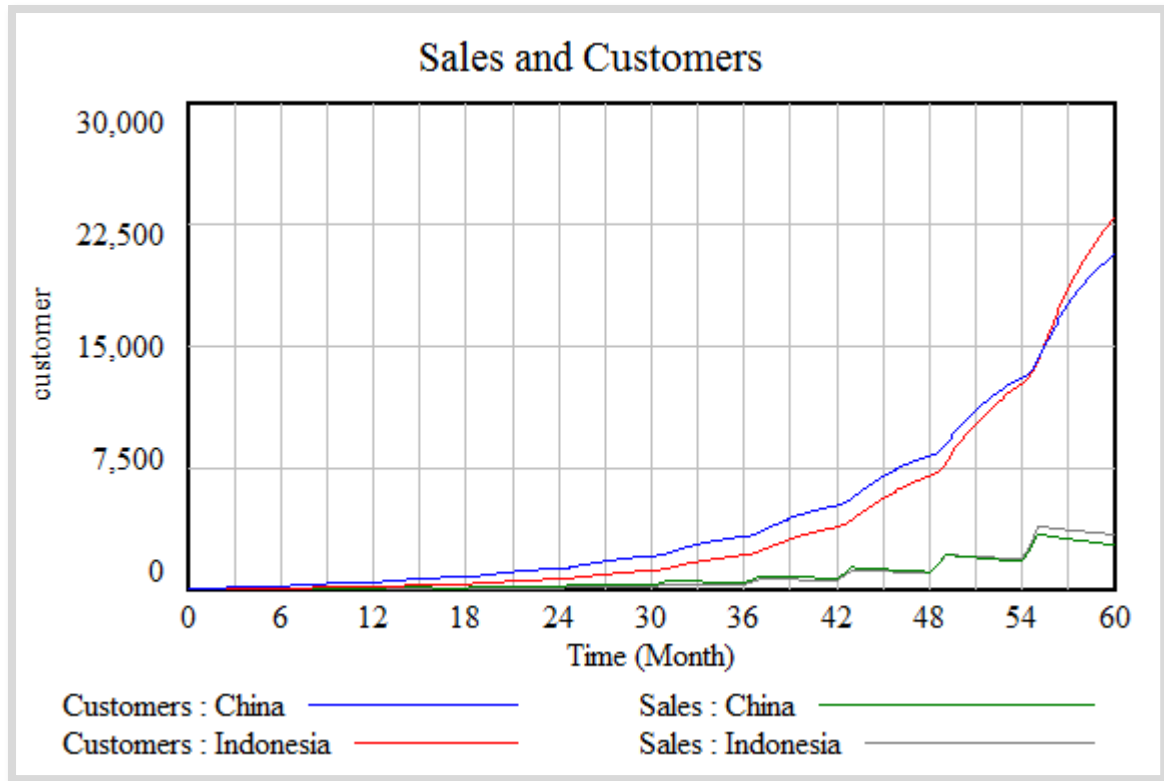


Figure 20: Customers and sales of the Chinese and Indonesian start-up

The sales rate determines the customer stock which amounts to 20,714 people for the Chinese start-up and 23,042 people for the Indonesian start-up. The customer stock is an important variable that controls not only the unit cost but also the start-up's revenues. A high number of customers translates into higher revenues. Even though the Indonesian start-up's market is more limited than the Chinese, it acquires more customers than the Chinese start-up. However, the difference is relatively small (2328 customers in total). In addition to the sales rate, the dissatisfaction rate has significant impact on the customer stock. The Chinese start-up has a dissatisfaction rate of 2,034 customers per month, while the Indonesian start-up loses 2,236 customers per month. As a result, the *net* number of customers the start-ups acquire per month is 707 (Chinese start-up) and 1,154 (Indonesian start-up) which correspond to 26 percent (Chinese start-up) and 34 percent (Indonesian start-up) of the sales rate. In other words, both start-ups lose a considerable number of customers per month and can only keep 26 percent (34 percent) of customers long term. Consequently, they should both try to increase customer satisfaction since the loss of customers does *ceteris paribus* not only mean a decrease in revenues and profit but can also damage the start-ups' reputation.

4.2.3. Infrastructure Management

Human resource variables are important performance indicators since start-ups heavily rely on the talent of their founders and employees to develop and market competitive products and generate profits. The different levels of engineering effort and sales effort have already indicated differences between the Chinese and Indonesian start-up in human resource related performance indicators. The following table provides an overview of the most important human resource variables for the two start-ups in month 60 (end of the simulation period):

	China	Indonesia
Human Resources	46 persons	165 persons
Hiring	34 persons/month	130 persons/month
Turnover	2 persons/month	4 persons/month
Headcount Growth	61 persons	220 persons
Time to Hire	1.77 months	1.685 months
Unemployment Rate (institutional factor)	4.6%	6.3%
Labour Market Regulations (institutional factor)	4.3 weeks	17.3 weeks
Team Productivity	204.53 hours/(month*person)	201.66 hours/(month*person)
Higher Education (institutional factor)	8.8%	7.9%
Performance Orientation (institutional factor)	4.45	4.41
Collectivism (institutional factor)	4.77	4.54

Table 5: Human resource related performance

The Chinese start-up has a staff of 46 people after five years of being in business. The number of staff of the Indonesian start-up is more than three times higher and amounts to 165 people. This significant difference is caused by the start-ups' hiring and turnover rates. Even though both start-ups hire new employees once every six months, the number of effective hires differs. In month 60, the Chinese and Indonesian start-up are hiring 34 and 130 new employees, respectively. The effects of these new hires will be reflected in the human resource stock after month 60. The hiring rate is determined by headcount growth and time to hire. The Chinese start-up's headcount growth amounts to 61 people. Thus the Chinese start-up can afford and is planning to hire 61 people in month 60. Since the time to hire is 1.77 months and therefore longer than one month, the effective number of employees it can hire in month 60 is 34 people. The Indonesian start-up's headcount growth is significantly higher. It can afford and would like to hire 220 new employees in month 60. Due to the time to hire of 1.685 months, the effective number of new hires is 130 people. Thus the difference in hiring rate of the two start-ups is caused mainly by headcount growth and only to a lesser extent by

the time to hire variable. Since China and Indonesia have similar unemployment rates, the time to hire new staff for the two start-ups is only marginally different.

Greater difference lies in the turnover rate of the two start-ups. The Indonesian start-up's turnover rate of four people per month is twice higher than the Chinese start-up's turnover rate of 2 people per month. However, the human resource stocks and hiring rates of both start-ups have to be taken into account when evaluating the turnover rate. Compared to its relatively high hiring rate and the average turnover rate of 5 percent of the human resource stock, the Indonesian start-up's turnover rate is low. Only few staff leaves the start-up. This is due to Indonesia's strict labour market regulations. The severance pay for redundancy dismissal is 17.3 weeks in Indonesia which slows down the start-up's turnover process considerably. As a result, the Indonesian start-up keeps more staff than it actually needs. In contrast, China's labour market regulations are less strict and severance pay for redundancy dismissal amounts to only 4.3 weeks. The Chinese start-up can dismiss staff more easily and therefore has a high turnover rate in relation to its hiring rate and human resource stock.

Another important variable and human resource related performance indicator in the infrastructure management block is productivity. It measures the hours per month in which employees work productively and contribute to the creation of new product features. In the Chinese start-up, the productivity level per month and staff member is 204.53 hours while it is 201.66 hours in the Indonesian start-up. The productivity level of both start-ups is significantly higher than the average productivity of 140 hours per person and month which is due to the three institutional factors higher education, performance orientation and collectivism. The Chinese start-up's productivity level is marginally higher compared to the one of the Indonesian start-up since all three institutional factors are all slightly better in the Chinese than the Indonesian context. Productivity directly affects the variables engineering effort and sales effort and can therefore impact the product development rate and sales rate. Since productivity levels of the two start-ups are very similar, they do not explain the major differences in product feature and customer stock. As mentioned previously, the Indonesian start-up's product feature stock is three times the Chinese start-up's product feature stock. In addition, its sales rate and customer stock are higher than the ones of the Chinese start-up, despite the limitation in its market. The differences in product feature stock, sales rate and customer stock are caused by the human resource stock which is significantly larger in case of the Indonesian start-up. The Indonesian start-up has more employees and can therefore invest more time into engineering and sales efforts. As a result, it can develop more product features

and approach more customers than the Chinese start-up. However, this does not necessarily translate into superior financial performance as the next section will show.

4.2.4. Financial Aspects

Financial performance indicators are generally considered the most important indicators when comparing the performance of profit-oriented start-ups. They describe the financial results of the interplay between the other three blocks (product, customer, and infrastructure). The financial performance indicators of our Chinese and Indonesian start-up look as follows in month 60 of the simulation:

	Chinese Start-Up	Indonesian Start-Up
Cash	8,148,210 US\$	2,666,840 US\$
External Funding	13,658 US\$/month	13,624 US\$/month
Net Income	586,951 US\$/month	310,146 US\$/month
Revenues	1,760,700 US\$/month	1,958,570 US\$/month
Costs	1,173,750 US\$/month	1,648,430 US\$/month
Costs of Goods Sold	1,035,700 US\$/month	1,152,100 US\$/month
Total Salaries	138,042 US\$/month	496,325 US\$/month
Macroeconomic Growth (institutional factor)	7.7%	5.8%
Informal Investor Rate (institutional factor)	4.5%	5.4%
Legal Rights (institutional factor)	4	4
Media Attention (institutional factor)	71%	75%

Table 6: Financial performance

In the other three blocks, the Indonesian start-up tended to have a better performance than its Chinese counterpart. It has a more sophisticated product whose value proposition is better than the competition's, it has a greater number of customers and employees. However, its financial performance is inferior to the Chinese start-up's financial performance. In month 60, the Chinese start-up has accumulated a cash stock of more than US\$ 8 million which is more than three times the Indonesian start-up's cash stock. The cash stock is determined by the variables external funding and net income. The rate of external funding of both start-ups is about the same (the difference is only US\$ 34) since the four institutional factors affecting external funding are not very different and balance each other. In both countries, the four institutional factors increase the average investment of US\$ 10,000 by approximately 37 percent. External funding does play a role in increasing the start-ups' cash stock (especially

during the first months as discussed in section 4.1.) but the main source of cash for both start-ups is net income.

Net income describes the profit that the start-ups earn from producing and selling their products. The net income of the Chinese start-up amounts to US\$ 586,951 in month 60 which is significantly higher than the Indonesian start-up's net income of US\$ 310,146. This result is surprising since the Indonesian start-up performs better than the Chinese start-up in the three former blocks. The reason for this significant difference can theoretically be found in the variables revenues and costs. In the case of revenues, the Indonesian start-up still outperforms the Chinese start-up by approximately US\$ 200,000. This is consistent with the sales rate and customer stock of the Indonesian start-up. Since they are higher than the ones of the Chinese start-up, the Indonesian start-up has a higher number of revenues. Consequently, the difference in net income is caused by the costs variables. The Chinese start-up's monthly costs amount to US\$ 1,173,750, while the costs that the Indonesian start-up incurs in month 60 are at US\$ 1,648,430 indeed significantly higher. Even though the costs of goods sold of the Indonesian start-up are higher than those of the Chinese start-up, the difference is not significant taking into account the fact that the Indonesian start-up has a greater customer stock and sales rate. The major difference in the start-ups' cost structures can be found in the salary expenses. The total salaries of the Indonesian start-up are significantly more than those of the Chinese start-up (US\$ 496,325 versus US\$ 138,042). As discussed in the previous section, the Indonesian start-up employs more people than its Chinese counterpart. Thus it incurs higher total salary expenses which reduce its profit significantly.

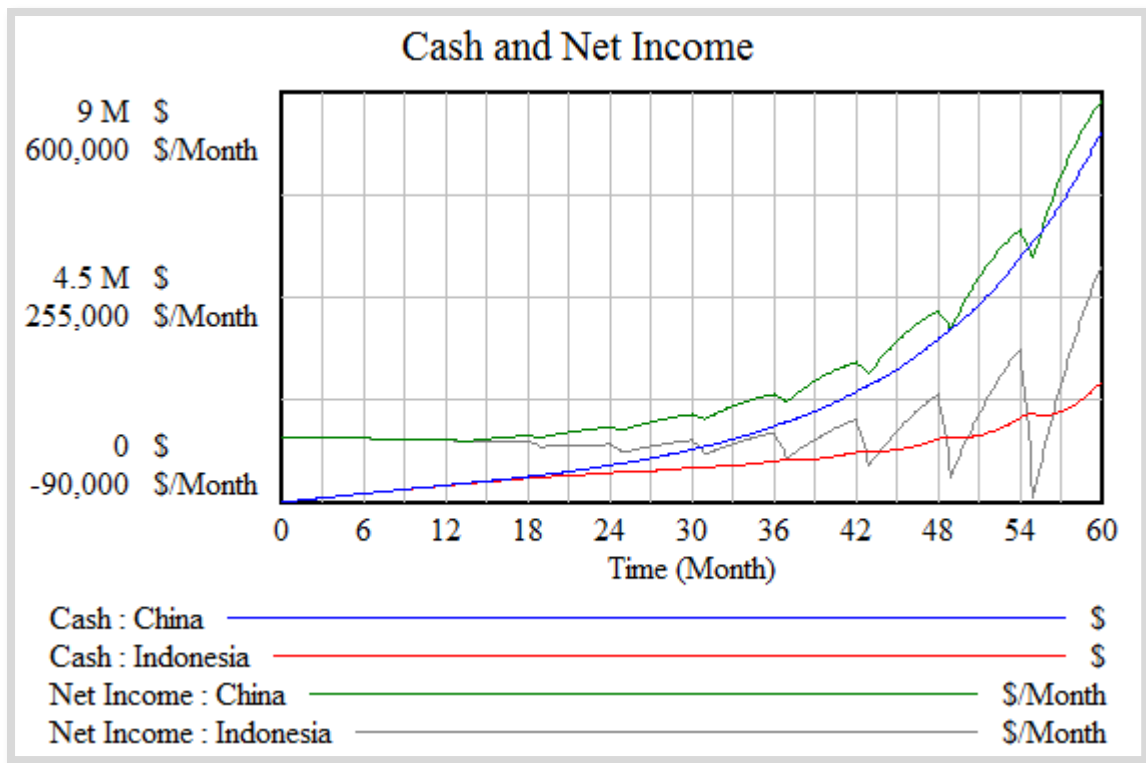


Figure 21: Cash and net Income of the Chinese and Indonesian start-up

Summary

Both start-ups succeeded in building a thriving information technology business that is still in the market and performing well after five years. They started with the same firm- and industry-specific conditions but in a different institutional environment. This resulted in differences in the four blocks product innovation and value proposition, customer relationship, infrastructure management and financial aspects. The Indonesian start-up performed better in the product related block and the customer related block. At the end of the simulation period, it had a more sophisticated product that was perceived to be of higher value than the competition's product offerings. It had a greater number of customers and sold to a higher percentage of reachable customers in its market every month. In the infrastructure management block which describes the start-ups' human resource related variables, the Indonesian start-up and the Chinese start-up performed very differently, too. However, it is not so clear which of the two start-ups' performance was better. The Indonesian start-up accumulated a greater stock of employees than the Chinese start-up. On one hand, this resulted in the Indonesian start-up's ability to develop more product features because more staff was available. On the other hand, it also incurred higher costs than the Chinese start-up since it had more employees to pay salaries to. Eventually, this led to a major difference in the financial performance of the two start-ups. The Chinese start-up's net income and cash stock,

the two most important financial performance indicators, were both higher than those of the Indonesian start-up. Even though the Chinese start-up had a less sophisticated product and a smaller number of customers, it outperformed the Indonesian start-up in financial terms. It had a leaner and more efficient human resource structure that was apparently a result of less strict labour market regulations. This is a subject of the following chapter that analyses the effect of labour market regulations and the other institutional factors on the basis of sensitivity analysis.

4.3. Sensitivity Analysis

The comparative analysis in the previous chapter revealed differences in the performance of the two start-ups and discussed the variables that are directly involved in producing these differences. System dynamics is a method to depict complex structures with variables that affect other variables in an indirect and oftentimes counterintuitive way. Sensitivity analysis helps to uncover these effects. In light of this thesis' start-up model and research questions, the following sensitivity analysis is focused on institutional factors and their effect on start-up performance. This does not only help explain differences in the performance of the Chinese and Indonesian start-up but also allows identifying the most critical institutional factors influencing start-up performance.

4.3.1. Formal Institutions

Formal institutional factors affect variables in all four blocks of the system dynamics start-up model. In order to analyse their effect, each institutional factor is tested separately by changing its value to a (near) maximum and (near) minimum that can also be negative. Results are compared through the financial performance indicators cash stock and external funding and the non-financial performance indicator customers stock. Both the Chinese and the Indonesian start-up models are used as base models for testing maximum and minimum levels. The base month is the last month of the simulation period (month 60).

Cash Stock

The formal institutional factors that have the closest connection to the cash stock are legal rights, macroeconomic growth and informal investor rate. They affect the rate of external funding which has direct impact on the cash stock. Despite their proximity, none of these three institutional factors shows a very significant effect on the cash stocks of the two start-ups. Both start-ups are more sensitive to other institutional factors which are not closely connected to the cash stock. For example, the Chinese start-up is highly sensitive to changes in technology adoption, unemployment rate, labour market regulations and higher education. If technology adoption (i.e. the number of internet users) is 100 percent, the Chinese start-up's cash stock increases by more than US\$ 11 million from the base value of US\$ 8,148,210 (technology adoption level of 45.8 percent; see chapter 4.1.1. for details). Consequently, an improvement of internet access in China would definitely support the start-up's performance and growth.

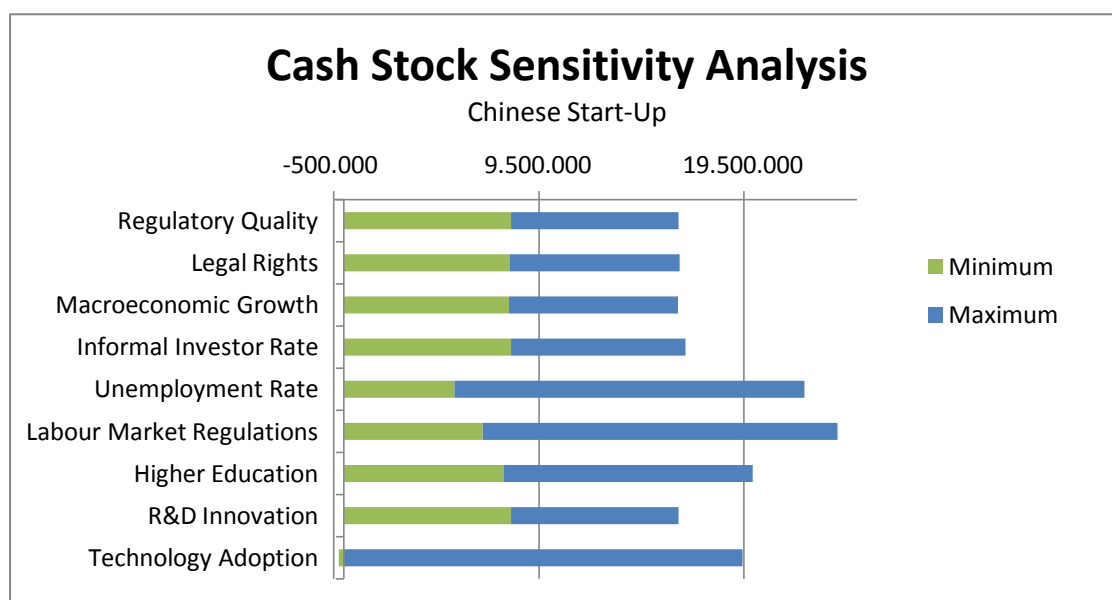


Figure 22: Cash stock sensitivity analysis in the Chinese institutional environment

Interestingly, the Chinese start-up is also very sensitive to changes in unemployment rate and labour market regulations. Its cash stock increases significantly if either of those two institutional factors is high. A high unemployment rate enables the start-up to hire employees faster as the pool of qualified people it can choose from is greater. Stricter labour market regulations (i.e. a higher value of the labour market regulations variable) increase the start-up's cash stock too. Both institutional factors result in a larger human resource stock that in turn develops more product features and puts more effort in selling the product. This increases the number of customers, revenues and, finally, the cash stock. Apparently, the additional

salary expenses that the start-up incurs for employing more staff do not reduce its net income and the cash stock. The comparative analysis in the previous chapter showed that the Indonesian start-up performed worse financially than the Chinese start-up because its human resources stock and the resulting salary expenses were too high. The Chinese start-up is able to handle a large human resources stock and its financial consequences better than the Indonesian start-up. The reason for this is likely to be differences in the start-ups' productivity levels. The Chinese start-up team is more productive and creates more output than the Indonesian team which results in a better financial performance. These results indicate that the Chinese start-up does not have the most efficient human resources strategy in the base model. Since it cannot rely on a high unemployment rate and strict labour market regulations in order to improve its financial performance, the Chinese start-up needs to reduce its turnover rate and employ more qualified staff. However, finding qualified staff does not only depend on the start-up's attractiveness as an employer but also on the education level in the country. As the sensitivity analysis of the cash stock shows, the Chinese start-up is sensitive to the institutional factor higher education. A maximum value of higher education (100 percent of the population attained a tertiary education level) increases the cash stock by more than 50 percent as compared to the base model (higher education rate of 8.8 percent). This is due to the fact that higher education raises the start-up's productivity level which results in more product features at no additional costs. A perfect higher education rate is of course not realistic, however even small improvements in the number of university graduates and graduates from other forms of tertiary education will benefit the start-up.

The Indonesian start-up is even more sensitive to higher education than the Chinese start-up. In case of perfect higher education (100 percent of population), its cash stock more than doubles from its value in the base model (7.9 percent). Consequently, the Indonesian start-up will benefit even more from an increase in education level in the country. Besides higher education, the Indonesian start-up is extremely sensitive to the institutional factor technology adoption. In the base model, the Indonesian start-up only reaches 15.8 percent of its potential customers since only 15.8 out of 100 people have internet access in Indonesia. This represents a major limitation to the start-up's success and growth potential. If technology adoption is perfect, the start-up can reach 100 percent of its pre-defined market and therefore increase its customer base, net income and cash stock dramatically. From about US\$ 2.6 million in the base model, its cash stock rises to US\$ 47 million in the maximum technology adoption case.



Figure 23: Cash stock sensitivity analysis in the Indonesian institutional environment

Unlike the Chinese start-up, the Indonesian start-up is not sensitive to changes in unemployment rate and labour market regulations. This might be due to the fact that it employs enough staff in the base model so that more employees do not make a significant difference and less employees result in inefficiencies. Both start-ups' cash stock is only marginally sensitive to changes in the other institutional factors regulatory quality, legal rights, macroeconomic growth, informal investor rate and R&D innovation.

External Funding

External funding is a rate that increases the cash stock in the system dynamics model. It includes all kinds of funds that the start-ups obtain from external sources such as venture capital and bank loans. As the country-specific results indicated, external funding only plays an important role in the first few months of the Chinese and Indonesian start-ups. Afterwards, both start-ups primarily finance themselves with the net income they generate by selling their products. However, external funding can have an important signalling effect and is therefore considered a start-up performance indicator. The attention and investments by outside investors signal that the start-up is legitimate and create awareness among the public. In the system dynamics model, external funding is only sensitive to the three formal institutional factors legal rights, macroeconomic growth and the informal investor rate. Both the Chinese start-up and Indonesian start-up show similar sensitivity levels as the figure 24 and 25 illustrate.

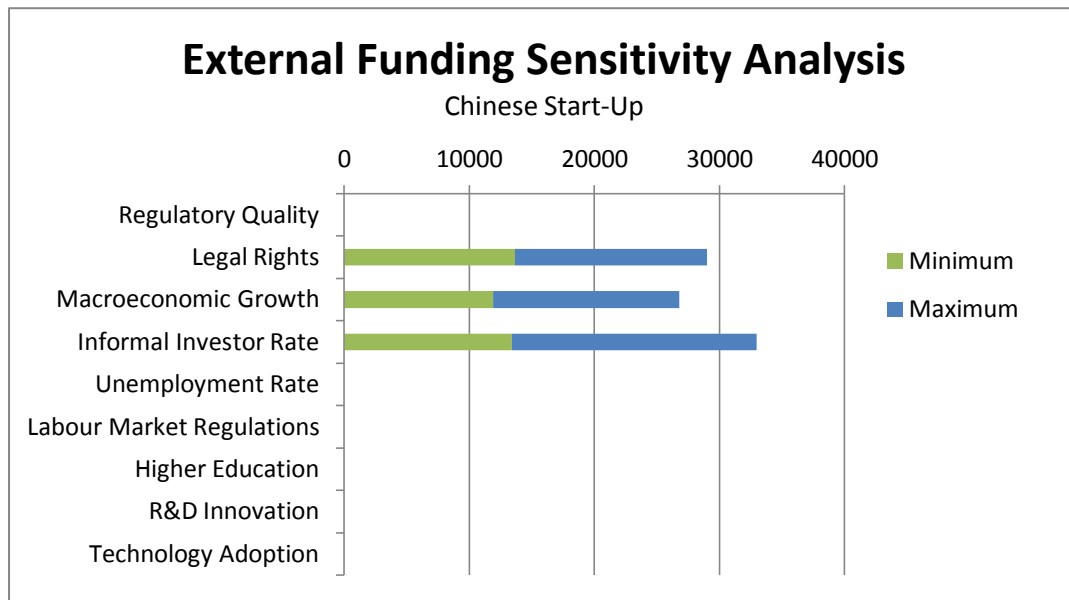


Figure 24: External funding sensitivity analysis in the Chinese institutional environment

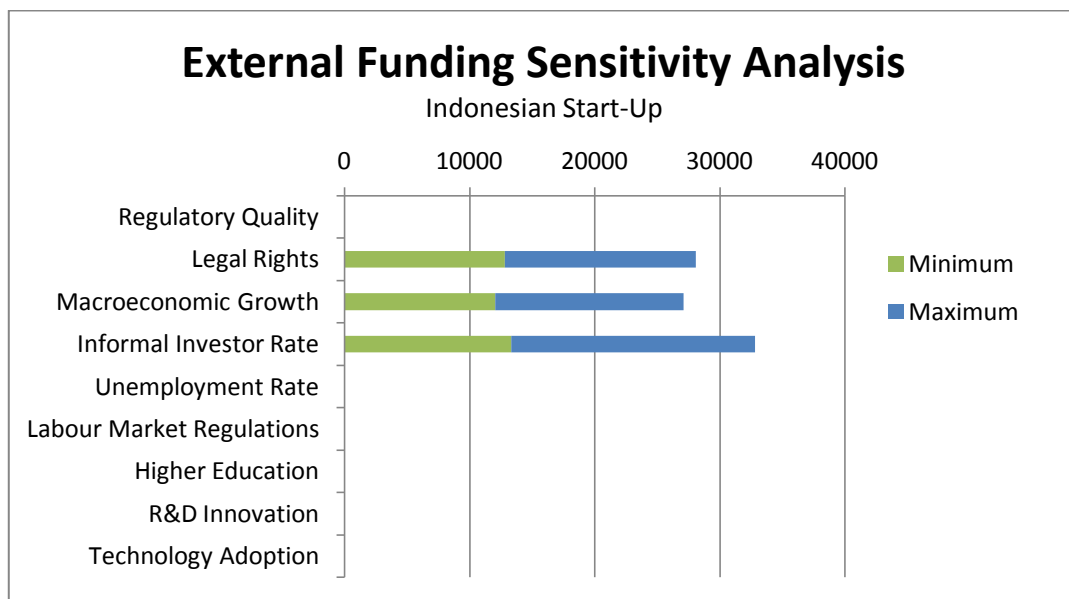


Figure 25: External funding sensitivity analysis in the Indonesian institutional environment

External funding is most sensitive to the informal investor rate. Thus, if 100 percent of the population privately invest in businesses, the start-ups' external funding is 50 percent higher than in the base model. This translates to an increase in cash stock of about US\$ 370,000 for both start-ups. The impact of changes in legal rights and macroeconomic growth on external funding are less significant. The maximum effect that perfect legal rights (12 out of 12) and extraordinary macroeconomic growth (20 percent annual growth) can have is an increase in external funding by about US\$ 2,000 and US\$ 3,000 per month, respectively.

Customers Stock

Customers stock is a non-financial performance indicator. It is included in the sensitivity analysis in order to identify those formal institutional factors which contribute to the popularity of the start-ups' products. The product's popularity as indicated by a high number of customers does not always automatically result in higher net income and a greater cash stock. As the comparative analysis showed, this is the case if the start-ups' salary expenses are high. For the Chinese start-up, the sensitivity analysis of the customers stock does not differ significantly from the sensitivity analysis of the cash stock. The Chinese start-up's customers stock is most sensitive to unemployment rate, labour market regulations, technology adoption and, to a lesser extent, to higher education. Maximum levels of all these institutional factors increase the Chinese start-up's customers stock. Unemployment rate and labour market regulations increase the number of employees in the start-up that in turn develop more product features. More product features increases the start-up's value proposition and product attractiveness which results in a higher number of sales and customers. Compared to the cash stock, these two institutional factors have an even more significant impact on the customers stock. This is because salary expenses and external funding dampen their effect on the cash stock. Technology adoption also increases the start-up's customers stock by expanding its market size. Legal rights, macroeconomic growth and informal investor rate do not have any impact on the customers stock.

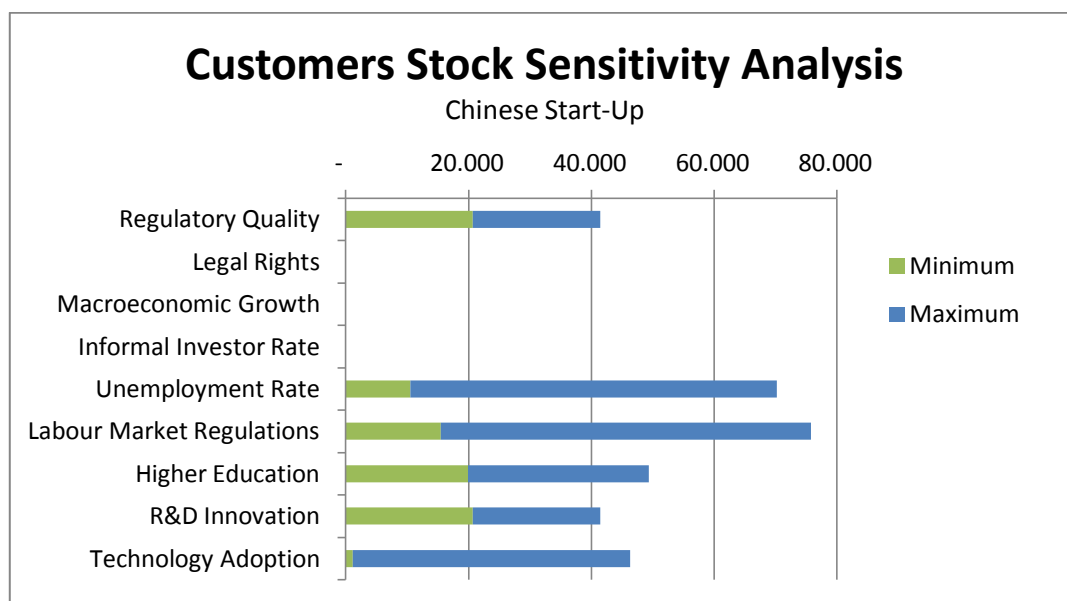


Figure 26: Customers stock sensitivity analysis in the Chinese institutional environment

The institutional factors in the Indonesian start-up model behave similarly to those in the Chinese model. The customers stock is most sensitive to technology adoption, unemployment

rate and labour market regulations due to the same reasons as mentioned above. The Indonesian start-up is extremely sensitive to technology adoption. It has a highly attractive product and a value proposition which is superior to the one of its competition, which results in a high sales rate. However, in the base model, technology adoption is very low, so the Indonesian start-up can reach only a small percentage of its potential customers. When technology adoption is perfect, the high sales rate translates into a vast customers stock. This behaviour is reflected in the cash stock as well. In regard to unemployment rate and labour market regulations, the customers stock and cash stock behave differently. While the customers stock is highly sensitive to these two institutional factors, the cash stock is not. This is due to the fact that high salary expenses that are a result of maximum values in unemployment rate and labour market regulations compensate for their effect on the cash stock.

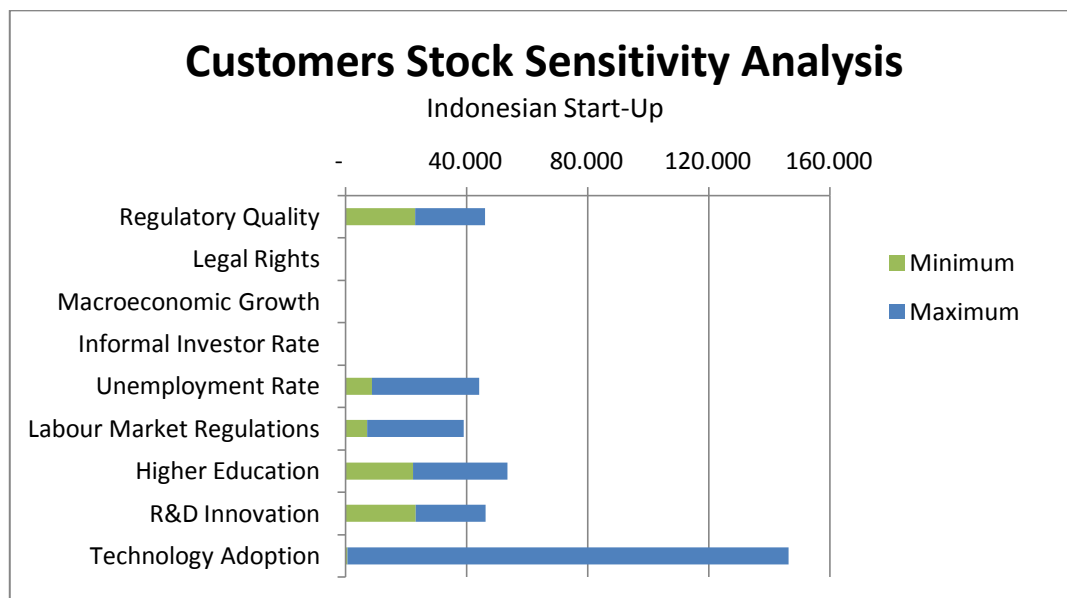


Figure 27: Customers stock sensitivity analysis in the Indonesian institutional environment

4.3.2. Informal Institutions

The system dynamics model includes four informal institutional factors representing non-regulatory and cultural practices in China and Indonesia. They have direct impact on the three variables productivity, product development and external funding. The following sensitivity analyses measure their impact on the financial performance indicator cash stock and the non-financial performance indicator product features stock. Like in the sensitivity analyses of the formal institutional factors, the values of the four informal institutional factors are changed to maximums and minimums in order to best study their effect on the performance indicators. The Chinese and Indonesian models are used as base models, the base month is month 60.

Cash Stock

From the four informal institutional factors, the Chinese start-up's and especially the Indonesian start-up's cash stocks are most sensitive to performance orientation. If the value of performance orientation is 7 (the maximum), both start-ups' cash stocks rise by more than US\$ 1 million as compared to the base models and by more than US\$ 3 million as compared to the minimum performance orientation scenario (performance orientation of 1). A high value of performance orientation improves the start-up's productivity which results in a higher number of product features without generating additional costs. This leads to a higher degree of product attractiveness and more sales which increase the start-up's revenues.

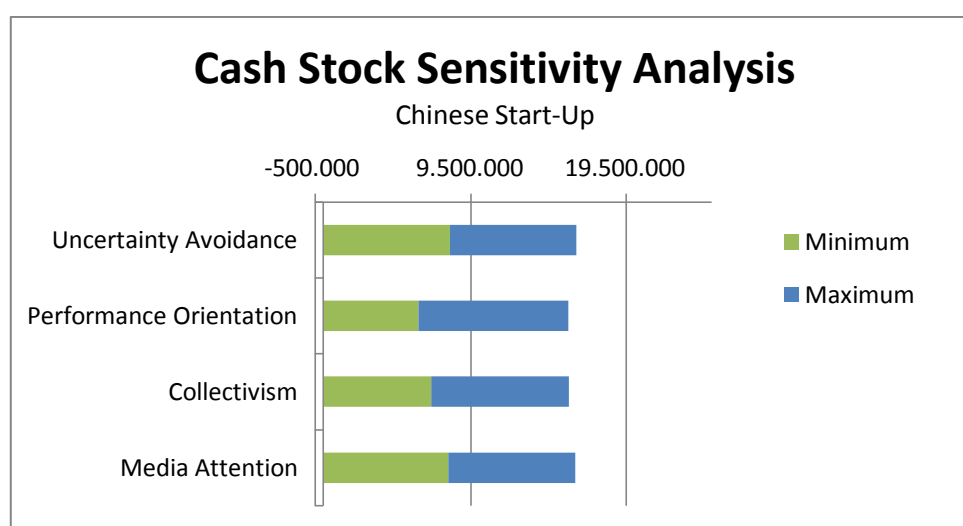


Figure 28: Cash stock sensitivity of Chinese informal institutions

The second informal institutional factor both start-ups are sensitive to is collectivism. Like performance orientation, a high value of collectivism positively affects productivity. The maximum value of collectivism (7 on a scale from 1 to 7) produces an increase of about US\$ 700,000 in both start-ups' cash stocks as compared to the base models. The Indonesian start-up is more sensitive to collectivism than the Chinese start-up because its cash stock and its value of collectivism in the base model are smaller than those of the Chinese start-up (the same applies to performance orientation). In regard to uncertainty avoidance, the maximum value of 7 indicates that the society the start-ups are embedded in avoid all kinds of uncertainties which negatively affects the start-ups' product development rates. By contrast, the minimum value of uncertainty avoidance (1 on a scale from 1 to 7) implies that the start-ups are not afraid to take risks and therefore develop a greater number of new product features in short time. Neither of the two start-ups is particularly sensitive to uncertainty avoidance. The minimum value of uncertainty avoidance produces a negligible difference of

approximately US\$ 25,000 (Chinese start-up) and US\$ 22,000 (Indonesian start-up) in cash stock.

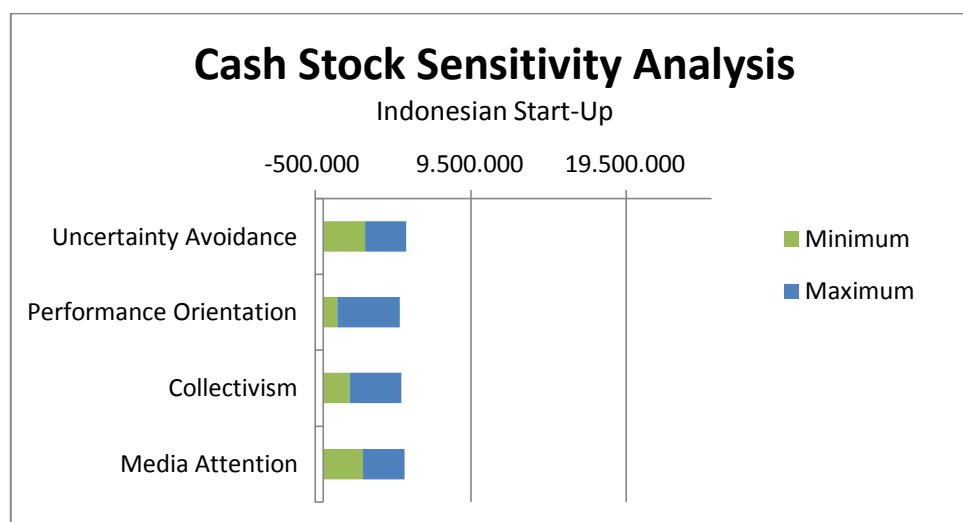


Figure 29: Cash stock sensitivity of Indonesian informal institutions

Media attention, the fourth informal institutional factor in the system dynamics model, affects the cash stock through the rate of external funding. Its maximum value of 100 percent increases the cash stock of the Chinese and Indonesian base models by 0.5 percent and 1.4 percent, respectively. The cash stock's sensitivity to media attention is about the same as to legal rights and macroeconomic growth. Media attention and legal rights are the two institutional factors affecting external funding that both start-ups are least sensitive too.

Product Features

The stock of product features indicates how efficient the start-up's employees are at developing new product features. Efficiency at product development can be a result of a high level of productivity, a large human resources stock or a low degree of uncertainty avoidance. Controlling the human resources stock, the sensitivity analysis of the product feature stock tests the impact of uncertainty avoidance, performance orientation and collectivism. In both start-ups, uncertainty avoidance creates greater changes in the product features stock than the other two institutional factors when altered to a maximum and minimum level. Its impact on the product features stock is also more significant than the impact of the formal institutional factor R&D innovation which also directly affects the product development rate in the model. At the minimum level of uncertainty avoidance, the Chinese start-up develops 47, the Indonesian start-up 105 more product features than in the base scenario (80 and 259 features, respectively).

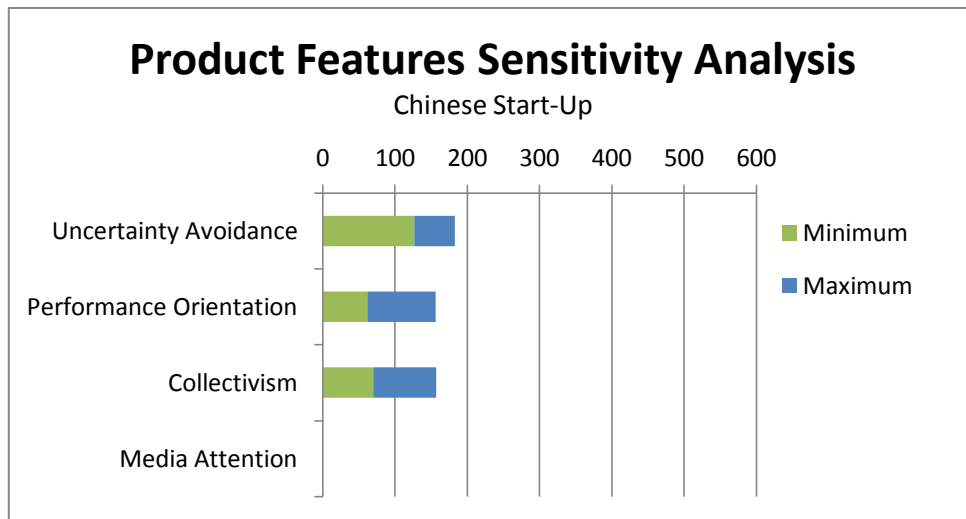


Figure 30: Product features stock sensitivity of Chinese informal institutions

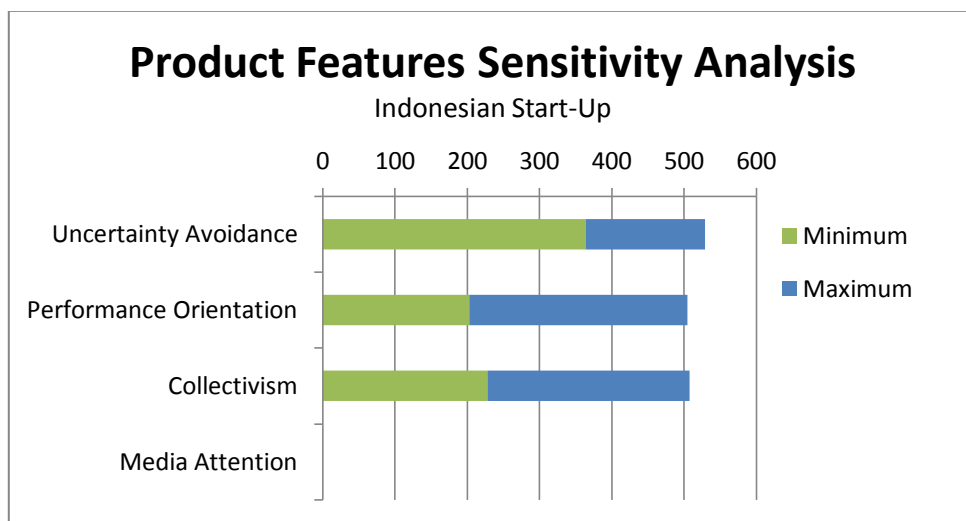


Figure 31: Product features stock sensitivity of Indonesian informal institutions

The effect of performance orientation and collectivism on the stock of product features is relatively small. The difference between maximum (7) and minimum (1) values of performance orientation amounts to 32 features in the Chinese start-up and 99 features in the Indonesian start-up. For collectivism, this difference is even smaller: 17 features in the Chinese and 52 in the Indonesian start-up. However, as the cash stock sensitivity analysis showed, performance orientation and collectivism have a greater impact on the cash stock than uncertainty avoidance. Apparently, a higher number of product features as caused by a low level of uncertainty avoidance does not automatically result in a better financial performance. Performance orientation and collectivism do not only affect the product development rate, but also engineering effort and sales effort which impact product

attractiveness and the sales rate, respectively. Consequently, they affect the cash stock through various channels and therefore result in higher accumulations of cash.

Summary

This section tested and discussed the impact of formal and informal institutional factors in the start-up model on financial and non-financial performance indicators. The three institutional factors that Chinese start-up is most sensitive to are technology adoption, unemployment rate and labour market regulations. Increases in the values of these institutional factors result in a better financial and non-financial performance of the Chinese start-up. The Indonesian start-up is most sensitive to technology adoption, higher education and performance orientation. Changes in the values of these institutional factors create vast differences in the start-up's performance. Especially changes in technology adoption have a very significant impact on the Indonesian start-up's cash stock and customers stock. This is also true for the Chinese start-up but the difference is not as extreme as in the Indonesian start-up. The Indonesian start-up's sales rate relative to the number of customers it can effectively reach (market size * technology adoption) is very high due to its increased sales effort. As a result, when technology adoption increases, it can sell to even more customers than before which increases the cash stock and customers stock significantly. Since technology adoption in the base model is only 15.8 percent of Indonesia's population, there are still a great number of potential customers which the start-up could sell to once they have access to the internet. The same effect applies to the Chinese start-up, but to a smaller extent. The Chinese start-up's sales rate relative to the number of customers it can effectively reach (market size * technology adoption) is lower than the one of the Indonesian start-up. In addition, China's technology adoption is 45.8 percent which is higher than in Indonesia but still leaves a lot of room for future sales.

The Chinese start-up's sensitivity to unemployment rate and labour market regulations are a result of a rather inefficient human resources strategy in the base model. The Chinese start-up could increase its profit and cash by employing more staff but it has difficulties to do so in the base model. The Indonesian start-up does have enough employees, but their productivity is rather low. As a result, the Indonesian start-up is sensitive to increases in higher education and performance orientation, two variables affecting productivity. The institutional factors that both start-ups are least sensitive to are R&D innovation and regulatory quality. The Chinese start-up is more sensitive to formal than informal institutional factors while the sensitivity of the Indonesian start-up to formal and informal institutions is mixed. As

mentioned above, the Indonesian start-up is quite sensitive to performance orientation and, to a lesser extent, to collectivism. These results again show differences between the Chinese and Indonesian start-up and support the theory on the influence of the institutional environment on start-up performance.

4.4. Discussion of Findings

This chapter discusses the findings of this thesis and makes connections between the results of the analysis, the theoretical framework and the two research questions. The discussion is presented in five sections. First, the performance of technology based start-ups in China and Indonesia is discussed and compared. This will allow to subsequently answer the first research question. The findings on institutional factors affecting the performance of technology based start-ups in China and Indonesia will follow. These findings constitute the basis for answering the second research question. Next, a strategy recommendation for start-ups in China and Indonesia will be given. Similarly, policy recommendations with the objective of improving the situation of start-ups in both countries are then presented. Finally, the limitations of this thesis are discussed.

The Performance of Technology Based Start-Ups in China and Indonesia

According to the strategy tripod by Peng et al. (2008; 2009) discussed in the theoretical framework of this thesis, the performance of a start-up is a result of firm-specific, industry-specific and institutional factors. The system dynamics start-up model developed in the empirical part of this thesis integrates all three kinds of factors. Its basis is the business model of an information technology start-up whose most important resources are its employees. The system dynamics model also integrates characteristics of the information technology industry such as short product (feature) life cycles, intense competition, high fixed and low variable costs and high margins. Institutional factors in the system dynamics model describe the relevant institutional environment the start-up is embedded in. Formal institutions represent regulatory, oftentimes government influenced factors while informal institutional factors describe normative, cultural factors. Among the formal institutional factors included are regulatory quality, legal rights, macroeconomic growth, informal investor rate, unemployment rate, labour market regulations, higher education and technology adoption. Informal institutions are represented by uncertainty avoidance, performance orientation, collectivism and media attention. The system dynamics model controls firm- and industry-specific factors in order to determine in which institutional environment, the Chinese or Indonesian

environment, a technology based start-up is more likely to succeed. The duration of the simulations is 60 months.

The country-specific results and comparative analysis showed that both start-ups survive the first five years of being in business and are profitable throughout the simulation period. In financial terms, the start-up in the Chinese institutional environment performs better than the start-up in the Indonesian context. It achieves a higher net income and accumulates more cash over the simulation period. According to non-financial performance indicators, the Indonesian start-up performs better than the Chinese start-up. Its product is more sophisticated and it has more customers and employees than the Chinese start-up. Furthermore, its value proposition is better than the competition's value proposition. This is mainly due to the fact that the Indonesian start-up employs more staff than the Chinese start-up. A closer look on the reasons for the superior performance of the Indonesian start-up in terms of non-financial indicators reveals that the Indonesian start-up only has a more sophisticated product and more customers because its number of employees is higher than the one of the Chinese start-up. Its productivity level which also affects product sophistication is not higher than the Chinese start-up's productivity level. Similarly, its larger customer base is only a result of an increased sales effort due to a higher number of sales employees. Consequently, the Indonesian start-up incurs higher costs than the Chinese start-up due to its high number of employees. The additional revenues it generates from selling to more customers than the Chinese start-up are significantly reduced by its salary expenses. As a result, its financial performance is inferior to the financial performance of the Chinese start-up. The Chinese start-up is therefore considered to be more successful than the Indonesian start-up even though its product has less product features and its customer stock is smaller. The Chinese start-up is more of a "lean start-up" than its Indonesian counterpart and achieves a better financial performance by being economical with its resources.

Institutional Factors Affecting Start-Up Performance in China and Indonesia

The institutional theory by North (1990) was used as the basis for describing and modelling the institutional environment with system dynamics. The impact of formal and informal institutions on start-up performance was then tested with a sensitivity analysis. The institutional factor which has the most significant impact on the performance of technology based start-ups in China and Indonesia is technology adoption. In the system dynamics model, technology adoption is represented by the percentage of the population who have internet access and affects the effective market size of the start-up. The initial market size of both the

Chinese and the Indonesian start-up is set at 30,000 potential customers per month. However, the effective market size is reduced since only a certain percentage of these people (45.8 percent in China, 15.8 percent in Indonesia) have internet access, a requirement for purchasing and using the start-ups' products. Raising the number of customers the start-up can sell to by improving technology adoption results in a significant increase in both start-ups' net income and cash stock. As the discussion of the start-up ecosystem in China and Indonesia showed, the governments of both countries have confirmed initiatives on infrastructure projects. These infrastructure projects are designed to improve internet access and internet speed and increase the number of internet users. According to the system dynamics model, both start-ups would greatly benefit from an increase in internet users.

After technology adoption, the Chinese start-up is most sensitive to changes in unemployment rate and labour market regulations while the Indonesian start-up is most sensitive to changes in higher education and performance orientation. The Chinese start-up's sensitivity to unemployment rate and labour market regulations are a result of a rather inefficient human resources strategy. The Chinese start-up could increase its profit and cash by employing more staff but it has difficulties to do so. This reflects the problems pointed out in the description of the tech start-up landscape in China. Working at start-ups is less attractive to Chinese graduates than working at established companies. Consequently, it is difficult for start-ups to hire new and keep existing employees. In the system dynamics model, a high unemployment rate and strict labour market regulations would make it easier for the start-up to hire new and keep present employees. However, these institutional factors cannot be influenced by the start-up and the government is very unlikely to seek an increase the country's unemployment rate. The government might tighten labour market regulations but this would probably benefit the start-up only in the short term. A better solution would be to promote a positive attitude towards entrepreneurship, working at start-up companies and failure. The announced government measure to provide psychological counseling to entrepreneurs who failed is a step in the right direction (Gao 2015).

On the other hand, the Indonesian start-up does have enough employees, but their productivity is rather low. As a result, the Indonesian start-up is sensitive to an increase in higher education and performance orientation, two variables affecting productivity. Employees with a higher education level are assumed to work more efficiently and therefore create more and better product features for the start-up. This finding is consistent with the description of the start-up ecosystem in Indonesia. There is a lack of experienced talents and in particular engineers in Indonesia. This makes it difficult for start-ups to find qualified staff.

Performance orientation reflects how ambitious the population and therefore the start-up employees are. Ambition reflects a need for achievement and motivates people to work hard (Javidan 2004, p. 239). As these two are institutional factors, they cannot be changed by the start-up itself. The start-up may try to cooperate with universities in order to hire the best talent. However, it is upon the government to increase the education level of the population and the quality of education. Performance orientation is an informal institution which can hardly be regulated by the government since it reflects the country's culture that has evolved over many years.

In summary, the performance of technology based start-ups in China is most affected by the institutional factors technology adoption, unemployment rate and labour market regulations. In Indonesia, the institutional factors which have the most significant impact on the performance of technology based start-up are technology adoption, higher education and performance orientation.

Start-Up Strategy Recommendation

After having identified the most relevant variables and institutional factors to the performance of technology based start-up in China and Indonesia, this thesis can give a strategy recommendation for technology based start-ups in these two countries. According to the strategy tripod (Peng et al. 2009, p. 72), the final performance of a firm is a combination of factors from the resource-, industry- and institutional-based view. However, knowing how the institutional environment affects their performance, technology based start-ups can adapt their resources, capabilities, core competencies and business model in order to achieve better outcomes. As the sensitivity analysis showed, both start-ups in the Chinese and in the Indonesian institutional environment are sensitive to technology adoption. Increases in technology adoption lead to a better performance of both start-ups. However, the start-ups themselves cannot increase technology adoption as it is an institutional factor. What they can do is improving their sales rate relative to the number of customers they can effectively reach (market size * technology adoption). For example, the Chinese start-up sells to only about 25 percent of its effective market size in its best sales month (month 55). This shows that there is a lot of room for improvement and potential for an increase in revenues and net income. In order to improve its sales rate, the Chinese start-up needs to employ more people and raise its sales effort. As its sensitivity to labour related institutional factors showed, the Chinese start-up's human resources structure is rather inefficient and could be improved by hiring and keeping more employees. Another way to improve the start-up's sales rate is offering a better

value proposition. This can be achieved by raising engineering effort (e.g. by employing more people or improving productivity) and/or changing its pricing strategy (e.g. lowering the desired profit margin). For the latter option, the start-up would need to thoroughly study the Chinese information technology industry and its competitors' strategies, both of which were simplified in this thesis.

In contrast, the Indonesian start-up sells to 82 percent of its effective market size. It can try to optimize this rate by improving its sales effort. However, as the room for improvement in sales rate is relatively small, it can focus its strategy on the human resources block. Unlike the Chinese start-up, it has enough employees (probably even too many) but their productivity level is not very high. An increase in productivity results in a higher engineering and sales effort without causing additional costs. However, productivity is dependent mainly on institutional factors that the start-up cannot influence. In the system dynamics model, the only way the start-up can improve its productivity is by hiring the best qualified and talented employees whose productivity is above average. In reality, these high potentials are likely to demand above average salaries which the start-up will maybe not able to pay. 'Real world' strategies to improve productivity that are not considered in the system dynamics model include incremental improvements of work space, working hours, start-up processes, team work organisation, etc. These strategies concern very detailed firm-level factors which have been left out in the system dynamics model.

Policy Recommendation

Entrepreneurship and technological innovation are central drivers of economic growth (Acs 2007; Pathek et al. 2013). Technology based start-ups combine these two characteristics. They can create jobs, promote competition, and contribute to an increase in national productivity and to technological change. However, many start-ups have difficulties to stay in the market and eventually fail before they can have a positive impact on the country's economy and create value for society (Quatraro & Vivarelli 2014, p. 3). Governments and policy makers can support technology based start-ups by creating a start-up friendly institutional environment. This thesis identified institutional factors to which technology start-ups in China and Indonesia are very sensitive. In other words, changes in these institutional factors can result in major improvements or deterioration of the start-ups' performance. Technology adoption was identified as the most crucial institutional factor for successful start-up performance.

In China, technology adoption amounted to 45.8 percent which means that slightly less than half of the Chinese population had access to the internet in 2013 (The World Bank 2015e). However, improvements in technology adoption have been significant in recent years. In 2005, only 8.5 percent of the Chinese population had internet access while in 2010 it was already 34.3 percent (ibid). According to Miao Wei, the Chinese minister of industry and information technology, vast improvements in internet infrastructure are also planned for 2015 and the next years (Xinhua 2015). Technology based start-ups will certainly profit from these improvements. Furthermore, Chinese start-ups would benefit from easier access to funding in the early stage development phase. Very young start-ups tend to suffer from liquidity constraints which can impede their growth. The Chinese banking system favours established companies over entrepreneurial venture when it comes to lending money. What is more, venture capital companies often lack technical, product or market understanding to evaluate early-stage start-ups and therefore tend to invest in start-ups that are already rather established (Evdemon 2013).

According to the system dynamics model, technology based start-ups in Indonesia are even more sensitive to changes in technology adoption than their Chinese counterparts. In Indonesia, technology adoption in 2013 was significantly lower than in China, only 15.8 percent of the population had internet access (The World Bank 2015e). In addition, improvements in internet infrastructure in Indonesia have been smaller than in China. In 2005, 3.6 percent of the population had internet access while this number increased to 10.9 percent in 2010 (ibid). Besides a poor internet infrastructure, another reason for the low number of Indonesian internet users is believed to be the inability to afford data (Ericsson et al. 2014). Thus the government should not only focus on improving internet infrastructure but also on making data plans affordable. For example, this could be achieved by increasing competition in information technology and telecommunication industries.

These are just a few policy recommendations for improving technology adoption in China and Indonesia from which technology based start-ups could benefit. These recommendations would of course need to be thoroughly evaluated before implementing any concrete policies.

Limitations

As any academic paper, this thesis has certain limitations that need to be taken into account when interpreting its findings. First, it simplifies the reality of technology based start-ups in China and Indonesia. The system dynamics model developed in the second part of this thesis is a simplified representation of a generic technology based start-up in its institutional

environment and does not include all firm- and industry-specific characteristics and institutional factors which might influence the start-up's performance. In addition, the relationships between these factors are simplified as well. In reality, they are likely to be much more complex. Second, firm- and industry-specific factors have the same values for the Chinese and Indonesian start-up in the system dynamics model. In reality, these factors are likely to differ between start-ups in two different countries. As the start-up founders have different cultural backgrounds, values and education, they might organise their start-ups differently. The structure and characteristics of the information technology industry in China and Indonesia are also very likely to be different from each other. In the system dynamics model, they have been heavily simplified and assumed to be the same in both countries. Third, there are likely to be local differences too. China and Indonesia are both very large countries with numerous regions, some of which even have different ethnicities, cultures and languages. Thus firm- and industry-specific and even institutional factors might differ across these regions. Furthermore, secondary data has been used for the values of institutional factors in the system dynamics model. Even though the data and indicators used have been carefully examined and selected, the lack of primary data still represents a limitation to this thesis. What is more, the start-up model has not been tested with real start-ups. Case studies with examples of real start-ups would have significantly strengthened the significance of this thesis' results. However, collecting sensitive business data from start-ups and conducting in-depth case studies would have gone beyond the scope of this thesis. A PhD thesis could draw on these aspects as it offers much scope for extensive data collection and detailed analyses.

5. Conclusion

This thesis discussed the effect of institutional factors on the performance of technology based start-ups in China and Indonesia. It started out with a theoretical framework on firm strategy in emerging economies, the influence of institutions on firm performance in emerging economies, and on firms as systems. The strategy tripod by Peng et al. (2008; 2009) was the basis of the theoretical framework of this thesis. It is a holistic theory on the strategic management of firms and combines the resource-based view, industry based-view and institution-based view of the firm.

In regard to technology based start-ups, the resource-based view revealed that their most important resources are human resources since technology based start-ups depend heavily on technological knowledge and skills to create unique firm capabilities and competitive products. Managing their human resources efficiently may even substitute for a lack of resources in other areas. The start-ups' organisational structure plays an important role in this regard as it affects cooperation and coordination within teams which are both crucial for developing synergies and creating competitive products. Finally, the start-up's resources, capabilities, core competencies and organisational structure need to be translated into a business model. The theory on e-business models by Osterwalder & Pigneur (2004) has been chosen to describe the simplified business model of a technology based start-up. It is based on four pillars (product innovation and value proposition, customer relationship, infrastructure management, financial aspects) which have been implemented in the system dynamics model of a start-up in chapter 3.

The industry-based view of technology based start-ups described the main characteristics of the information technology industry. Companies, including start-ups, operating in the information technology industry face intense competition and significant uncertainty as the life cycle of information technology products is short and technologies change rapidly. Due to easy access to information, entry barriers are decreasing and the imitation and copying of information technology products are easy which can result in violations of intellectual property rights. In regard to costs and pricing, information technology products have high fixed costs but low marginal costs. First time production is expensive but reproduction is comparatively cheap.

The third pillar of the strategy tripod, the institution-based view, was discussed more thoroughly as it represents the main topic of this thesis. The discussion was primarily based on North's (1990) institutional theory. Previous research on technology based start-ups has often taken the institutional context for granted and assumed that once an entrepreneur finds

an opportunity, the institutional context will be supportive (Woolley 2014, p. 741). However, the institutional context of technology entrepreneurship in emerging economies is not always supportive and can affect start-ups in various ways. Technology based start-ups in emerging economies often face challenges in regard to the enforcement of (intellectual) property rights, laws and regulations, corruption and bureaucracy and financial possibilities. In addition, it can be difficult for technology based start-ups in emerging economies to find and keep qualified labour as employees with higher education are rare. What is more, the technological infrastructure is still underdeveloped or even restricted by authoritative governments in some emerging economies. Besides these formal institutional factors, the performance of technology based start-ups can also be affected by informal institutional factors such as the country's culture, customs and values. In regard to technology entrepreneurship, the informal institutional factors most prominent in research are cultural aspects such as uncertainty avoidance, fear of failure, performance orientation, individualism and collectivism (Salimath & Cullen 2010). Uncertainty avoidance and fear of failure were found to impede entrepreneurship and restrict post-entry growth of start-up businesses. In contrast, performance orientation affects start-up performance in a positive way as it spurs entrepreneurs to strive hard. Contrary to common belief, collectivism does not necessarily have a negative effect on entrepreneurship. It may even affect the performance of start-ups in a positive way. Media attention was the fourth informal institutional factors discussed in this thesis. It affects the performance of start-ups by providing start-ups with legitimacy and increasing social transparency. As Busenitz et al. (2000, p. 995) put it, formal and informal institutions need to be seen together in order to explain firm performance and cross-national differences in entrepreneurship.

The last pillar of this thesis' theoretical framework was system theory. The discussion of system theory provided the basis for understanding the start-up model developed in chapter 3. From a system theory perspective, a technology based start-up is seen as a system that is part of larger systems such as the information technology industry, the business sector, the economy, etc. It constantly interacts with its environment and is controlled by the management that sets targets and organises activities. The concept of system dynamics, a methodology based on system theory, allows simulating this situation.

Based on this framework, this thesis proceeded to develop a model of a generic start-up in its institutional environment using system dynamics. The model simulated a technology based start-up that is influenced by industry specific variables and institutional factors over a period of five years. It included nine formal and four informal institutional factors. Two simulations

were conducted. First, the generic start-up was simulated in the Chinese institutional environment and then the same generic start-up was simulated in the Indonesian institutional environment. The start-up specific variables such as initial number of product features, desired profit margin, average salary, etc. have been kept equal for both simulations in order to examine differences in the effect of institutional factors on start-up performance. The research questions this thesis sought to answer based on the theoretical framework and the start-up model are:

- Given the same business model, is a technology based start-up more likely to succeed in China or Indonesia?
- Which are the most critical institutional factors influencing the performance of a technology based start-up in China and Indonesia?

The analyses of the start-up simulation results in chapter 4 provided valuable findings which answer the first research question as follows: Given the same business model, a technology based start-up is likely to succeed in both China and Indonesia. At the same time, it is likely be more financially successful in China than in Indonesia. The discussion of the country-specific results in chapter 4.1 and the comparative analyses in chapter 4.2 showed that the start-up in the Indonesian institutional environment performed better than the start-up in the Chinese institutional environment in regard to non-financial indicators. The Indonesian start-up had a more sophisticated product and a larger customer base but due to its excessive number of staff, it incurred high costs which dampened its financial performance. The Chinese start-up resembled a “lean start-up” as it had fewer employees than the Indonesian start-up but at the same time a slightly higher level of productivity. This resulted in superior financial performance despite its lower number of customers and product features.

Chapter 4.3 analysed both start-ups’ sensitivity to the nine formal and four informal institutional factors of the model and sought to identify the most critical institutional factors influencing start-up performance. Its findings provide an answer to the second research question: The performance of technology based start-ups in China is most affected by the institutional factors technology adoption, unemployment rate and labour market regulations. In Indonesia, the institutional factors which have the most significant impact on the performance of technology based start-ups are technology adoption, higher education and performance orientation. On the basis of these findings, strategy recommendations for start-ups and policy recommendations were given.

This thesis has some implications for linking institutional theory with the analysis of technology based start-ups in future research. Its approach to analyse technology based start-ups in the institutional environment of two emerging economies by building a model in system dynamics was the first of its kind. As discussed in chapter 1.4 on the state of the art, research on technology entrepreneurship tends to take a supportive institutional environment for granted. This is probably due to the fact that most research on technology entrepreneurship is conducted by scholars in the USA, Europe or other developed countries and focused on start-ups in these countries. Since their institutional environment is generally supportive of technology based start-ups, research focuses on other aspects of technology entrepreneurship such as personality traits, attitudes, human and social capital, etc. In emerging and developing economies, technology based start-ups tend to face a less benevolent institutional environment which can significantly affect their performance. This thesis provides valuable findings on the effect of institutional factors on the performance of technology based start-ups in the two emerging economies China and Indonesia. Furthermore, it used an innovative methodology to examine its research topic. Although system dynamics was developed many years ago, it is not widely used outside the system theory and cybernetics community. This may be due to the fact that developing models with system dynamics is a time-consuming and very challenging task that is also prone to simplifications and errors in reasoning. However, system dynamics is a very useful method to examine social systems such as companies. It allows the inclusion of a great number of variables, feedback loops and time delays. By using system dynamics to develop a model of a start-up, this thesis makes a valuable contribution to interdisciplinary research and innovative research methodology in social sciences.

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Appendix I – Model Documentation

- (01) Average Hiring Time=
2
Units: Month
- (02) Average Investment=
10000
Units: \$/Month
- (03) Average Productivity=
140
Units: hour/(Month*person)
- (04) Average Salary=
3000
Units: \$/Month/person
- (05) Average Turnover=
0.05
Units: 1/Month
5% turnover every 6 months (Saad 2013, p. 73)
- (06) Cash= INTEG (
External Funding+Net Income,
5000)
Units: \$
- (07) Churn Rate=
0.1
Units: 1/Month
10% of customers are lost each month
- (08) Collectivism=
4.54/7/3
Units: dmn1
Societal institutional collectivism practice (rescaled and weighted)
- (09) Competition=
0.8
Units: dmn1
The intensity of competition
- (10) Competitor's Feature to Price Ration=
20/25
Units: (feature*customer)/\$

- (11) Competitor's Value Proposition=
Competitor's Feature to Price Ratio*(1+(MAX(Competition-Regulatory Quality
, 0)))
Units: (feature*customer)/\$
- (12) Costs=
Costs of Goods Sold+Total Salaries
Units: \$/Month
- (13) Costs of Goods Sold=
Customers*Unit Cost
Units: \$/Month
- (14) Customer Acquisition Cycle=
0.05
Units: 1/hour
It takes 20 hours to attract 1 customer
- (15) Customers= INTEG (
Sales-Dissatisfaction,
1)
Units: customer
- (16) Desired Gross Margin=
0.7
Units: dmn1
- (17) Desired Headcount Growth=
(0.2*Human Resources)*PULSE TRAIN(6, 1, 6, 60)
Units: person
Desired monthly headcount growth is assumed at 20% of current human resources (10% growth and 10% to compensate for turnover). This behaviour starts in month 6, every 6 months until month 60. (Saad 2013, pp. 75-76)
- (18) Dissatisfaction=
Churn Rate*Customers*(1-Effect of Product Attractiveness(Product Attractiveness
))
Units: customer/Month
- (19) Effect of Labour Market Regulations(
[(0,0)-(20,10)],(0,0),(4,0.005),(8,0.01),(12,0.015),(16,0.02),(20,0.025))
Units: 1/Month
- (20) Effect of Product Attractiveness(
[(0,0)-(10000,0.06)],(0,0),(1,0.01),(10,0.02),(100,0.03),(1000,0.04),(10000
,0.0560526))
Units: dmn1

- (21) Effect of Unemployment Rate(
 $[(0,0)-(10,10)],(0,0),(0.05,0.25),(0.1,0.5),(0.15,0.75),(0.2,1),(0.25,1.25), (0.3,1.5))$
 Units: Month
- (22) Engineer Proportion=
 0.7
 Units: dmn1
 Percentage of engineers from total human resources
- (23) Engineering Effort=
 Human Resources*Engineer Proportion*Team Productivity
 Units: hour/Month
- (24) External Funding=
 $\text{Average Investment}*(1+\text{Macroeconomic Growth}+\text{Informal Investor Rate}+\text{Legal Rights}+\text{Media Attention})$
 Units: \$/Month
- (25) Feature Development Rate=
 0.000625
 Units: feature/hour
 Number of new features that can be developed per hour based on the assumption that one complete feature can be developed every 8 months.
- (26) Feature Obsolescence=
 Feature Obsolescence Rate
 Units: feature/Month
- (27) Feature Obsolescence Rate=
 0.125
 Units: feature/Month
- (28) FINAL TIME = 60
 Units: Month
 The final time for the simulation.
- (29) Headcount Growth=
 $\text{ZIDZ}((\text{Salary Budget}*\text{Desired Headcount Growth}), \text{Average Salary})$
 Units: person
- (30) Higher Education=
 7.9/50/3
 Units: dmn1
 Percentage of the population above 25 years who attained at least short-cycle tertiary education (rescaled and weighted)

- (31) Hiring=

$$\text{Headcount Growth/Time to hire}$$
Units: person/Month
- (32) Human Resources= INTEG (

$$\text{Hiring-Turnover,}$$
1)
Units: person
- (33) Informal Investor Rate=

$$(5.4/100+5.4/25.2)/2/4$$
Units: dmn1
Informal investor rate in % of population (rescaled and weighted)
- (34) INITIAL TIME = 0
Units: Month
The initial time for the simulation.
- (35) Labour Market Regulations=
17.3
Units: dmn1
Severance pay in weeks for redundancy dismissal for a worker
with 1 year of tenure. 4 weeks of severance pay reduce turnover
rate by 0.5 percent.
- (36) Legal Rights=
4/12/4
Units: dmn1
Strength of legal rights index (weighted)
- (37) Macroeconomic Growth=
0.058
Units: dmn1
GDP growth rate
- (38) Market Size=
30000
Units: customer
- (39) Media Attention=
75/100/4
Units: dmn1
Media attention of entrepreneurship (weighted)
- (40) Net Income=
Revenues-Costs
Units: \$/Month

- (41) Performance Orientation=

$$(((4.41-4)/(7-4)+4.41/4.94)/2)/3$$
Units: dmn1
Performance orientation practice (rescaled and weighted)
- (42) Pricing=

$$\text{Unit Cost} \times (1 + \text{Desired Gross Margin})$$
Units: \$/customer
- (43) Product Attractiveness=

$$\text{Value Proposition} \times (\text{Engineering Effort} / 720)$$
Units: dmn1
- (44) Product Development=

$$\text{Engineering Effort} \times \text{Feature Development Rate} \times (1 + \text{"R\&D Innovation"} + (1 - \text{Uncertainty Avoidance}))$$
Units: feature/Month
- (45) Product Features= INTEG (

$$\text{MIN}(\text{Product Development} - \text{Feature Obsolescence}, 100), 1)$$
Units: feature
- (46) "R&D Innovation"=
0.0008
Units: dmn1
The impact of national R&D expenditure (% of GDP)
- (47) Regulatory Quality=
0.464
Units: dmn1
- (48) Revenues=

$$\text{Pricing} \times \text{Customers}$$
Units: \$/Month
- (49) Salary Budget=

$$\text{MIN}(\text{Cash}, 20000)$$
Units: \$/(Month*person)
Salary budget available for new hires per month
- (50) Sales=

$$\text{MIN}(\text{Market Size} \times \text{Technology Adoption}, \text{Market Size} \times \text{Technology Adoption} \times \text{Customer Acquisition Cycle} \times (1 + \text{Effect of Product Attractiveness}(\text{Product Attractiveness})) \times (\text{Sales Effort} / 720))$$

Units: customer/Month

- (51) Sales Effort=
 $\text{Human Resources} * (1 - \text{Engineer Proportion}) * \text{Team Productivity}$
Units: hour/Month
- (52) SAVEPER =
TIME STEP
Units: Month [0,?]
The frequency with which output is stored.
- (53) Team Productivity=
 $\text{Average Productivity} * (1 + \text{Higher Education} + \text{Performance Orientation} + \text{Collectivism})$
Units: hour/(Month*person)
- (54) Technology Adoption=
0.158
Units: dmn1
Percentage of internet users in the market
- (55) TIME STEP = 0.125
Units: Month [0,?]
The time step for the simulation.
- (56) Time to hire=
 $\text{Average Hiring Time} - \text{Effect of Unemployment Rate}(\text{Unemployment Rate})$
Units: Month
- (57) Total Salaries=
 $\text{Average Salary} * \text{Human Resources}$
Units: \$/Month
- (58) Turnover=
 $\text{Human Resources} * (\text{Average Turnover} - \text{Effect of Labour Market Regulations}(\text{Labour Market Regulations}))$
Units: person/Month
- (59) Uncertainty Avoidance=
 $(4.17/7 + 4.17/5.37)/2$
Units: dmn1
Uncertainty avoidance practice (weighted)
- (60) Unemployment Rate=
0.063
Units: dmn1
- (61) Unit Cost=

$\text{MAX}(30000/\text{Customers}, 50)$

Units: \$/customer

(62) Value Proposition=

$\text{ZIDZ}(\text{Product Features, Pricing})/\text{Competitor's Value Proposition}$

Units: (feature*customer)/\$

Appendix II – Abstract

This thesis examines the effect of institutional factors on the performance of technology based start-ups in China and Indonesia. Research on technology based start-ups has focused almost exclusively on the entrepreneurial characteristics and abilities of start-up founders as keys to explaining venture success and failure. However, since firms operate in and interact with a specific political, economic and social environment, the study of personal traits alone does not provide a complete picture of their performance. The success or failure of entrepreneurial firms is also influenced by the environment they are embedded in. This environment is determined by political, economic and social institutions that define the “rules of the game in the society” and govern human interaction (North 1990, p. 3). This thesis investigates the institutional environment of technology based start-ups in China and Indonesia. It is motivated by two research questions (1) Given the same business model, is a technology based start-up more likely to succeed in China or Indonesia? (2) Which are the most critical institutional factors influencing the performance of technology based start-ups in China and Indonesia? To examine these questions, the thesis first develops a theoretical framework on the basis of the strategy tripod (Peng et al. 2008, 2009), institutional theory (North 1990) and system theory (Sternan 2001; Beer 1967, 1984). This theoretical framework is then used for modelling a generic technology based start-up with system dynamics. Institutional factors are included in the model to simulate the start-up’s institutional environment. The start-up model is then applied to the Chinese and Indonesian institutional context to examine the effect of institutional factors on the performance of technology based start-ups in these two countries. Comparative analysis and sensitivity analysis are used to discuss the results of the simulation. The findings of this thesis show that a technology based start-up in the Chinese institutional context achieves a better financial performance than a technology based start-up in the Indonesian context. Furthermore, the performance of a technology based start-up in China is most affected by the institutional factors technology adoption, unemployment rate and labour market regulations. In Indonesia, the institutional factors which have the most significant impact on the performance of a technology based start-up are technology adoption, higher education and performance orientation. On the basis of these findings, strategy recommendations for start-ups and policy recommendations are given.

Key words: technology based start-up, entrepreneurship, strategic management, institutional theory, system theory, system dynamics, China, Indonesia

Appendix III – Zusammenfassung

Die vorliegende Arbeit untersucht den Einfluss von institutionellen Faktoren auf den Unternehmenserfolg von Technologie-Startups in China und Indonesien. Bisherige Forschung zu Technologie-Startups behandelt den Unternehmenserfolg oder –misserfolg von Startups fast ausschließlich aus der Perspektive von unternehmerischen Persönlichkeitseigenschaften und Fähigkeiten der Startup-GründerInnen. Da jedoch Unternehmen immer in ein politisches, wirtschaftliches und soziales Umfeld eingebettet sind und mit diesem interagieren, bildet die ausschließliche Untersuchung von Persönlichkeitseigenschaften und Fähigkeiten der Startup-GründerInnen den Erfolg von Technologie-Startups nur unzureichend ab. Der Erfolg oder Misserfolg von jungen Unternehmen wird von dem Umfeld, in dem sie eingebettet sind, beeinflusst. Dieses Umfeld wird von politischen, wirtschaftlichen und sozialen Institutionen bestimmt, die die „Spielregeln der Gesellschaft“ bestimmen und menschliche Interaktionen steuern (North 1990, S. 3). Die vorliegende Arbeit untersucht das institutionelle Umfeld von Technologie-Startups in China und Indonesien und versucht, folgende zwei Forschungsfragen zu beantworten: (1) Unter der Voraussetzung eines identischen Geschäftsmodells, ist ein Technologie-Startup eher in China oder in Indonesien erfolgreich? (2) Welche institutionellen Faktoren haben den größten Einfluss auf den Unternehmenserfolg von Technologie-Startups in China und Indonesien? Um diese Fragen zu beantworten wird zuerst ein theoretisches Grundgerüst auf Basis des ‚Strategy Tripods‘ (Peng et al. 2008, 2009), der Neuen Institutionenökonomik (North 1990) und der Systemtheorie (Sternan 2001; Beer 1967, 1984) entwickelt. Anhand dieses theoretischen Grundgerüsts wird dann ein generisches Technologie-Startup mit System Dynamics modelliert. Institutionelle Faktoren werden in diesem Modell miteingebaut, um das institutionelle Umfeld von Startups zu simulieren. Dieses Startup-Modell wird dann auf den chinesischen und indonesischen institutionellen Kontext angewendet, um den Einfluss von institutionellen Faktoren auf den Unternehmenserfolg von Technologie-Startups in diesen beiden Ländern zu bestimmen. Anhand einer Vergleichs- und Sensitivitätsanalyse werden die Ergebnisse der Modellsimulationen besprochen. Die Ergebnisse dieser Analysen zeigen, dass ein Technologie-Startup im chinesischen institutionellen Kontext finanziell erfolgreicher ist als ein Technologie-Startup im indonesischen institutionellen Kontext. Darüber hinaus wird der Unternehmenserfolg von Technologie-Startups in China am meisten von den institutionellen Faktoren Technologie-Verbreitung, Arbeitslosenrate und Arbeitsmarktregulationen bestimmt. Die institutionellen Faktoren, die den größten Einfluss auf den Unternehmenserfolg von Technologie-Startups in Indonesien haben, sind Technologie-Verbreitung, höhere Bildung

und Leistungsorientierung. Auf Basis dieser Ergebnisse werden eine Strategieempfehlung für Technologie-Startups sowie eine Politikempfehlung gegeben.

Schlagwörter: Technologie-Startup, Unternehmertum, Strategisches Management, Neue Institutionenökonomik, Systemtheorie, System Dynamics, China, Indonesien

Appendix IV – Curriculum Vitae

Julia Andrea Grabner

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EDUCATION

University of Vienna **Vienna, Austria**
Master of Arts in East Asian Economy and Society since October 2012

Vienna University of Economics and Business **Vienna, Austria**
Bachelor of Science in International Business Administration October 2011 - November 2014

- **Exchange semester** in Singapore (Singapore Management University)

University of Vienna **Vienna, Austria**
Bachelor of Arts in Translation Studies and Intercultural Communication October 2008 - June 2012

- **Double Degree Programme**
- **Exchange semesters** in China (Xiamen University, PR China) and France (Institut Catholique de Paris, France)

WORK EXPERIENCE

Unicredit Bank Austria **Vienna, Austria**
Working student, Corporate & Investment Banking March - June 2013, October - December 2013

Deutsche Bank **Frankfurt am Main, Germany**
Intern, Global Transaction Banking (Summer Internship Program) July - August 2013

Unicredit Bank Austria **Vienna, Austria**
Intern, Vienna International Centre ('UNO-City') Branch August 2012

Erste Sparinvest Asset Management **Vienna, Austria**
Intern, Finance & Accounting July 2012

SKILLS, ACTIVITIES & INTERESTS

Languages: Fluent in German, English, French; Conversational Proficiency in Italian, Chinese; Basic skills in Indonesian

Technical Skills: MS Office (Word, Excel, Powerpoint), Wordpress, HTML

Activities: Member of the Austrian Academic Forum of Foreign Affairs (AFA), Advisor to high school students in Vienna, Lower Austria and Burgenland (Studienberatung) from 2011 to 2013