An Explanatory Framework for the Growth of Small and Medium Enterprises

A System Dynamics Approach

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This study aims to develop an explanatory framework for the growth of small and medium enterprises (SMEs), which is a concept that has not been adequately developed in the literature. Various published models were reviewed and critiqued, and we especially focused on the stages model. Additionally, a greater understanding of the nature of the growth of SMEs has been elicited from the mental models of domain experts. A case study of a fast-growing small-to-medium enterprise was conducted, and a full-fledged simulation model was crafted by integrating experts' mental models with the current state of the art in scientific theories. The model was validated against various reference modes. Finally, a future research road-map based on various case studies was proposed to further enhance and corroborate our framework.

Contents

1. Introduction

The growth of small and medium enterprises (SMEs) is major driver of the economy because SMEs contribute to employment growth at a higher rate than larger firms. This is clearly demonstrated by the fact that about 99.8 per cent of the enterprises in the EU are SMEs, which employ 67% of the European workforce and generate 57% of the revenue (European Statistical Data Support, 2008).

The important economic contribution of SMEs has aroused significant interest from both international organizations and academic researchers whose goals include using public policies to trigger growth in SMEs, ultimately enhancing overall economic performance. Accordingly, since the 1970's, many researchers have worked to establish an explanatory framework for the growth of SMEs.

However, despite the considerable attention paid to SME growth, to date no theories have been able to adequately explain why some SMEs grow and others fail. There has been a plateau in this research since the late 1990's (Achtenhagen and Naldi, 2009) due to the complexity of the problem, the multidisciplinary nature of the related variables and the difficulty in generating a generic model that fits the various types of SMEs, as described by Gibb and Davis (1990).

To attempt to overcome this plateau, this paper briefly survey the available literature regarding current SMEs' growth and highlighted how the dynamic nature of the phenomenon has frequently conflicted with multivariate methodologies and static frameworks that shaped the majority of the previous publications. Furthermore, we tried to develop a dynamic model by integrating both the market growth model by Forster (1967), as illustrated by Sterman (2002), with the stages model described by Churchill and Lewis (1982). Hence, the goal of this paper was to contribute to the literature on SMEs by providing a dynamic framework that has reasonable explanatory power for the success and failure of SMEs.

The following section will provide background by quickly highlighting the major approaches to studying SMEs growth, ranging from the earliest research on stochastic models to the deterministic approach that is largely based on multivariate designs. Next, the stages model will be described as the most significant framework in the literature because most of the successive literature is based on or contrasted with the stages model. Emphasis will be placed on the Churchill and Lewis model (1982) and subsequent critiques.

The third section will identify the dynamic attributes of the phenomenon by challenging the validity of static assumptions that form the basis of the stages model, such as assuming discrete stages and assuming that a generic static model will fit all firms. Consequently, a dynamic alternative will be proposed by assuming the dynamic and idiosyncratic nature of growth and proposing a path dependent paradigm for explaining firms' evolution. Finally, the third section ends by challenging the inclusion of external factors in the model. Although there has been a lot of criticism of the stages model for putting less importance on external factors, we argue that limiting the inclusion of external factors within model boundaries will enhance the validity of the model, not threaten it. Gaps in the research will be described at the end of the third section, and an alternative paradigm will be proposed.

In the fourth section, we will discuss the three phases of our research plan. The first phase, which has been completed, involves the initial case study and dynamic modeling, and the second stage, which is upcoming, involves a multi-case analysis and final model development, the third stage, which cover model validation.

In the fifth section, we will describe a case study for a rapidly growing firm. The firm experienced exponential growth during which it doubled in size every two years. Moreover, the industry settings were unique in a way that almost eliminated the effect of external factors on the firm. The section identified the main five milestones that have shaped tipping points in the lifecycle of the organization. This section will conclude by addressing similarities between the case and the previously proposed dynamic paradigm.

In the sixth section, a dynamic model is developed based on the available literature and the case study, in which SMEs' growth was modeled using four main processes:

1. Utilization of customer base relevant capacities (e.g., Sales units and resources to obtain international customers.)
2. Utilization of demand acquiring relevant capacities (e.g., Investment in differentiation and new product development).
3. Utilization of operation relevant capacities (e.g., Investment in production units and other sales fulfillment resources)
4. Demand estimation and rationalizing of growth decisions (e.g., Quality of current intelligence practices and accuracy of expected return on investment when financing growth.)

Section six will then validate the model results with reference mode and insights gained from the modeling exercise.

Finally, the last section conclude and describes limitations of the current model to guide future research.

2. Background

2.1 Stochastic (Random) Models

The very first attempts to understand growth phenomena in SMEs resulted in stochastic models, which have evolved from the field of economics (Matthew Dobbs and R.T. Hamilton 2006) and developed from the "Law of proportionate effect" Gibrat's (1931).

Stochastic models assume that there are too many factors affecting growth and that no specific factors have a dominant effect that can be used to explain growth. Accordingly, the growth of firms can be assumed to be perfectly random and cannot be predicted using any group of variables. By definition, stochastic models assume that growth is independent of any other factors, a notion which has been disproven by various studies

including the work of David S. Evans (1987) and Francesca Lotti, Enrico Santarellia and Marco Vivarelli (1999).

2.2 Deterministic (Static) Approach

In contrast to stochastic models, a "deterministic approach" has evolved, which focuses on identifying a set of internal and external variables that can explain the growth of SMEs, such as by identifying some characteristics, strategies and practices that are significantly related to growth, as in Smallbone & Leig & North, (1995), Becchetti and Trovato (2002), Davidsson and Klofsten (2003), and Barringer, Jones and Neubaum (2005).

Although the deterministic approach enriched our understanding of SMEs growth patterns, "it has only been able to provide partial explanations of small business growth rates, leaving considerable unexplained variation" (Dobbs and Hamilton, 2006). Moreover, robust empirical validity has not been established for this approach, so applying this model in a different context (e.g., industry or country) will likely not result in repeatable results. The lack of empirical validity is thought to result from the complex nature of growth phenomena and heterogeneity of the SMEs, as explained later.

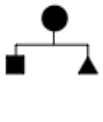
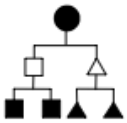
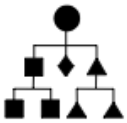
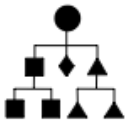
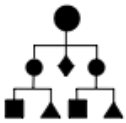
2.3 Stages Models

The stages model has evolved to represent the complicated and dynamic nature of growth phenomena. This model was adopted from the biology life-cycle analogy, assuming that the firm progresses through different stages, including existence, growth, take off and maturity.

In the stages model, a firm's characteristics, challenges, practices and attributes are mapped into separate successive stages, as in the work of Lawrence L. Steinmetz (1969), Greiner (1972), Churchill and Lewis (1982), Miller and Friesen (1984), Scott and Bruce (1987), Kazanflan (1988), Adizes (1989), Larry E. Greiner (1994), McMahon (1998) and Hanks et al. (1993). Study of the growth of SMEs gained momentum when Churchill and Lewis (1982) developed their famous model by extending the frameworks of Steinmetz (1969) and Greiner (1972) and sketched a 5-stage model in which SMEs progress through different stages of growth (existence, survival, success, take-off, and resource maturity). Churchill and Lewis described the evolution of main five characteristics throughout the lifecycle of an organization as follows:

EXHIBIT 3

Characteristics of Small Business at Each Stage of Development

	Stage I Existence	Stage II Survival	Stage III-D Success-Disengagement	Stage III-G Success-Growth	Stage IV Take-off	Stage V Resource Maturity
Management style	Direct supervision	Supervised supervision	Functional	Functional	Divisional	Line and staff
Organization						
Extent of formal systems	Minimal to nonexistent	Minimal	Basic	Developing	Maturing	Extensive
Major strategy	Existence	Survival	Maintaining profitable status quo	Get resources for growth	Growth	Return on investment
Business and owner*						

*Smaller circle represents owner. Larger circle represents business.

Figure 1: Characteristics of Small Businesses at Each Stage of Development

Source: Source Churchill and Lewis (1982)

2.4 Criticism of Churchill and Lewis

The practicality of the Churchill and Lewis model resulted in its vast popularity among both entrepreneurs and academic researchers. Nevertheless, the model has been widely criticized for its many limitations,

including the emphasis it places on internal factors while putting less focus on external factors. This limitation could threaten the validity of the model.

Furthermore, stages models, including the one put forth by Churchill and Lewis, are critiqued because few have been applied in longitudinal studies, which are needed to clearly understand the process of growth.

Moreover, the common use of self-reporting instruments in stages model research might be a source of bias because respondents are asked to recall events that happened long ago. Accordingly, some events might be omitted and others exaggerated according to respondents' point of view.

2.5 Stages Models reaching a plateau

Aiming to overcome the limitations of stages models, many researchers have conducted further studies, the most important of which include a longitudinal study by Miller and Friesen (1984) and a two-phase study by Kazanflan (1988). Although most studies confirmed the existence of stages in a firm's lifecycle, to date, no one has been able to define universal stages that can reliably explain growth of SMEs.

As shown in the evolution of the literature, the study of the SMEs' growth processes is challenging. To date, researchers have been unable to describe a stable explanation for growth phenomena with consistent and replicable results.

Accordingly, research on the growth of SMEs has plateaued. As stated by Gibb and Davies, (1990):

"As other authors have noted, there is no single theory which can adequately explain small business growth and little likelihood of such a theory being developed in the future".

Gibb and Davies reasoned that this can be explained by both variety in the types of SMEs and the multidisciplinary nature of the variables affecting growth of the SMEs.

The perceived plateau has discouraged researchers from investigating the phenomenon. As noted by Davidsson, Achtenhagen and Naldi (2009), since the 1990s, the growth of SMEs has not been the subject of research due to criticisms of these efforts. Although critique should have encouraged more accurate research, aggressive critiques discouraged researchers from pursuing this topic.

However, interest in the growth of SMEs has recently been renewed. Many new frameworks have been introduced, and many critical reviews of literature have been conducted to summarize the previous research and offer an integrated model from a fresh perspective.

A good example of such a model is the work of Bessant, Phelps and Adams (2005, 2007), who developed an extensive framework to describe the growth of SMEs by integrating previous models and introducing a new model designed to address most of the criticisms of earlier models. Nevertheless, the Bessant Philips and Adams model is still no more than a framework; it has not yet been studied or validated.

3. Growth as Dynamic Phenomenon

In order to develop a model of the growth of SMEs, this section will identify and group limitations of the stages model and propose an alternative framework.

3.1 Static Assumptions of the Life Cycle Analogy

The stages model used the lifecycle analogy to describe firms' growth stages. Consequently, it inherited the following assumptions that make it less acceptable to many researchers:

1. Sequence of Stages: The stages model assumed that all firms grow through the same stages and in the same sequence. Conversely, Kazanflan & Drazin (1989) found that firms do not grow in the same pattern or sequence. Moreover, Bessant, Philips and Adams (2007) found that firms jump between stages and sometimes visit the same stage again. For example, after stabilizing growth, some firms undergo a maturity stage, whereas another firm might resume growth again and take on the attributes of a growing firm in structure, strategies or management style.

2. Discrete Stages: The stages model assumes that there are well-defined stages with sharp borders, and when a firm enters a stage, we should expect discrete sets of variables that are repeatable among different firms in the same stage.

The discrete nature of stages was rejected by Kazanflan (1988), who found that firm growth consisted of continuous stages in which variables overlap across stages. This was later confirmed by McMahon (1998).

States not Stages

To overcome this limitation, 'gestalts' or 'states' have been introduced as alternative building blocks of a firm's lifecycle. This concept was highlighted by Miller (1981), Kazanflan (1988) and Bessant, Philips and Adams (2007). For example, Kazanflan described firms' evolution as follows: "Rather than moving predictably through a sequence of developmental stages, businesses might instead attain gestalts or patterns of strategy, structure, and environment that may emerge for any number of reasons."

Gestalts or states are a common set of variable configurations that firms reach during their evolution. Similar states might be found across growing firms, but moving between states is not assumed to be in a certain order, as the sequence of the states is neither predictable nor generalizable.

Growth is an idiosyncratic phenomenon

Growth is an idiosyncratic phenomenon that is unique and non-repeatable for each firm.

Discussion of idiosyncrasy of growth has roots in the work of Edith T. Penrose (1959), who argued that even firms with similar resources that are in the same industry can configure resources in unique combinations that sharpen the idiosyncratic nature of their performance and growth.

More recently, Vinnell and Hamilton (1999) concluded that "we should not expect to find the same universal stages of growth in all trajectories." The idiosyncratic approach results in an idiosyncratic growth process, and consequently, the nature, timing and sequence of the firm's growth stages are unique and dependent on their historical choices.

3.2 Path dependence as alternative mechanism for growth

Figure 2: The Five Phases of Growth. Source: Greiner 1994

In order to shed light on the mechanisms of growth that can produce idiosyncratic patterns, Greiner (1994) divided the growth of a firm into periods of revolution followed by periods of evolution as follows:

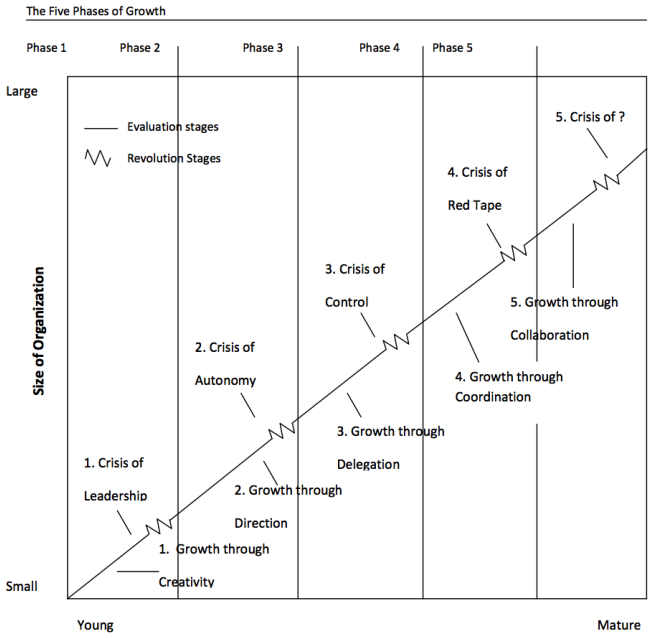


Figure 2: The Five Phases of Growth
Source: Greiner 1994

1. Revolution periods with "substantial turmoil" take place, and as a result of this revolution, a period of evolution happens during which no major upheaval occurs.

2. These periods of evolution are both the natural results of the prior revolution and the causes of the next revolution.

As concluded by Greiner (1994), growth is path-dependent, wherein different reactions to a crisis will result into different routes for the firm. Therefore, today's decisions are more predictive of tomorrow's characteristics than both external factors and generic patterns of growth.

Similar to the revolution-evolution concept, Bessant, Philips and Adam (2005, 2007) introduced the idea of "Tipping Points," which are points of dramatic change in a firm's life as a response to certain crises.

Throughout the literature, it have been widely discussed that evolution takes place in successive leaps when the firm reaches a critical point. This is referred to by different names, such as "crisis" in the work of Greiner (1972), "shift in dominant problem" by Kazanflan (1988), "revolution" by Greiner (1994) or "tipping point" by Bessant, Philips and Adam (2005, 2007). Regardless of what it is called, it always found to have the following dynamic attributes:

1. It has different effects relative to each stage.

2. It contributes to the formation of the next stage where it interacts with other variables and with itself to create more changes in variables' behavior.

3.3 Ignoring External Factors

O'Farrell and Hitchens (1988) criticized the stages model for paying insufficient attention to the impact of external factors, which have long been considered to be the major dimension that influences firms' growth and performance. However, by tracking the literature, we found a trend toward putting less emphasis on external factors as the major influence on SMEs' performance.

The earliest work in this regard is that of Edith T. Penrose (1959), who became frustrated by neoclassical economists' focus on price, output and demand. She directed her research toward internal factors, stating: "demand is no more important, and is perhaps less important, than the existing resources of the firm".

More recent work in the direction of putting less importance on the external factors comes from a study that monitored 236 companies from 1979 until 1990 (Smallbone & Leig & North, 1995). This study concluded the following: "While the market environment is clearly a factor influencing the opportunities for growth, few high growth firms in this study were simply pulled along by market trends. High growth performance was achieved even in sectors where difficulties dominated over opportunities and competitive environments were as likely to spur firms to grow as to discourage them. In most cases active strategies (particularly with respect to products and markets) were necessary to achieve growth over an extended period. Firms achieved high growth in sectors offering very different opportunities for growth and different scope for building a business" (Smallbone & Leig & North, 1995).

Therefore, it can be safely assumed that integrating external factors into the growth model of SMEs is not necessary to understand growth determinants. On the contrary, heavily depending on external factors may add unnecessary complexity due to diversity of the industries, locations and market conditions. This complexity will force the modeler to decide between developing the model to be too complicated to be useful and narrowing the sample to specific market conditions in a specific industry and a specific market supply status, which will limit the generalizability of the model and challenge its ability to be replicated, which are common problems plaguing previously published models.

Accordingly, it seems more insightful to limit the inclusion of the external variables as much as possible in order to simplify the models of growth. This will facilitate the development of a robust model with enough explanatory power for the growth process. Once created, this model could be extended later by including external factors in different settings.

3.4 Research Gap and alternative paradigm

To conclude this section, the following table describes major research gaps and proposed alternative paradigms.

Research Gap	**Alternative Paradigm**
Lifecycle stages models assume a deterministic sequence and discrete stages; such assumptions have been rejected by much empirical research.	States are more representative of 'common patterns of variables' configuration that can be attained upon the availability of causes not on deterministic sequence'

Assuming the possibility of generating a generic static model. This assumption has been rejected based on the heterogeneity of SMEs and the idiosyncratic nature of their growth.	Firm evolution is idiosyncratic. A firm's growth is path-dependent. Evolution happens through successive tipping points.
Disregarding external factors completely.	Limited inclusion of external factors.

Table 1: Research Gaps

In addition, we should emphasize that growth patterns are not predictable and cannot be generalized rigidly for different companies. Stages are unique from one company to another based their characteristics, accumulated resources and, more importantly, past decisions. This leads to unique timing, sequences and attributes of growth states.

4. Research Design

4.1 Research Plan

In order to develop an explanatory model for SME growth, the following procedures are planned:

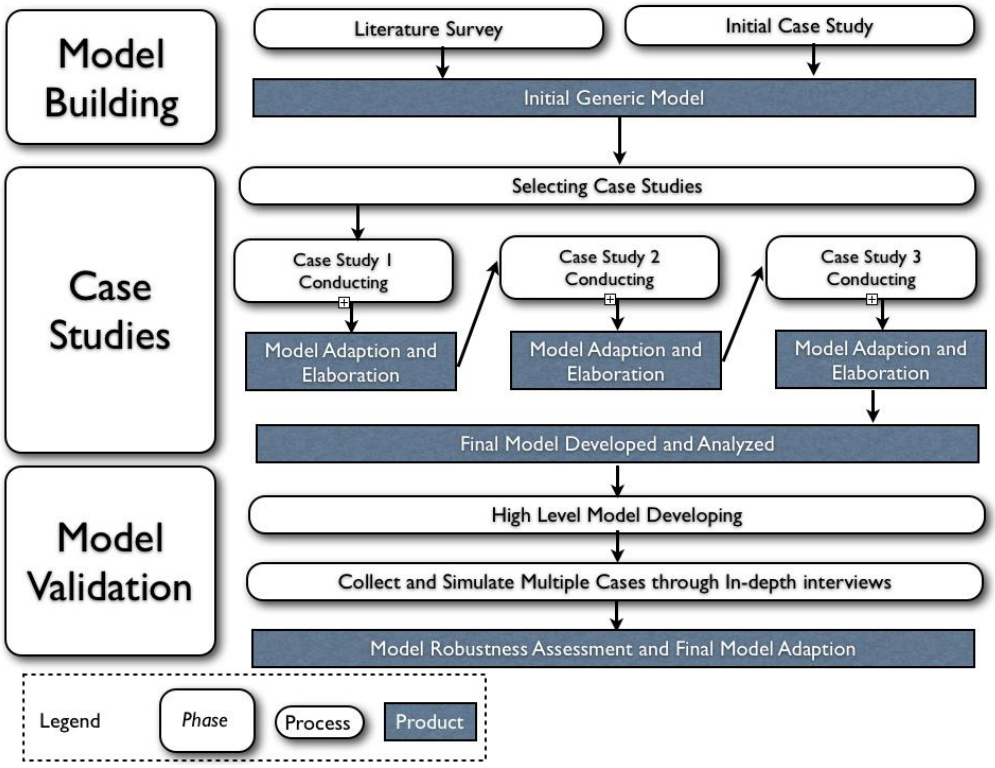


Figure 3: Research Plan

Phase 1. Building Theoretical Framework for the SMEs Growth The purpose of the first phase is to develop a dynamic model that explains growth; such a model will be based on: 1) a survey of recent literature of SMEs growth ; 2) a case study for fast-growing small firms; and 3) developing a dynamic model that explains growth and highlighting the important dynamics that trigger or trouble firms' growth.

Phase 2. Model elaboration and testing through Case Studies

The purpose of the second phase is to collect and simulate more cases of fast-growing SMEs in order to further characterize and elaborate on the model. This will be achieved by: 1) studying three more cases of SMEs successively, during which a simulation model will be adapted and elaborated on based on the results of each case; 2) cases will be selected using theoretical sampling

in which heterogeneity will be targeted by conducting the first two successive cases of food industry firms with extreme differences in growth curves (for example, a case where the growth curve stagnated and another where the growth curved collapsed or grew exponentially), followed by a third case from a different industry will be conducted to further validate the model; and 3) a final dynamic model will be analyzed and compared to the results of the first phase.

Phase 3. Model Validation

The aim of the final phase is to validate the model further by covering a larger and more diversified sample. Among other possible designs, the following research design is initially proposed: 1) a small model that includes the most important dynamics from Phase 2 will be developed and tested using an online instrument that collects case data, simulates it and analyzes it; 2) a series of in-depth interviews with the management teams of 10 SMEs will be conducted, in which researchers will help the management team to use the case collecting instrument; and 3) the model will be validated against the collected cases, and a conclusion about the validity of the developed model will be made.

5. The Case Study

To study the dynamic phenomenon of SMEs' growth, a proper dynamic hypothesis should be sketched. This type of dynamic hypothesis has not been developed yet in the literature because earlier literature focused on defining static relationships with variables of interest.

In order to define such a hypothesis, a case study for a fast-growing SME will be briefly described in the following section.

5.1 A Case of a Fast-Growing Company: Imtenan Company

Imtenan is an Egyptian firm that was originally founded in 1989 to produce packaged honey. By 1998, after the founder passed away, the family's second generation took over management of the firm and started a period of exponential growth by doubling the firm's size almost once every two years until they suddenly stopped growing in 2005 (for more details on performance indicators, please refer to Table 3). The firm owners have been thoroughly interviewed, and company financial, sales, client and employee records have been collected and analyzed.

5.2 Industry Uniqueness

The industry in which the firm operated offered a unique setting that is highly valuable for the case study. By the time the firm started operating in the late 1980's, the Egyptian honey market was unstructured, with growing demand and no formal players. Demand was met by small beekeepers and some grocers who were selling non-branded, non-packaged bee-honey.

Although the formal industry was in the introduction phase, with relaxed competition and low customer expectations, including the demand of the mature, the unstructured market led to a total market demand that was huge and stable, and this demand was much bigger than the firm's capacity. The demand was virtually unlimited in the medium- to long-term. These unique market settings isolated the effect of external factors on limiting growth for a long time, which created a rare opportunity to isolate the effect of external factors on limiting growth and contrasted the effects of the firm's internal characteristics and strategies on growth. This enabled us to study internal dynamics in the context of a high-growth firm.

5.3 Typical Growth Behavior

The firm has experienced exponential growth in both its turnover and other strategic resources like number of employees, coverage of retailers and others, as shown in the following table.

	1998	**2005**
Turnover	2.5 Million EGP	29 Million EGP

Annual Production Capacity	222 Ton/ Year	2300 Ton a year
Coverage of Retailers	200	2300
Number of Countries Covered	1	28
Number of Employees	11	200
Number of Products	1	3

Table 2: Performance indicators in the Imtenan Case

Growth has generally been stable, although it oscillated at several points, and the firm succeeded in resuming growth when it managed to increase relevant capacity (for example, retail coverage capacity or production capacity).

This pattern of oscillation and resuming growth is similar to the framework proposed by Greiner (1994), which described the growth stages as evolution, interrupted by a crisis (reaching capacity in our case), resuming upon revolution (acquiring relevant capacity in the case) followed by resuming growth after another period of evolution.

The following section will highlight the several crisis/revolution breakthroughs that occurred during the high-growth period.

5.4 Evolution Milestones

1st Crisis: Production Capacity

In the beginning of 1998, although the firm had sufficient demand, it stagnated for a long time. The reason was that the firm reached its maximum capacity to process raw materials. The firm's capacity to handle raw materials was limited by its manual procedures of quality control, which were concentrated on the owner's ability to examine materials.

Uncertain about the extent of the possible demand, the management team hesitated for a long time about investing time and money in its capacity to obtain raw materials and. However, consistently unfulfilled sales orders convinced the management team to invest in increasing production capacity.

The Imtenan team invested in quality control procedures, bought a laboratory, invested in some purchasing specialists and adjusted their material receiving processes and processing procedures to allow the firm to receive more materials from suppliers and process it in a timely manner.

Despite the uncertainty surrounding the decision-making, the investment proved to be beneficial, and turnover doubled by 1999. In turn, the management team gained confidence, and whenever they thought they had reached full production capacity, they considered increasing their capacity.

By 2005, production capacity reached a tipping point in the growth path three times: once in 1998 because of the capacity to handle raw materials; once in 2002 because of moving to a new factory; and once in 2004 because of automating an important part of the production process.

2nd Crisis: Retail Coverage

After Imtenan continued to show smooth evolution following the first production capacity tipping point and the fulfillment of more sales orders, the firm suddenly faced its next crisis. Because Imtenan had no clear estimate of the demand, the management team reached a point where the production capacity exceeded the current demand of the customer base. Once again, although demand was unknown, the current level of growth increased the management team's confidence in the un-utilized potential, which can be achieved by reaching more customers. To maintain growth, the Imtenan management team had to extend demand by investing in increasing distribution

coverage. First, they added sales units; each added sales unit cost the firm a new distribution van, salesman and driver.

Again, by investing in the fully utilized capacity, the firm was able to increase the number of retailers it served, ultimately gaining a larger customer base, which again resulted in doubling turnover by 2002. To maintain growth, the firm continued to increase its retail coverage by adding more sales units and then by opening new distribution centers in different districts and, later, in different provinces.

3rd Crisis: Local Market Saturation

Imtenan maintained its growth by balancing sales capacity and production capacity. When one exceeded the other, the company acquired more capacity and maintained growth. However, after some time and continued growth, the firm faced its next crisis. When the local market was saturated, the customer acquisition rate reached a low level, and few regions were left without coverage.

By this time, the management believed that the company had hit the Egyptian market demand limit and that by hitting the demand boundaries, growth slowed, and operations became less and less efficient, leaving Imtenan's management team with two options: shrink operations to an efficient level or find a way to increase demand. Imtenan's management team then decided to sustain growth by investing in exports, thereby meeting the considerable international demand in the same period. The firm was able to maintain growth and continue to invest in new market penetration, one market at a time, reaching 28 countries by the end of 2005.

4th Crisis: Acquiring Demand

Due to an environmental crisis in Egypt, honey production decreased significantly. Egypt lost 80% of its production. Consequently, Imtenan had to withdraw from the international market due to shortages in raw material. Finding another path for growth to maintain efficient operations was a priority that pushed the firm to re-enter the local market aggressively. However, by the time the firm started to resume growth plans in the local market, the local market had evolved to be very competitive. Gaining new customers was not as simple a process as it once was. Competition was aggressive, consumers were more demanding, and the firm lost part of its bargaining power within its distribution network.

To overcome these challenges, Imtenan's team invested in new product development and in communicating its brand image heavily to obtain more demand and ultimately sustain growth. The demand acquisition plan has been rewarding, as it already filled the sales gap the firm experienced due to withdrawing from international markets, and the plan has even maintained the firm's growth rate.

5th Crisis: Organizational Capabilities

As Imtenan continued to grow its capacity, the number of employees has grown exponentially, leading to an increase in management layers between owners and front-line employees. Such organizational complexity demanded new skills and a new management style. The management has tried to introduce different professional staff and formal planning and control procedures. However, their lack of experience, which is required for such a deployment, led to continued failure of the firm in this regard.

Moreover, the managers, who see themselves as successful entrepreneurs, have explained the failures as the result of impractical formal work procedures and a lack of suitability of professional employees to the nature of their business instead of as a result of the managers' inexperience. Accordingly, the firm reached a point where, despite the existence of demand, it was unable to expand due to the limitation of its organizational capabilities. Between this time and 2010, the firm failed to overcome this obstacle, leading to an approximately 3 percent growth rate.

5.5 Imtenan Case Fitting with a Dynamic Framework

The following is a comparison of characteristics of case evolution with proposed dynamic conceptualization for the SMEs evolution:

Growth Model Critiqued for	**Proposed alternative Conceptualization**	**Imtenan Case**
Having deterministic and discrete stages	States are more representative.	□ Instead of growing in discrete successive stages, Imtenan was moving between different states in no particular order. Moreover, the same state might be revisited more than once. For example, production capacity has limited growth several times over the life of the organization.
		□ In each state, different growth factors were on different levels of maturity, with no dominant maturity level. For example, in the fifth stage where market expansion and product development reached maturity, management and organizational capabilities were stuck at a primitive level.
Assuming a generic model	Growth is idiosyncratic.	□ Imtenan did not follow certain Generic Case; however it had unique configuration of resources and opportunities that cannot be repeated.
	Growth is path-dependent.	□ Management decisions to invest in certain resources have shaped their competitive edge and limited their future decisions in a unique set of alternatives. For example, deciding to invest in production capacity enabled the firm to resume growth, but it led to the next crisis when production capacity exceeded sales acquiring capacity and operation turned out to be inefficient, which forced the firm to invest in coverage. This restarted growth but led to the next crisis of market saturation, and so on.
	Growth happens through tipping points.	□ Rather than having smooth and continuous growth from the beginning to the end, Imtenan has grown through tipping points where they experienced exponential growth, then growth started to oscillate and, once critical capacity was identified and the investment started to get rewarding, the firm experienced its next tipping point and grew exponentially again.
Ignoring external Factors	Limited inclusion of external factors	□ Imtenan has been affected by external factors, such as the size of the opportunity and the environmental crisis, that led it to pull out of the international market.
		□ In most situations, the main trigger or suppresser for growth was not external factors. Instead, it was the firm's critical capacities or the management team's ability to perceive demand and rationalize growth decisions.
		□ Imtenan as a small business that mostly operates in a small part of the market, and most of the time it is limited by its capabilities not by market opportunity. Therefore, the underutilized opportunity is much bigger than the utilized opportunity.

		Assuming a small firm utilizes 5% of the market opportunity because they do not have enough money to invest in production capacity or customer acquiring capacity to utilize the full opportunity. In this case, even if the market opportunity suddenly was cut in half, a small business might not be affected and might still have the opportunity to grow ten times its current size before noticing that the market opportunity has changed.

Table 3: Case evolution compared with proposed conceptualization

6. Dynamic Model and Simulation Results

This section will show the dynamic model as elicited from the mental models of the Imtenan management team.

The complete model documentation, including the formal model description, detailed stock and flow diagram, mathematical formulation and description of variables, is attached as supplementary material.

6.1 Problem Articulation

6.1.1 Purpose

Our goal is to provide an explanatory model for the growth of small and medium enterprises by explaining how the mental model of the entrepreneur affects firm growth and how inaccurate perceptions might influence growth-related decisions and ultimately hinder or trigger a firm's growth.

6.1.2 Reference Mode

As shown in Figure 2, the general behavior of SME growth is expected to match the illustrated graph as described by Greiner (1994), in which firms pass through periods of smooth growth (evolution periods) that are interrupted by periods of troubled growth (the revolution periods). The periods of interrupted growth happen when the firm approaches its limits to meet current demand or when the firm approaches the limit of the market demand in the served segments. Hence, the firm enters into a plateau until the entrepreneur succeeds in identifying the over-utilized opportunity or capacity. Such a plateau might be followed by oscillation during the capacity acquisition period, as the entrepreneur might go through several trials and errors until he successfully acquires more capacity or more market opportunity. Hence, the time needed to break through from a growth plateau is directly affected by the entrepreneur's ability to identify and approach growth opportunities in a timely manner. Accordingly, the firm's general growth is expected to change regularly between exponential growth, followed by a plateau, and, finally, oscillation (either resuming exponential growth in cases of success or decline in cases of failure, as illustrated in Figure 4).m

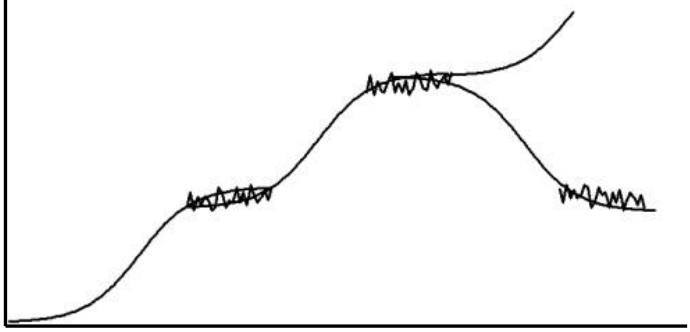


Figure 4: Conceptual illustration of reference mode

6.1.3 Time Horizon

The simulation model is designed to run for 84 months. This period was set to match the case, which took place from 1998 to 2005. Moreover, no forecasted time was included in the model because the objective of this simulation was to recreate history to validate the coherency of the dynamic paradigm in explaining a small firm's growth.

6.2 Dynamic Hypothesis[1]

6.2.1 Submodels Diagram:

In Figure 6, the illustrated diagram shows the eight submodules that represent different demand and supply capacities that entrepreneurs manage to sustain growth.

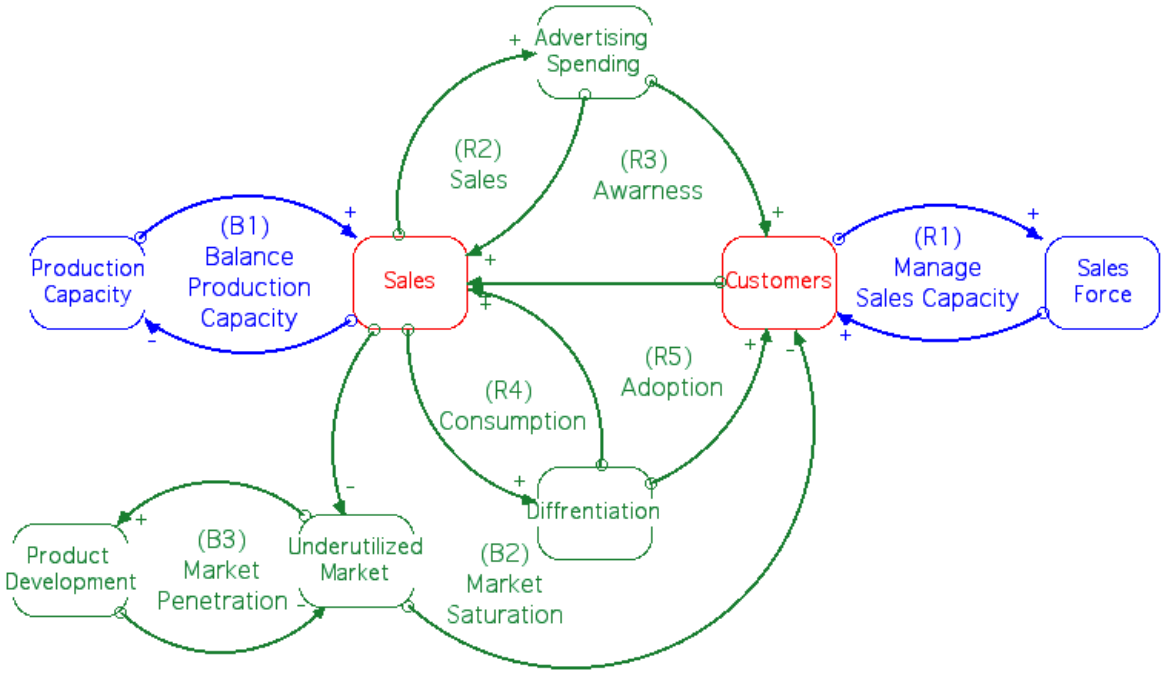


Figure 5: Submodels Diagram

The following is a short description for each submodule, which will be elaborated in detail later:

Advertising Spending: This submodule represents the dynamics of optimizing advertising spending. It takes into consideration the effects of uncertainty, internal information delay and limited know-how on the Return on Investment ROI in advertising.

Customers: This submodule represents customers' acquisition and loss dynamics, including the effects of advertising, sales forces and differences in adoption rate.

[1] Please refer to the attached document 'Complete Model Documentation', for formal model description, including a detailed stock-flow diagram, mathematical formulation and variables description.

Differentiation: This submodule represents the dynamics of optimizing investment in different differentiation activities, including increasing product quality and variety, adding new features or acquiring new technology. The dynamics of differentiation include its effect on adoption and consumption and the effects of uncertainty, internal information delay and limited know-how on the level of investment in differentiation.

Production Capacity: This submodule represents the dynamics of managing utilization and acquisition on production capacity.

Product Development: This submodule represents dynamics of overcoming market saturation by new product development.

Sales: This submodule represents the firm's dynamics of obtaining and fulfilling sales, as affected by demand, sales effectiveness and production capacity.

Sales Force: This submodule represents the dynamics of managing sales force capacity utilization and acquisition.

Underutilized Market: This submodule represents the current level of market saturation. In the stock and flow diagram, the components of this module were redistributed to the differentiation and product development submodules.

To achieve sustained growth, the entrepreneur uses one of two strategies:

Pushing strategy:

In the pushing strategy, the entrepreneur aims to achieve growth by investing in product availability, which increases the probability of achieving sales. This strategy is effective in many cases, especially in the early stages of market evolution where availability can be the main criteria in buying the product.

To sustain growth, the entrepreneur aims to keep the sales force in equilibrium with expected customers (R1). This equilibrium allows the firm to avoid losing opportunities while avoiding inefficient operation.

In contrast, to achieve a successful pushing strategy, the entrepreneur aims to keep production capacity in equilibrium with the expected order rate (B1). This allows the entrepreneur to sustain uninterrupted and efficient growth.

Pulling Strategy:

In the pulling strategy, the entrepreneur aims to achieve growth by investing in demand-enhancing activities such as advertising, differentiation and product development activities.

Investing effectively in advertising increases sales directly by increasing sales rate from current customers (R2) and indirectly by attracting new customers (R3).

Investing effectively in a product's differentiation by enhancing quality, features, and variety; this investment sustains growth directly by increasing the average consumption of current customers (R4) and indirectly by increasing new customers' adoption rate (R5).

With respect to long-term sales, growth exhausts the market opportunity (B2) and markets reach a saturation level where advertising and differentiation are not justified. Hence, the entrepreneur aims to break through by developing new products that allow the firm to penetrate new markets (B3).

The following sections will illustrate the main causal loops and how the mental model of the entrepreneur affects growth of the firm. Moreover, the simulated behavior of the main variables will be shown.

6.2.2 Pushing Strategy.

During firm growth, the entrepreneur may approach the limits of a firm's operation capacity many times. Therefore, the firm may enter into a stagnation period. To resume growth, the entrepreneur needs to invest in acquiring more operation capacity to meet expected demand. In contrast, the entrepreneur may manage a conflicting objective as he aims to minimize underutilized capacities to assure operational efficiency. Thus, the entrepreneur keeps struggling between two conflicting objectives:

Acquiring new capacity in a timely manner to ensure that the firm will not lose market opportunities. In many cases, the entrepreneur lacks the know-how needed to acquire new capacities, and capacity is often acquired through trial and error, which wastes valuable time and resources and eventually leads to losing opportunities for growth.

Maximizing operation capacity utilization. Overestimating demand leads to obtaining too much capacity, which might damage profitability. Underestimating demand might lead to losing a chance to grow. In many cases, demand is inaccurately estimated due to a lack of formal research practices in small business, and in other cases, the reporting of such opportunities is delayed due to informal reporting and planning practices. Hence, in many cases, capacity acquisition is inaccurately planned, and many small businesses run inefficient operations.

Thus, entrepreneurs oscillate between acquiring more capacity than they can utilize to acquiring more demand than they can fulfill. This behavior affects a firm's growth significantly, and in extreme cases, it can halt growth permanently.

The following are two common examples wherein the entrepreneur manages growth by maintaining equilibrium between operational capacity and market opportunity, and in which his growth is greatly affected by the entrepreneur's accuracy of perception of market opportunities and his efficiency of acquiring new capacity:

6.2.3 Managing Sales Capacity Utilization[2]

To apply a successful pushing strategy, the entrepreneur aims to increase sales by investing in the sales force to enhance his ability to cover more customers. This capacity will assure product availability for more customers, and hence it will increase the probability of achieving sales.

To sustain growth, the entrepreneur must manage the following feedback loops:

(R5) Invest in Sales Force

Entrepreneurs acquire 'Customer Covering Capacity' by investing in 'Sales Force', leading to increase in 'Sales Revenue' and eventually leading to an increase in 'Sales Force Budget.' This re-enforcing loop leads to exponential growth in the short-term.

(B5) Market Saturation

As the firm keeps investing in covering capacity (R5), the non-served customers keep decreasing, and the potential to obtain new customers is depleted. Consequently, the long-term return on investing in sales force drops to an unsatisfactory level, which discourages further investment in the sales force.

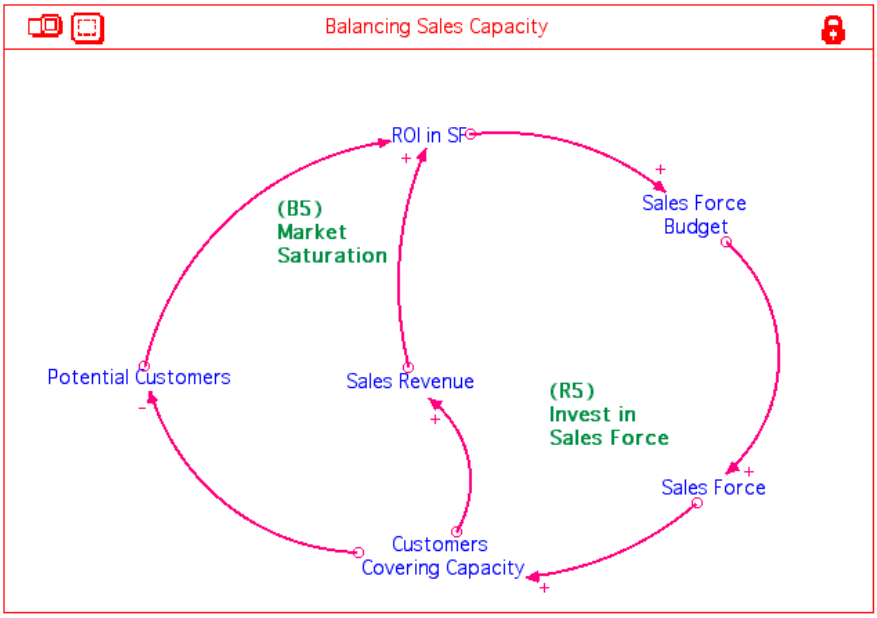


Figure 7: Sales Capacity Management CLD

As illustrated in Figure 7, the entrepreneur keep investing in the sales force, driven by their Return on Investment (ROI). When the ROI increases in the first 8 months, the entrepreneur responds by continuing to hire new members of the sales force. However, as he hires too many sales people, the ROI drops, and the entrepreneur is forced to dismiss some of the sales force in the second 8 months. Starting from the 16th month onward, he manages to achieve smooth sales growth by maintaining sales capacity in equilibrium

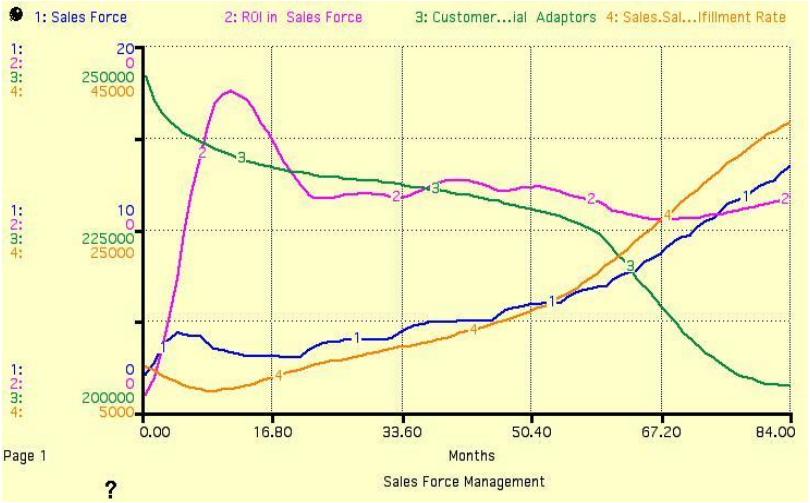


Figure 8: Sales Capacity Management Variables Behavior

[2] Please refer to the attached document 'Complete Model Documentation', For formal model description, including the detailed stock flow diagram, mathematical formulation and variables description.

with expected return. This equilibrium stabilizes ROI at an optimum level.

In contrast, as sales increase, un-served customers decrease, which limits the potential customers available for the newly hired sales people and slowly reduces ROI, forcing the firm to dismiss some sales people to maintain operational efficiency. In the long term, this leads to stabilizing growth, and the entrepreneur is forced to explore other routes to achieve growth rather than increasing the sales force.

[3]6.2.4 Manage Production Capacity Utilization (B1)

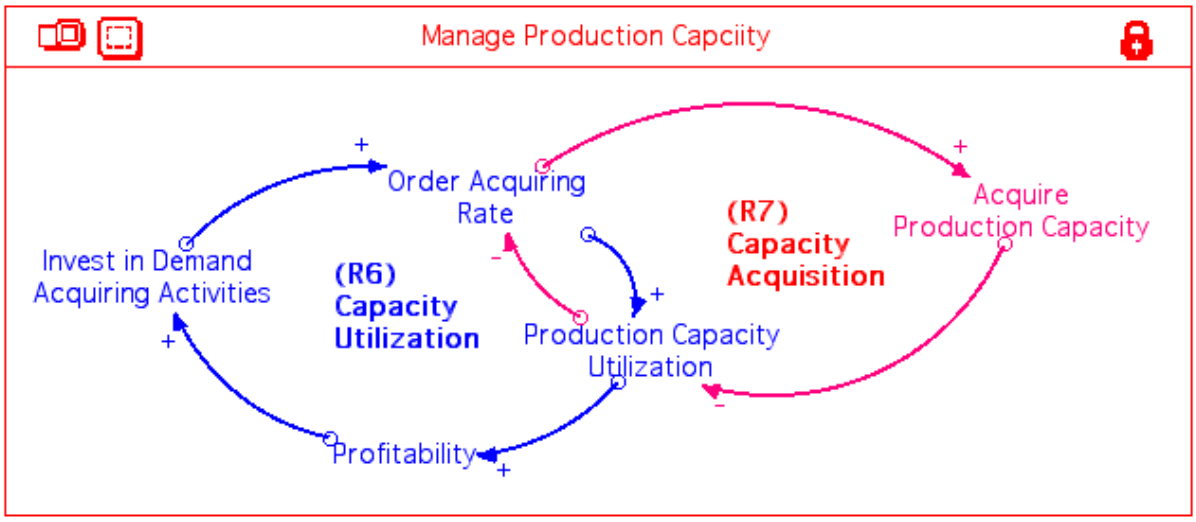


Figure 9: Production Capacity CLD

When planning production capacity, the entrepreneur seeks to achieve equilibrium between production capacity and the sales orders rate. This equilibrium is attained by maximizing the order acquisition rate by investing in a pulling strategy to enhance operation utilization and, consequently, profitability. (R6)

However, as the sales orders increase, the firm reaches a point where production capacity is fully utilized, and the firm starts to lose sales opportunities because it lacks capacity. In this case, the entrepreneur seeks to return to equilibrium by acquiring production capacity to meet expected orders (R7).

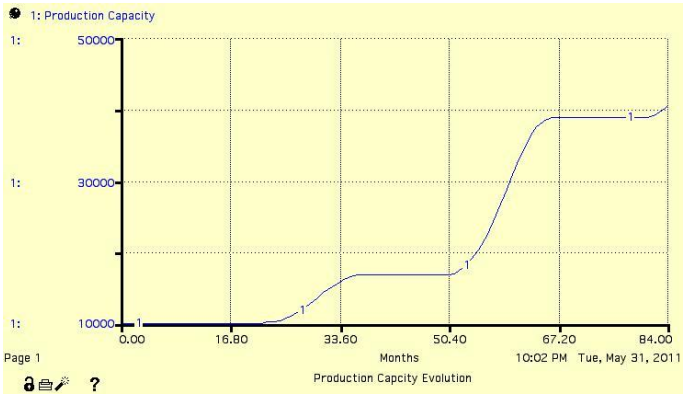


Figure 10: Production Capacity Evolution

Figure 11: Production Capacity Management Variables

As illustrated in Figures 10 and 11, production capacity swings between being:

Under-utilized: where order rate is on a level below fulfillment capacity. This places pressure on the entrepreneur to invest in demand-acquiring activities to enhance profitability.

[3] Please refer to the attached document 'Complete Model Documentation', for the formal model description, including the detailed stock-flow diagram, mathematical formulation and description of variables.

Over-utilized: where order rate is on level above fulfillment capacity. This places pressure on the entrepreneur to invest in acquiring new capacity.

6.2.5 Pulling Strategy:[4]

In many cases, entrepreneurs are hesitant to approach growth using pulling strategies because they are usually more expensive and more uncertain. Therefore, they prefer to invest in pushing strategies. Nevertheless, in the medium-term, many small businesses consume growth opportunities that pushing strategies can provide, and eventually the entrepreneur finds himself forced to use a pulling strategy to sustain growth.

As illustrated in Figure 12, in a pulling strategy, the entrepreneur obtains more sales by investing in pulling strategies (Advertising, Differentiation and New Product Development). This investment increases "Accessible Demand," which consists of both number of adaptors and average consumption by adaptor, which eventually increase sales (R8).

However, because market opportunity is a finite resource, firms approach the market limit as they grow (B7), and increasing investment in advertising or in differentiation will not be justified. Consequently, entrepreneurs aim to penetrate new segments of the market (R9). Usually this happens by developing new products, which have the potential to attract new segments.

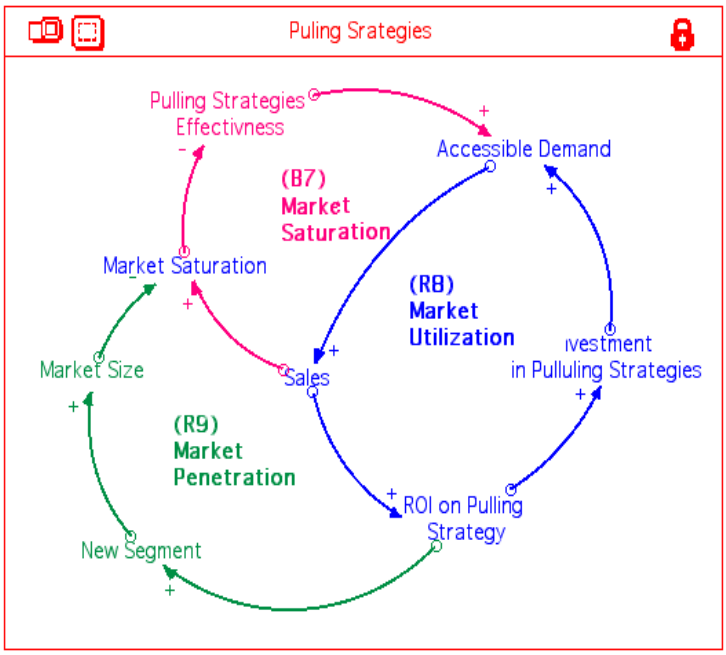


Figure 12: Pulling Strategy CLD Diagram

Pulling strategies have the potential to achieve smooth growth if the entrepreneur has enough market knowledge. However, in the small business environment, a firm might lack the required level of know-how to implement a pulling strategy successfully. For example, the entrepreneur might lack the experience needed to perform new product development; thus, it happens through trial and error, which wastes the firm's time and resources. In extreme cases, competitors might be faster and launch the product first and ruin the firm's investment completely.

In other cases, growth might be troubled due to a lack of formal market knowledge, which leads to a high level of uncertainty in decision-making. For example, the entrepreneur might not realize market potential limits, and he might keep investing in pulling activities and waste valuable resources on already depleted opportunities. This uncertainty

increases the risk of investing in growth activities. So, in many cases, entrepreneurs may believe that launching a new product or acquiring new technology to support product differentiation is a risky venture. Therefore, it is very tempting to surrender to the current profitable plateau rather than risking the firm's financial resources to finance growth.

[4] Please refer to the attached document 'Complete Model Documentation', for the formal model description, including the detailed stock-flow diagram, mathematical formulation and description of variables.

Furthermore, at any level of knowledge or uncertainty, the entrepreneur needs to discover the optimum level of investment that will maximize firm growth. This leads entrepreneurs in many cases to use the "hill-climbing optimization" technique, which, although it has often been shown to be useful, has limitations and negative consequences, as discussed previously.

6.2.6 Optimize Advertising Spending.[5]

Advertising is a basic activity in pulling strategies, as illustrated in Figure 13. Entrepreneurs invest in advertising to achieve sales growth by increasing customers (R10) and increasing sales from current customers (R11). However, entrepreneurs have to always maintain the level of advertising spending in

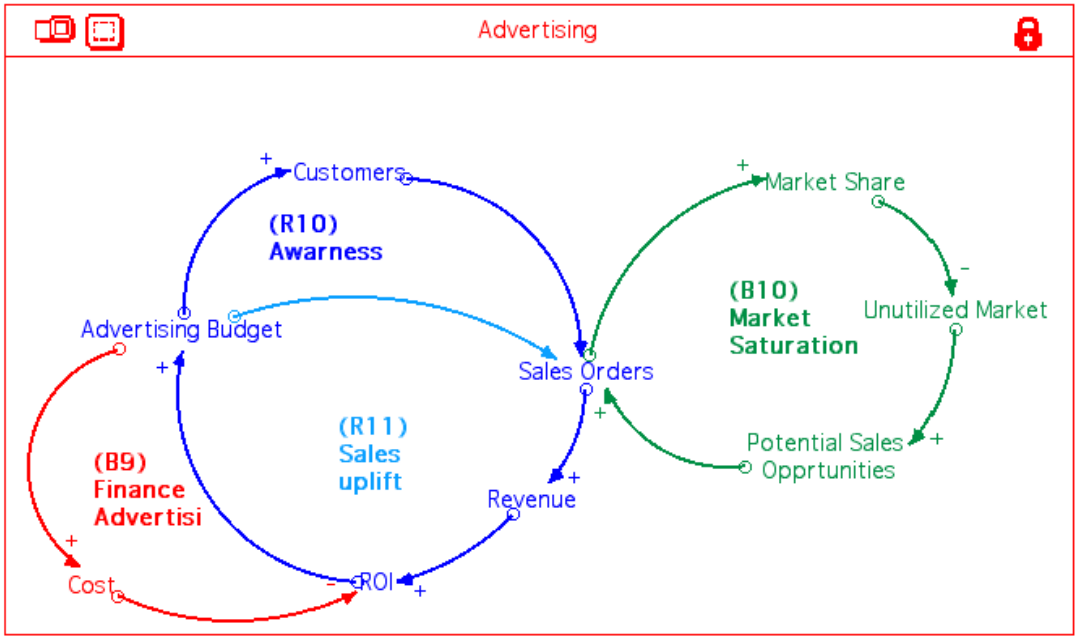


Figure 13: Advertising Management CLD Diagram

balance with the expected return (Finance Advertising B9). If the entrepreneur is uncertain about the expected return on Investment in advertising due to the lack of accurate information about the market demand limitation (B10), he must start a hill-climbing optimization, as described earlier, in which he slowly increases advertising spending and reviews the effects of the recent increase. He will then make another decision to increase or decrease spending accordingly until he reaches a point where no more spending will result in sales increases. Such trial and error methods in advertising lead to obstructed growth and, in extreme cases, might lead to the firm entering a plateau.

A. The effect of Uncertainty and Information Delay on Optimizing Advertising

As illustrated in Figure 14, assuming a high level of uncertainty, entrepreneurs will search for the optimal level of advertising spending (blue line) that maximizes the return of advertising (red line).

In general, advertising spending was always driven by the recent returns on investments. However, there are four important notes to highlight:

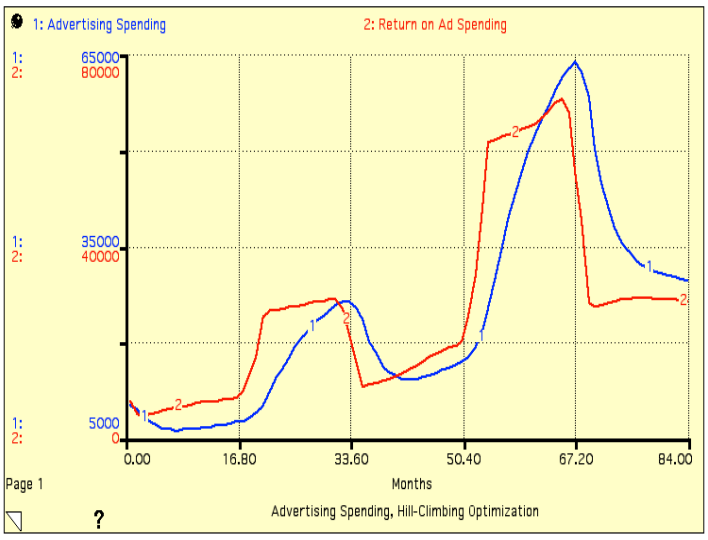


Figure 14: Advertising Spending Optimization

[5] Please refer to the attached document 'Complete Model Documentation', for the formal model description, including the detailed stock-flow diagram, mathematical formulation and description of variables.

There always exists a few months lag between a change in return and the resultant change in advertising spending. This lag is the result of the information reporting delay and the time needed to deploy the new level of advertising.

Even when return on investment showed a sudden increase (in months 17 and 50), advertising spending still followed slowly. This is due to the previously discussed hill-climbing optimization method, as management carefully tests small increases at a time to reduce the risk of uncertainty, which smoothes the advertising spending curve.

The entrepreneur first found the optimum level for advertising spending in month 33. However, he quickly lost it because of his slow response to changes in return, as he planned the advertising upon old information when return peaked (from month 20 to 31); when the advertising was applied in month 33, the market was already down. Thus, the intervention with advertising was too late.

In month 50, the return started to peak again due to many market changes. For example, many new markets were penetrated, new products were introduced and sales organization reached its optimum level. Nevertheless, the entrepreneur was too cautious again, and his decisions were made based on trends of old data. Again, he missed his opportunity by under-investing in advertising.

Figure 15 sheds light on how market uncertainty and information delay limit the entrepreneur's ability to find optimum level of advertising spending and eventually affected the firm's growth. However, to emphasize this behavior we diminished the effect of limited know-how in small business by assuming that the entrepreneur has a perfect ability to deploy advertising properly from the first trial. Hence, the graph below will establish the effect of "know-how" in growth decisions, where "know-how" will be represented as "Time Needed to Perform Advertising Correctly." This effect will be demonstrated by inspecting the Sensitivity Analysis for the effect of "Time Needed to Perform Advertising Correctly" on both spending and return.

B. The effect of Know How on Growth

To highlight the effect of change in know-how on advertising effectiveness and ultimately on growth, the following graph shows the results of conducting an experiment of changing level of know-how from perfect to poor. The effect of know-how will be measured by the duration the entrepreneur takes to successfully perform the advertising campaign as follows:

Perfect know-how time = 1 month, (Blue Line).

Moderate know-how time = 3 months (Orange Line).

Poor know-how Time = 3 months (Pink Line).

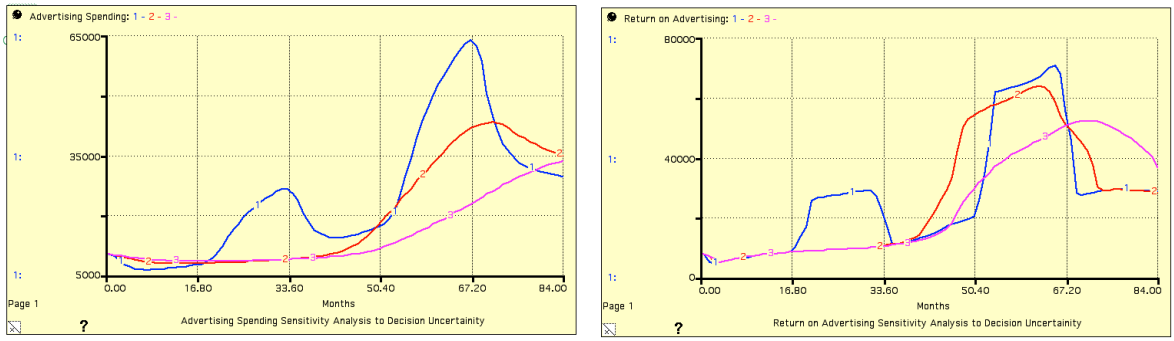


Figure 15: Sensitivity Analysis on the effect of Know-How on Advertising effectiveness (left) and Sensitivity Analysis on the effect of Know-How on Return on Advertising (Right)

It is important to emphasize that as "know-how" decreased, the entrepreneur could not catch the first period of optimal of advertising spending and consequently did not achieve the first peak of return, which affected the overall performance of the firm for the rest of the time. Moreover, when the entrepreneur caught the second peak, his performance was far below the base run, as he achieved a 52,000 USD return instead of 70,000 USD.

6.2.7 Maximizing Market Share by Differentiation[6]

Investing in enhancing the value delivered to the customer remains the most reliable way to sustain growth in the long-term. Thus, entrepreneurs enhance product differentiation by investing in product quality, variety, features, and technology, as seen in Figure 16. These investments garner returns by increasing the number of adopters, which increases the demand for the product (R12), and by increasing consumption from the current customers (R13). Furthermore, to assure profitable growth, the entrepreneur carefully plans increases in this investment by comparing spending with expected returns (B11).

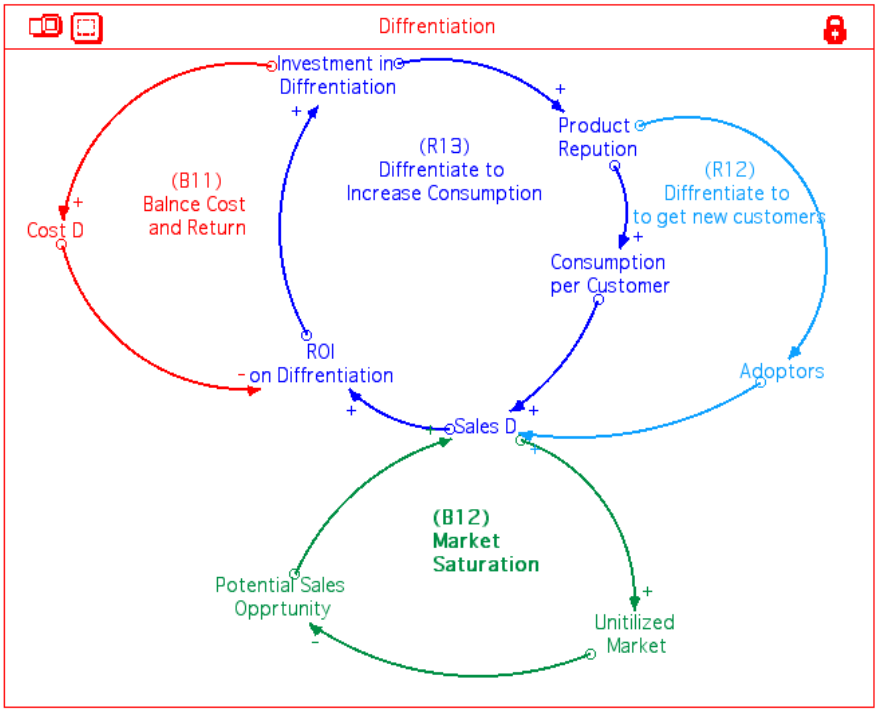


Figure 16: Investment in Differentiation CLD

In contrast, as the firm grows, its share of the underutilized market keeps decreasing; thus, the potential sales opportunities get depleted. Eventually, investing in differentiation loses its power to drive growth (B12).

Furthermore, large growth of the firm is obstructed due to the effect of the Knowledge Triangle on the entrepreneur as follows:

Lack of accurate market information. Hence, estimating expected returns involves a high level of uncertainty.

Delays in reporting and irregularity of planning that lead to limited ability to make decisions in a timely manner to assure the firm's ability to seize market opportunities.

Limited know-how that can prevent realizing full potential of investment.

Eventually, this information triangle leads to an intermittent growth curve and, in extreme cases, a permanent stoppage of growth.

To emphasize the effect of each factor on growth, the following graphs will be organized as described:

[6] Please refer to the attached document 'Complete Model Documentation', for the formal model description, including the detailed stock-flow diagram, mathematical formulation and description of variables.

First Run will focus on the effect of uncertainty and information delay on a firm's ability to differentiate. Thus, it will assume that the entrepreneur has perfect know-how and will isolate the effect of market saturation on growth.

Second Run will explore the effect of market saturation by reviewing the effects of including this factor.

Third Run will explore the effects of know-how on growth by testing the sensitivity of differentiation return to change in know-how.

A. Testing Uncertainty and Delay effect.

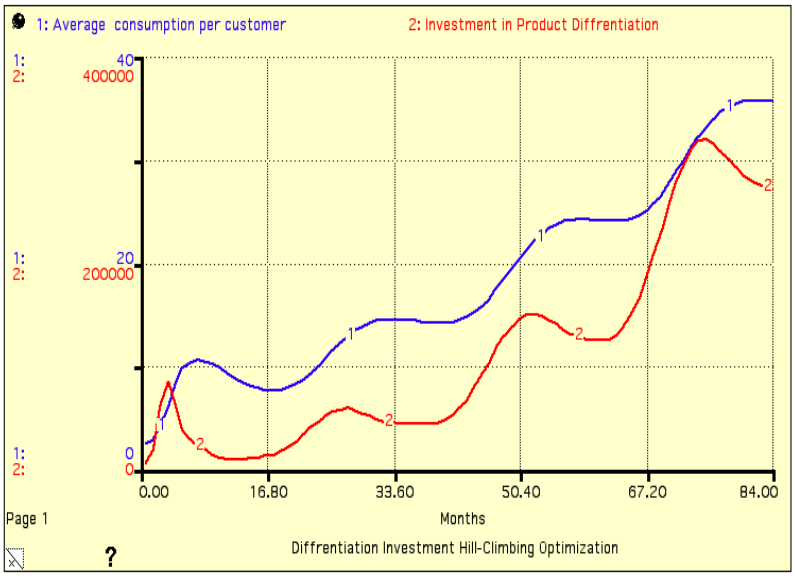


Figure 17: Optimizing Investment in Differentiation

As illustrated in Figure 17, firms invest in differentiation (Red Line) in order to maximize market share. Such an investment in differentiation is rewarded by increases in the customer's average consumption (Blue Line). As illustrated, investment in differentiation is driven by the changes in consumption. Moreover, it is important to note that there is a time lag between changes in consumption and changes in investment level. This lag results from inefficiencies in the internal exchange of information and irregularities in the planning practice, which lead to delays in entrepreneur response.

Moreover, response investment to the change in return is slower due to the entrepreneur's caution as he aims to minimize risk by implementing changes in investment slowly, without matching steep changes in return.

B. Market Saturation effect

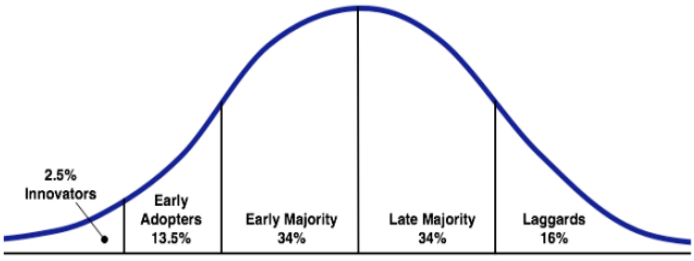


Figure 18: Product Diffusion Stages Rogers (1962)

For simplicity, Figure 17 assumes that all customers are similar to each other, and you can expect similar consumption behavior from all customers acquired in different market saturation stages.

However, as described by Rogers (1962), as the products diffuse, the customers' profiles change from high average consumption among innovators and early adopters to lower average consumption in the majority and laggards. Moreover, late adopters make up 84% of the market (see Figure 18). Hence, the market is biased toward the lower consuming population. Thus, as firms grow, average consumption generally decreases. For example, in the Imtenan case, average consumption was estimated to be 2.3 kg/customer/month in the early stages. In later stage of products diffusion, the estimated average consumption dropped to 0.8 kg/customer

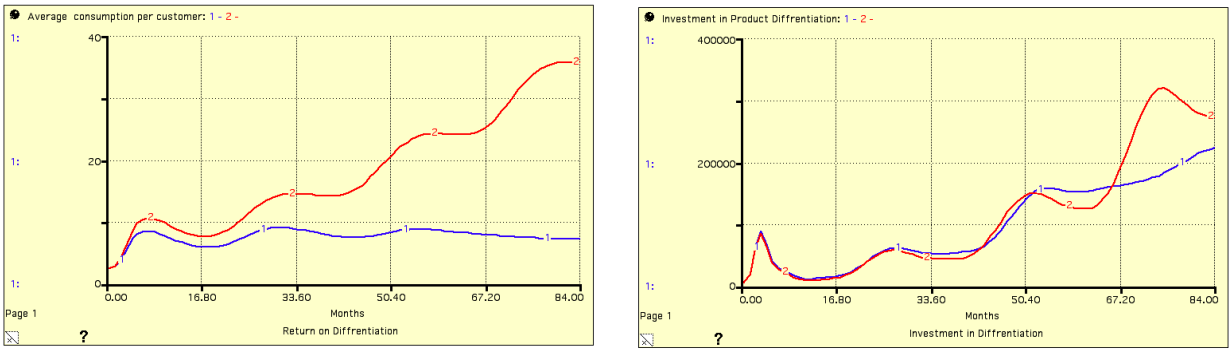


Figure 19: Sensitivity Analysis on the effect of Market Saturation on Return on Differentiation (Left), Sensitivity Analysis on the effect of Market Saturation on Investment in Differentiation (right)

/month.

To highlight the effect of changes in know-how on advertising effectiveness and ultimately on growth, the following graph shows the results of conducting an experiment of changing the level of know-how from perfect to poor. The effect of know-how will be measured by the time the entrepreneur takes until he successfully performs the advertising campaign as follows:

Perfect know-how time = 1 month, (Blue Line).

Moderate know-how time = 3 months (Orange Line).

Poor know-how Time = 3 months (Pink Line).

Figure 19 shows the significant effects of market saturation on the return on differentiation. Although market spending did not change significantly in the first 50 months (Figure 19 Right), average consumption significantly decreased (Figure 19 left). This is mainly because the customers in the first stages are innovators and early adopters who tend to consume more, on average, than customers in later stages (majority and laggards).

Accordingly, after certain stage in diffusion, differentiation loses its ability to drive more growth due the change in the customer profile. It is important that the entrepreneur realizes when the market reaches this point to start exploring another source of growth rather than differentiation. In many cases, the entrepreneur fails to reach this conclusion due to inaccurate perceptions about the market. Hence, a firm might keep

investing in quality or technology even though it is not rewarding. This phenomenon is shown in Figure 19, in which the entrepreneur keeps increasing his investment in product differentiation in the last 34 months (blue line in the right graph) despite the unencouraging general returns (blue line in the left graph).

C. Know How Effect

To highlight the effect of changes in know-how on the return on differentiation and ultimately on growth, the following graph shows the results of conducting an experiment of changing the level of know-how from perfect to poor. The effect of know-how will be measured as the time the entrepreneur takes until he successfully performs product differentiation, as follows:

Perfect know-how time = 1 month, (Blue Line).

Moderate know-how time = 6 months (Orange Line).

Poor know-how Time = 12 months (Pink Line).

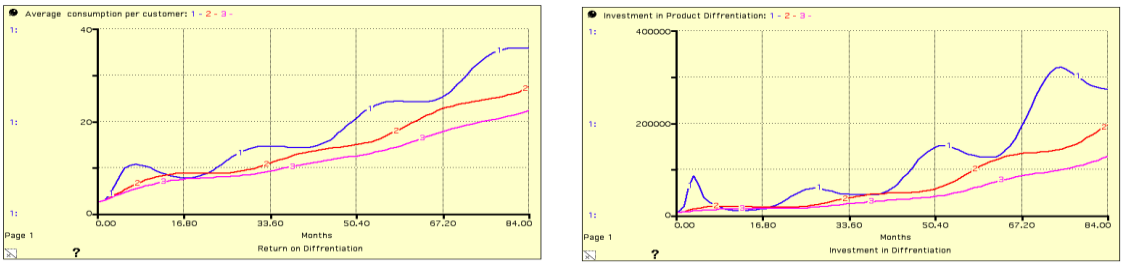


Figure 20: Sensitivity Analysis on the effect of Know-How on Return on Differentiation (Left), Sensitivity Analysis on the effect of Know-How on Investment n Differentiation (Right).

Know-how has similar effect as in advertising. As the firm know-how decreases, the firm reaches lower returns (Figure 20 left), becoming less sensitive and, consequently, less responsive to changes in the market. This can be clearly seen in the smoothness of the investment curve (Figure 20, right), which increases as the know-how decreases.

6.2.8 Maximize Growth by new market penetration[7]

Aiming to utilize current market opportunities, the entrepreneur invests in the available growth strategies, whether they are pulling strategies or pushing strategies, to increase market share. However, as the firm

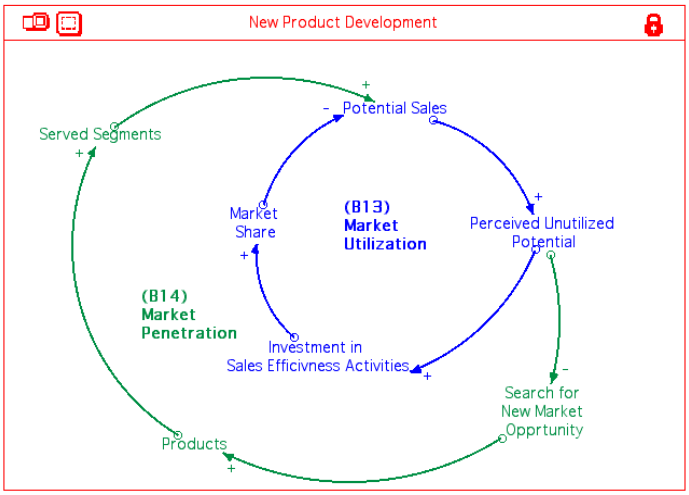


Figure 21: New Product Development CLD

[7] Please refer to the attached document 'Complete Model Documentation', for the formal model description, including the detailed stock-flow diagram, mathematical formulation and description of variables.

grows, non-utilized market opportunities gets exhausted, and consequently, growth rate drops (B13).

Eventually, the entrepreneur will be pressured to search for a new market opportunity by exploring the needs of different segments and developing suitable products to attract these new segments (B14).

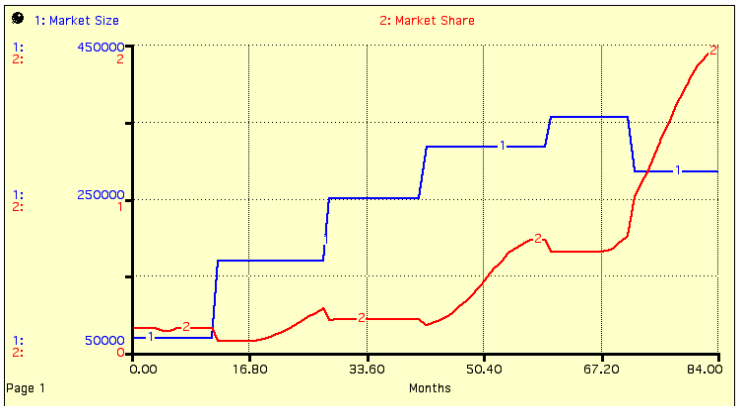


Figure 22: Optimize New Product Development

As illustrated in Figure 22, if a firm grows smoothly by systematically exploring new possible segments and approaching it, the entrepreneur keeps investing in exploiting the current market (red line) until the firm growth enters a plateau. He then invests in new products and achieves a breakthrough by increasing market size (blue line).

The firm growth does not happen smoothly due the lack of market information. Hence, the entrepreneur does not recognize market saturation until he approaches the market limit and the firm has already entered a plateau.

6.3 Model Validation

The model was simulated and variables' behaviors were illustrated to validate the model against reference modes:

- As proposed and different than what was assumed in the stages model, the firm did not experience smooth growth or disconnected discrete stages. Instead, the firm switched between two modes, including a substantial oscillation mode followed by a smooth growth period. This is in alignment with the growth framework proposed by Greiner (1994).
- Growth was path-dependent. Management decisions during a crisis usually succeeded in resuming growth, but they nevertheless caused a subsequent crisis. This supports the proposed paradigm of idiosyncratic growth.

Hence, the behavior of firm growth generally fit with the proposed reference mode.

7. Conclusion and Future Research

The growth of SMEs is a complex phenomenon. Although it has gained vast academic interest, not a single model has been developed to date that can adequately explain why some SMEs grow and others do not.

Our goal was to develop an explanatory model for this phenomenon. To do so, we surveyed the relevant literature, emphasizing critiques of the stages model. The literature survey concluded by identifying the following research gaps and proposing alternative paradigms:

- Lifecycle stages models assumed a deterministic sequence and discrete stages; such assumptions have been rejected by empirical research. Alternatively, states are proposed as a dynamic alternative. States are defined as common patterns of configuration of variables that can be attained based on conditions, not according to a deterministic sequence.
- Assuming the possibility of generating a generic static model. This assumption has been rejected because of the heterogeneity of SMEs and the idiosyncratic nature of the growth. Alternatively, the growth phenomenon should be considered path-dependent. Hence, it follows a unique path for each firm that cannot be generalized to other firms.
- Firms' evolution could not be understood as continuous curves or as discrete stages. Alternatively, growth happens through successive tipping points, separated by periods of smooth evolution.

- Although the stages model has been widely critiqued for the limited inclusion of external factors, this paper argues that on the contrary, the exclusion of the external factors will enhance model utility from control point of view.

A case study of a fast-growing SME has been conducted wherein the process of evolution was identified, the growth of the firm was found to match the reference mode proposed in the literature, and the evolution process was found to match the previously proposed dynamic paradigm.

A system dynamic model was developed that included eight submodels to demonstrate the effects of different critical resources on growth.

The model succeeded in breaking out of the plateau that has plagued research on growth of SMEs since the 1990's. This was achieved by sketching a multidisciplinary causal framework that can explain SME growth while avoiding the discrete assumptions of the stages model. Furthermore, the model balanced against the exclusion of external factors by integrating the effects of managing demand-side capacities.

In future work, we will perform the following tasks:

1. Collect and simulate three more cases of fast-growing SMEs in order to further validate the model and ultimately create a generic model that can be replicated.
2. Explore the application of eigenvalue analysis to our model in order to identify the tipping points associated with shifts in mode dominance (Forrester, 1982; Saleh et al., 2010).
3. Identify leverage points in the model and develop a policy for triggering SME growth.
4. Ultimately, the growth policy will be tested empirically.

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