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McGill University
Faculty of Management

The dynamics of corporate growth

A thesis submitted to the Faculty of Graduate Studies and
Research in partial fulfillment of the requirements of the
degree of Doctor in Philosophy

PhD. Candidate: **Denise L. Fleck**

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ABSTRACT

The thesis aims at contributing to clarify broad conjectures on growth, such as, (i) the extent to which growth constitutes an imperative for the firm, and (ii) what leads some firms to enjoy continuing growth and a continued existence, while others, after experiencing continuing growth, end up contracting and decaying. As a result, the thesis seeks to develop a deeper understanding of the mechanisms fostering and precluding growth, while also identifying challenges and opportunities in managing growth.

The thesis comprises four interrelated essays:

- i. *Chandler on the growth of the firm* – this essay scrutinizes *The Visible Hand* (Chandler, 1977) seeking to answer the question “What is Chandler’s theory on how and why did the modern business enterprise (MBE) appear and grow?” Four processes are identified – MBE formation, MBE development, industry formation, industry development. Their analysis within a process-oriented view (Mohr, 1982) discloses chains of necessary conditions in growth-related processes. Moreover, two growth-related dilemmas are advanced and the firm-industry co-evolution is explored.
- ii. Identifying the building blocks of growth dynamics – this essay addresses the question “Which are the basic processes of change that form the dynamics of growth?” Drawing on Mario Bunge’s philosophy (1973-1989; 1979), a framework of qualitatively different modes of change is derived. The framework allows the identification of elementary units of the growth dynamics. These comprise the following types: quantitative, qualitative (dialectical), goal-directed, interactional, causal, structural, random. In addition, complex units of growth dynamics made up of combinations of elementary units are also advanced: evolutionary motor of firm growth, co-evolutionary motor of growth relating firm and industry, and different instances of continuing growth motors.
- iii. Describing growth trajectories of firms – the question “How can growth trajectories be represented?” is addressed in this essay. An indicator of size, which automatically adjusts for inflationary and deflationary changes in currency value is proposed. This indicator enables the drawing of growth trajectories of firms in the economy over long periods of time.

- iv. Growth trajectories of General Electric and Westinghouse: a comparative study – this essay addresses the question “Why do some firms experience continuing growth and continued existence while others decay and disappear?” The growth trajectories of these two companies are drawn and examined over twelve decades. The longitudinal analysis reveals two sets of growth-related traits in firms: business-oriented and organization-oriented. Business-oriented traits relate to ways of managing relevant issues in business. These are: enterprising approach, growth motives approach and change approach. Organization-oriented traits refer to ways of managing the organization, its resources and practices. They are: organizing approach, resource allocation approach, problem-solving approach, managerial hierarchy development approach. The essay advances the notion that as a firm grows, it faces conflicting forces that push the firm towards either of two extreme poles: self-perpetuation or self-destruction. Evidence is provided that General Electric developed self-perpetuating traits throughout its existence, while Westinghouse more often than not developed self-destructing traits.

RÉSUMÉ

La thèse a pour but de contribuer à la clarification d'amples conjectures sur la croissance de la firme, telles que, (i) dans quelle mesure la croissance constitue un impératif pour la firme, et (ii) comment expliquer la croissance continue et l'existence continuée de certaines firmes, lorsque d'autres, après avoir crû, subissent contraction et déclin. De ce fait, la thèse essaye d'approfondir les connaissances sur les mécanismes qui favorisent ou qui empêchent la croissance de la firme, tout en identifiant les défis et les opportunités pour les gestionnaires.

La thèse comprend quatre essais:

- i. *Chandler sur la croissance de la firme* – cet essai examine minutieusement le livre *The Visible Hand* (Chandler, 1977) pour répondre à la question: "Quelle est-elle la théorie de Chandler à propos de pourquoi et comment la moderne entreprise d'affaires (MEA) est apparue et a crû?" Quatre processus ont été identifiés – la formation des MEA, le développement des MEA, la formation des industries, le développement des industries. À la lumière d'une analyse orientée à l'étude des processus (Mohr, 1982), des chaînes de conditions nécessaires pour la croissance sont mises en évidence. En plus, deux dilemmes associés à la croissance de la firme ont été proposés et la notion de co-évolution des firmes et de l'industrie est avancée.
- ii. *Identifiant les blocs constructeurs de la dynamique de croissance* – cet essai a abordé la question "Quels sont-ils les processus élémentaires de changement qui forment la dynamique de la croissance?" Faisant appel à la philosophie de Mario Bunge (1973-1989; 1979), un cadre d'analyse de différents modes de changement est dérivé. Le cadre d'analyse permet d'identifier des unités élémentaires de la dynamique de la croissance. Ce sont les modes: quantitatif, qualitatif (dialectique), orienté à but, interactionnel, causal, structurel, randomique. En plus, des unités complexes de la dynamique de la croissance, composées de différentes combinaisons d'unités élémentaires sont suggérées: le moteur évolutionnaire de croissance de la firme, le moteur co-évolutionnaire de croissance des firmes et leur industrie, et de différents types de moteurs de croissance continue.

- iii. *Décrivant les trajectoires de croissance des firmes* – la question “Comment peut-on représenter des trajectoires de croissance?” est travaillée dans cet essai. Un indicateur de taille, qui corrige automatiquement les effets d’inflation ou de déflation sur la valeur de la monnaie, est proposé. Cet indicateur permet de dessiner les trajectoires des firmes dans l’économie au long de grandes périodes de temps.
- iv. *Les trajectoires de croissance de General Electric et Westinghouse: une étude comparative* – cet essai focalise la question “Pourquoi certaines entreprises expérimentent-elles de la croissance continue et une existence continuée, lorsque d’autres expérimentent du déclin et disparaissent du monde des affaires?” La trajectoire de croissance de chaque firme est dessinée et analysée au long de douze décennies. L’analyse longitudinale permet d’avancer deux ensembles de traits des firmes: ceux orientés aux affaires et ceux orientés à l’organisation. Les traits orientés aux affaires sont associés à des façons de gérer d’importantes questions des affaires. Ce sont: l’approche entrepreneuriale, l’approche des motivations pour la croissance, l’approche au changement. Les traits orientés à l’organisation sont associés à des façons de gérer l’organisation, ses ressources et ses pratiques. Ce sont: l’approche organisationnel, l’approche d’allocation de ressources, l’approche de résolution de problèmes, l’approche de développement de l’hierarchie organisationnelle. L’essai suggère qu’au fur et à mesure que la firme croît, elle fait face à des forces contradictoires qui poussent la firme vers l’un des deux pôles: l’auto-perpetuation ou l’auto-destruction. L’étude historique de ces deux firmes réunit de l’évidence qu’au cours de leur existences, General Electric a développé des traits d’auto-perpetuation, lorsque Westinghouse a plutôt développé des traits d’auto-destruction.

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Chapter 1

INTRODUCTION

Grow or Die! seems to be an indisputable imperative in business. Or at least in the large firm. The quest for the growth of the firm is a continuous process within large firms. Besides constituting an important element in the organizational performance evaluation system, growth also plays a major role in the determination of managerial compensation. Moreover, often associated with health and success, growth receives wide coverage in the business press where the largest and the fastest growing companies, and their managers, occupy center stage.

Organizational growth is a challenging issue. Choosing the right timing, rate and mode of growth is far from simple. Equally demanding is the coordination of ever bigger organizations. In sum, managers face different sorts of challenges which, in turn, ask for a diversified range of skills. For academics, growth is no less challenging. Its understanding requires a fairly accurate description to unveil explanatory mechanisms. Yet, the very characterization of growth is not without problems. Although the notion of growth as a *process of change in the size of the firm* is quite straightforward, there are many ways of measuring a firm's size, including number of employees, productive capacity, total sales, assets, and market capitalization. Besides, by encompassing processes of change inside and around the firm, growth requires the consideration of a fairly diversified range of factors and mechanisms to advance its understanding.

Understanding growth has been a major challenge for researchers in several fields of study. Economists have addressed why firms come into being and undergo growth (Coase, 1937), as well as the qualitatively different mechanisms underlying firm's growth and determining limits to growth (Penrose, 1980). Business historians have also devoted considerable effort to understand the growth of the firm.

Chandler's works, for instance, have focused on the rise and growth of the modern business enterprise (Chandler, 1977), the rise and growth of the modern industrial enterprise (Chandler, 1990), as well as the internal transformations firms undergo while growing (Chandler 1962). In the strategic management field, a number of authors have advanced contributions towards a better understanding of growth. The addressed topics include models of organizational growth (Starbuck, 1971), identification of growth phases (Greiner, 1972), and the adequate balancing between business exploitation and exploration (Normann, 1977). In sum, the study of growth has been approached through various complementary lenses that have undoubtedly enriched our understanding of the matter.

Notwithstanding the contribution the literature has made so far, the cumulated knowledge falls short of providing powerful insights to some broad conjectures on growth. The extent to which growth constitutes an imperative for the firm is one such conjecture. Another one seeks to figure out what leads some firms to enjoy continuing growth and a continued existence while others, after experiencing growth, end up decaying. This thesis aims at contributing to further the understanding of the growth of the firm and advancing theoretical insights that might be helpful in clarifying such conjectures. By focusing on the dynamics and management of growth, the thesis seeks to develop a *deeper understanding of the mechanisms fostering and precluding growth on the one hand, while also uncovering the challenges and opportunities in managing growth.*

The structuring of this study rests on two assumptions:

- (i) that the literature has already advanced substantial insights, though it still needs integration;
- (ii) that the dynamics of growth comprehends internal and external pressures and processes of change whose identification and understanding are crucial for advancing knowledge on the growth of the firm.

As a result, the study is made up of four interrelated investigations:

- (i) *Chandler on the Growth of the Firm* - Chandler's works have provided

valuable insights on the growth of the firm. This essay, therefore, scrutinizes Chandler's *The Visible Hand* (Chandler, 1977) to answer the question "*What is Chandler's theory on why and how did the modern business firm appear and grow?*";

- (ii) *Identifying the Building Blocks of Growth Dynamics* – this essay addresses the question "*Which are the basic processes of change that form the dynamics of growth?*" Drawing on Mario Bunge's philosophy (Bunge, 1973-1989; Bunge, 1979), a framework of qualitatively different modes of change is derived. Such a framework allows for the identification of elementary and complex units of the growth dynamics;
- (iii) *Describing Growth Trajectories of Firms* – the question "*How can growth trajectories be represented?*" is addressed in this essay. An indicator of size is proposed, which enables the drawing of growth trajectories of firms in the economy;
- (iv) *Growth Trajectories of General Electric and Westinghouse: a comparative study* – the essay addresses the question "*Why do some firms experience continuing growth and continued existence while others decay and disappear?*" The growth trajectories of these two companies are drawn and examined over twelve decades so as to uncover why and how General Electric (GE) has experienced continuing growth and a profitable continued existence, while Westinghouse (WH), a long-time rival and partner, underwent decline and ended up disappearing from the business landscape.

The essays are interrelated, having each contributed to the others. The first two essays, presented in chapters 3 and 4, were developed in parallel and helped each other's ideas formation. Upon completion of the other two essays (chapters 5 and 6), the first two were revisited and enriched. The interrelatedness of the four essays can be expressed in terms of their contribution to one another's development (refer to Figure 1.1):

- (i) The essay on Chandler (chapter 3) has contributed to the GE x WH essay (chapter 6) by providing analytical and explanatory insights into the growth process of firms. In addition, it has also contributed to the growth dynamics

essay (chapter 4) by inspiring the organization of elementary kinds of change into complex types of change. In fact, throughout the scrutinizing of Chandler's work, we sought to associate Chandler's narrative with the modes of change that had already been derived. Upon identification of three concomitant modes of change in Chandler's account of industry development – competitive, cooperative and structural – I came to realize the occurrence of a complex structure of change comprising these three modes. From this I have developed the hypothesis that other complex structures might possibly occur linking the other modes of change. This was further explored in the analysis of GE's and WH's trajectories;

- (ii) The essay on growth dynamics (chapter 4) has contributed to the GE x WH essay (chapter 6) by providing a framework for analysis of change. In addition, as reported before, it has enabled the identification of three concomitant modes of change in Chandler's account of industry development. These, in turn, have inspired the formulation of dilemmas (chapter 3) associated with Chandler's account of the growth process;
- (iii) The growth trajectories essay (chapter 5) has enabled to draw the growth trajectories of GE and WH (chapter 6). In addition, it has helped to visualize Chandler's continuing growth concept (chapter 3);
- (iv) The comparative study on GE and WH (chapter 6), on the other hand, has provided insights for further discussing Chandler's ideas (chapter 3), such as defensive and productive motives for expansion, and continuing growth. It has also inspired an examination of Chandler's transhistorical contribution. In addition, the comparative study has enabled the identification of different mechanisms of continuing growth (chapter 4).

Each essay contributes in an original way to the advancement of knowledge on growth. The essay on *The Visible Hand* scrutinizes Chandler's text bringing to light the main growth-related concepts and explanatory mechanisms in his historical account. In addition, inspired by Chandler's narrative, it derives two growth-related dilemmas. The second essay proposes a framework of modes of change that distinguishes different ways whereby things may undergo change. The third essay

proposes an indicator of size, which enables the drawing of growth trajectories of firms, as well as, the visualization of continuing growth and continuing contraction periods. In addition, the method used to derive the size indicator helps to generate performance measures comparable over time, as well as, across industries. The fourth essay identifies the concomitant evolution of the firm's businesses and the firm's organization. It is proposed that the way the pair *<business-organization>* evolves determines the firm's chances of enjoying a continued existence. Additionally, the study suggests that firm's traits developed early on are likely to determine the way the *<business-organization>* pair evolves throughout the firm's existence.

Six other chapters follow this introduction. Chapter 2 reviews the literature on the growth of the firm, then the four essays are presented, and finally the conclusion is advanced in chapter 7. The essay on Chandler advances the analysis and the discussion of the ideas scrutinized. The essay on the dynamics of growth presents the framework of modes of change and advances elementary and complex units of the growth dynamics. The growth trajectories essay presents the size indicator that enables the drawing of trajectories curves. Finally, the essay on GE and WH describes the historical development of the two firms and performs the analysis of their trajectories over 12 decades.

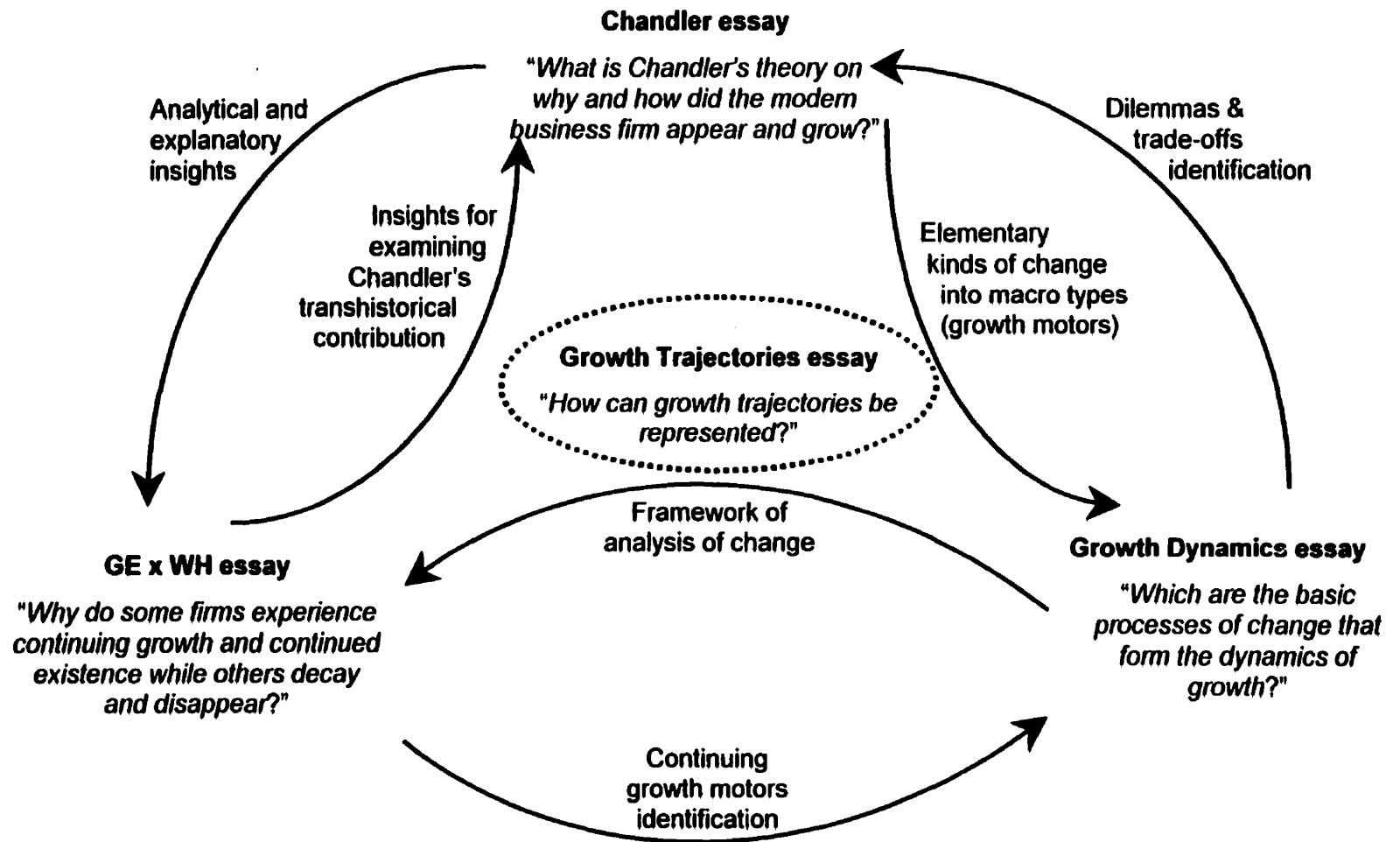


Figure 1.1 - The Four Essays Structure

Chapter 2

LITERATURE REVIEW

Representative works on the *growth process* of the firm are reviewed in this chapter. They provide complementary contributions by virtue of the particular lenses each one uses to examine the growth process, such as economics (Penrose, 1980), business history (Chandler, 1962), psychosociology (Starbuck, 1970; Katz & Kahn, 1978), strategic management (Greiner, 1972; Normann, 1977).

By emphasizing growth as a process, this review does not include works on specific growth phases such as start-up ventures and innovation studies. It also leaves out research on specific types of expansion moves such as acquisitions and mergers (Haspeslagh & Jemison, 1991), vertical integration (Williamson, 1975), strategic alliances (Pekar & Allio, 1994) and diversification (Ramanujam & Varadarajan, 1989). On the other hand, the works selected focus on general aspects of the growth of the firm process providing a comprehensive view of firm growth.

Besides contributing to the theory of growth, these studies have helped to advance strategic management and organization theory. For example, Edith Penrose's (1980) book on the growth of the firm is often cited as a foundation for the resource-base view of strategy. In this view, the possession of resources that are valuable, rare, difficult to imitate and difficult to be substituted, provides the basis for a company to achieve superior returns by virtue of the development of sustained competitive advantage (Barney, 1991). Kor and Mahoney (2000) provide an indication of the relevance of Penrose's work for the resource-based view in strategic management. These authors scrutinized her book, having identified ten fundamental arguments in Penrose's resource-based approach. Another example is the use of Greiner's model of the growth process (Greiner,

Penrose describes size as a state and growth as a process (p. 88). Moreover, she declares her concern only with the growth of firms. As a result, her book focuses on the process of growth, and on the limits to the rate of growth, while size concerns her only incidentally. Although she advances a number of reasons why many firms do not grow (p. 7) – unenterprising direction, inefficient management, insufficient capital-raising ability, lack of adaptability to changing circumstances, poor judgment leading to frequent and costly mistakes, bad luck due to circumstances beyond their control – Penrose is concerned “only with those firms that do grow” (p. 7).

Maintaining that *enterprise* “includes the willingness to take risks” (p. 62), as well as “the willingness to search for ways of avoiding risk and still expand” (p. 62), Penrose suggests that “for a firm, enterprising management is the one identifiable condition without which continued growth is precluded – this is one necessary (though not sufficient) condition for continued growth” (p. 8). In her view, the *large enterprising firm* “will permanently commit part of its resources to the task of investigating the possible avenues for profitable expansion” (p. 34), while smaller firms “may only periodically do so” (p. 34). On the other hand, “so long as a firm is dominated by men who are not ambitious to make profits it is unlikely that the firm will grow very large” (p.33). Penrose emphasizes that people create firms to serve their own purposes and that “expectations and not objective facts are the immediate determinants of a firm’s behavior” (p. 41). In sum, the extent to which a firm grows largely depends on its people objectives and nurtured expectations. In addition, Penrose maintains that “managers have much more to gain if funds are retained and reinvested in the firms” (p. 28). In her view, growth may enhance prestige, personal satisfaction, responsibility, the availability of better positions, and scope for ambitions & abilities.

According to Penrose, management of growth is a process, which requires two kinds of skills:

(i) *entrepreneurial skills* to take advantage of new possible avenues for profitable expansion. The quality of entrepreneurial services *includes entrepreneurial versatility* (imagination and vision), *fund-raising ingenuity*, *entrepreneurial*

judgment (in the absence of which the firm will tend to consistently make mistakes, over-estimate what it can do, guess wrongly the future course of events) and *entrepreneurial ambition* (p.35-41). Two types of *entrepreneurial ambition* are distinguished. The first is the *product-minded*, which is directed towards the improvement of the quality of products, the reduction of costs, the development of better technology, the extension of markets, the introduction of new products in which the firm is believed to have a productive or distributive advantage. The other type is called *empire-builder*, being pushed by visions of creating a powerful industrial empire extending over a wide area. According to Penrose, empire-builder is "much more interested in the extension of the scope of his enterprise through acquisition or the elimination of competitors by other means other than competition in the market" (p. 40).

(ii) *managerial skills* to coordinate the use of resources profitably. Such skills cannot be bought in the market as commodities. Quite on the contrary, they involve the development of interpersonal relations that take time to evolve, leading Penrose to assert that "expansion does not take place automatically" (p. 44).

Penrose classifies growth as internal – through the development of internal ventures – or external – by means of mergers or acquisitions. In line with her view that "it is at the organization as a whole that we must look to discover the reasons for its growth" (p. 7), Penrose mainly elaborates on internal reasons and obstacles to growth. Those of external nature are just mentioned: external inducements (p. 65) include growing demand, changes in technology, discoveries and inventions, opportunities to obtain or achieve monopolistic advantages, and threatening changes calling for defensive growth (backward integration, diversification, pre-emption of competitors). External obstacles (p. 66) include keen competition, patent rights, high costs of entry, difficulties of obtaining inputs.

In what concerns internal inducements, Penrose advances some factors that lead to continued growth. These are:

- (i) excess capacity of productive services of resources due to indivisibilities in machines, managers, R&D and engineering (Kor & Mahoney, 2000);
- (ii) unused services of resources, which stimulate innovation both in products as in organizing. In addition, Penrose suggests that "unused productive services are a selective force in determining the *direction of expansion*" (p. 87);
- (iii) efficient managerial resources. According to Penrose, "diversification will become the slogan of firms that are reasonably well-established, possess efficient managerial resources operating in a reasonably well worked-out administrative structure and want to increase their profits at a more rapid rate than their existing products permit" (p. 145).

Penrose advances three types of limits to the growth of firms. Growth is limited by external circumstances such as product or factor markets. It is also internally limited by the availability of managerial ability. Finally, it is limited by uncertainty and risk, which combines internal attitudes and external conditions. According to Penrose, the size of the firm is limited by the increasing costs of growth, which came to be known as the *Penrose effect*.

Penrose distinguishes between *economies of size* and *economies of growth*. *Economies of size*, commonly known as economies of scale, "would not be available if firms were sufficiently reduced in size" (p. 98). Classifying economies of size into technological, managerial and financial, Penrose maintains that they are responsible for "lower production and distribution costs", as well as for "competitive advantages, enabling firms to expand in certain directions" (p. 98). Based on the statistical theory of large numbers which states that "the greater the number of similar items involved, the more likely are deviations to cancel out and to leave the actual results nearer to the expected results" (p. 94), Penrose proposes that "the larger the operation, the more accurately prediction can be made" (p. 94).

Economies of growth are described as "internal economies available to an individual firm, which makes expansion profitable in particular directions. They

are derived from the unique collection of productive services available to it, and create for that firm a differential advantage over other firms... They may or may not be also economies of size" (p. 99). In addition, "economies of growth that are not at the same time economies of large-scale production and operation are essentially transient economies" (p. 101). The conditions for economies of growth to remain as economies of size are that "a reorganization of the older activities of the firm is required to take advantage of them", or that "they apply jointly to the old and new activities" (p. 103).

Penrose has overthrown the notion that the firm's long-term average cost curve was U-shaped. Consequently, she has also rejected the notion of an optimum size of the firm at the level of output – corresponding to the lowest point of the U-curve. Instead, she has underlined the possibility of diversification, and theoretically dealt with two limiting rates in the expansion process: the rate of growth, and the rate of entry in new fields. In both cases, the availability of entrepreneurial and managerial skills were limiting factors. Despite a quite detailed analysis of the growth phenomenon at the firm level, no formal model was proposed in Penrose's work.

Chandler's perspective (1962)

Chandler's study began as an experiment in the writing of comparative business history. It investigates the development of business activities and of organizational innovation (the structuring of these activities) in four American companies – DuPont, General Motors, Jersey Standard, and Sears – during the first half of the twentieth century. The comprehensive examination of activities, decisions, and structural changes in these corporations, in the light of environmental transformation has produced a rich account of business development, and of firm growth during the studied period. The common traits observed in the four companies prompted the author to advance general propositions concerning the development of business activities and business organizations.

Chandler observed that "growth might come through simultaneous building or buying of new facilities, and through purchasing or merging with other enterprises" (p. 16) and that "structure was often slow to follow strategy particularly in periods of rapid expansion" (p. 16). In many respects, Chandler's investigation confirms Penrose's theoretical development. He found, for example, that "trained personnel with manufacturing, marketing, engineering, scientific, and managerial skills often became even more valuable than warehouses, plants, offices, and other physical facilities" (p. 383). The important role played by skills and abilities in promoting and limiting growth was also acknowledged:

- (i) "The rate of growth and the effectiveness in the use of the enterprise's resources rested on the ability and ingenuity of its administrators to build, adjust, and apply its personnel and facilities to broad population, technological, and income changes" (p. 384);
- (ii) "The firm's health and effectiveness in carrying out its basic economic functions depended almost entirely on the talents of its administrators" (p. 384).

Chandler's ideas are in line with Penrose's view that internal factors play a larger role in the growth process than external ones. Chandler remarks that "the market, the nature of their resources, and their entrepreneurial talents have, with relatively few exceptions, had far more effect on the history of large industrial firms on the United States than have antitrust laws, taxations, labor and welfare legislation, and comparable evidences of public policy" (p. 384).

In contrast to Penrose, Chandler did not emphasize quantitative process properties such as rate of growth and rate of entry in new fields. Instead, he has focused on the development of the formal structure of the companies he studied. In his view, "historically, the executives administering American industrial enterprises have followed a recognizable pattern in the acquisition and use of resources, made up of four phases or chapters" (pp. 384-385):

. *Initial expansion and accumulation of resources:* The initial acquisition of extensive plant, equipment, and personnel came to meet rapidly growing and often new demands for the products of their company;

. *Rationalization*: Once these resources had been acquired, the executives in charge of the firm began to pay increasing attention to using them more rationally and efficiently;

. *Expansion into new markets and lines*: As the enterprise reached the limits of the existing market and of cost reduction, its senior executives began to seek new markets or new lines of business where they might apply some resources only partially used or where existing ones might be employed more profitably. Market limits were set by available consumer income, the state of technology, and the location of population. Rational and systematic integration and use of its resources brought about cost reduction;

. *Development of a new structure*: Those companies that did develop new markets or new products then had to reshape the channels of communication and authority within the enterprise.

The depicted pattern can be conceived as stages in the process of growth. Each expansion stage is followed by an internal consolidation phase, where operations are rationalized and organized. In this way, management can take the best advantage of the caught opportunities, "created by changing population, income, and technology" (p. 15).

Starbuck's perspective (1971; first edition in 1965)

According to Starbuck (1971), growth is defined as change in an organization's size when size is measured by the organization's membership or employment; development is defined as change in an organization's age"(p. 11). His work reviewed an impressive number of studies addressing why and how organizations develop.

In line with both Penrose's and Chandler's views, Starbuck conceived organizational growth as a neither spontaneous nor random event, but rather a consequence of decisions like hiring, and increasing production. According to Starbuck, the behavior patterns of growth are chosen through processes of

bargaining and problem solving, which deal with conflicting motives espoused by different coalitions (Cyert & March, 1963). Some motives promote growth while others tend to inhibit it. Two sorts of growth promoters have been advanced: organizational goals, such as revenue increase, cost reduction, profit increase, stability of operations and managerial goals, such as adventure, risk-taking, prestige, power, security, and higher salaries. Growth inhibitors included the attitudes towards change, namely resistance to change.

Starbuck has identified three kinds of change, which also correspond to three main sources of reasons for membership, namely,

- (i) organizational goals that may attract candidate members;
- (ii) activities performed in the organization's task structure;
- (iii) interactions experienced in the organization's social structure.

According to Starbuck, the more a change affects the reasons for someone's membership, the more one will be likely to resist such change. Conversely, the less a change affects one's reason for membership, the more one will be likely to support the change.

Starbuck has classified the various models of organizational growth into four groups:

- i. *Cell-division models* – focus on growth as a percentage change in size. Some studies make explicit use of the biological analogy to derive the model;
- ii. *Metamorphosis models* – take the view that growth is not a smooth continuous process. Instead, it is marked by abrupt and discrete changes in the conditions leading to organizational persistence and in the structures appropriate to these conditions. The evolution of the firm is seen proceeding in more or less well-defined stages;
- iii. *Will-o'-the-wisp models* – explore one kind of process which might connect the motives of organizational members to increases in the size of the organization;

- iv. *Decision-process models* – attempt to reproduce the fabric of organizational decisions. The model-builder must try to specify, by direct observation of individual organizations, all of the major decision rules used by the organizations and then test his model against detailed data on actual behavior.

Cell-division models have been applied in different ways. Haire's (1959) study exemplifies the study of growth at the firm level. It consisted of fitting time-series data on employment in eight individual firms to an equation that is frequently employed to describe the reproduction of biological organisms. However, most other studies use cross-section data on a number of organizations at a given point in time. Haire disapproved of this approach stating that it generates "a spurious growth curve. It is not a curve of growth representing the dynamics within an organization, but a set of static measurements arranged by size" (p. 292).

Though agreeing with Haire (1959), Starbuck has justified the application of cross-section studies to investigate equilibrium states – "taking equilibrium states to be a description of the 'average' organization after its initial surge of growth has passed". Starbuck maintains that "whether this is a reasonable thing to do, of course, depends on whether one believes that individual organizations are eventually constrained to the pattern of the 'average' organization" (p. 66). Starbuck concluded his review of cell-division models stating that they "should be good starting points for more sophisticated models of growth" (p. 68).

Starbuck's review of some metamorphosis models has included:

- i. **Moore's (1959) model** – Emphasizing different sorts of people, particularly top management people, the model distinguishes three phases and three corresponding types of executives. The first stage (creation of the business) requires a Promoter or Activity generator; the second stage (development of sound business practices) requires a Businessman or Consolidator; finally the third stage (a stage of organization as a rationalization of means to ends) requires a Manager or Administrator;

- ii. Starbuck's (1966) model on retail stores – The model distinguished between clerking activities, which involve interaction with customers, and backing activities, which do not. Small stores would be intrinsically backed because their employees perform both types of activities, while large stores are extrinsically backed because some of their employees never interact with customers;
- iii. Filley's (1963) model – It distinguished three stages in the life of a business firm: a non growth traditional stage, a dynamic stage of growth, and a bureaucratic stage.

The four phases or chapters identified by Chandler (1962) constitute another example of the metamorphosis model. According to Starbuck, "metamorphosis models describe probable changes in structure when the cumulative, long-run shifts are organizational growth and aging" (p.73). Though admitting the likelihood of disagreements concerning the significance of some of the structural changes described in metamorphosis models, Starbuck stated that "one can hardly doubt the importance of studying structural changes which correlate with growth and age" (p. 73).

Will-o'-the-wisp models make "growth a process of pursuing opportunities which tend to vanish when the expansion is completed" (Starbuck, 1971, p. 74). He cited Penrose's work (1980), which distinguishes economies of scale from economies of growth, as an example of such model: "there may be advantages in *moving* from one position to another quite apart from the advantages of *being* in a different position" (Penrose, 1980, p. 2). Starbuck remarked that the dynamics of Penrose's (1980) theory stresses factors inside the firm, although she also tried to take into account external factors. Starbuck has developed a mathematical treatment of Penrose's theory, concluding that her theory "appears to imply that the expansion path of any given firm could fall into either two patterns" (Starbuck, 1971, p. 79). These are either an expansion into the indefinite future, as Penrose suggested, or an expansion followed by contraction, an alternative that Starbuck's mathematical model suggests (Starbuck, 1971, p.130).

Starbuck considered decision-process models to be potentially the most fruitful approach to organizational growth. Yet, he admits, they are expensive to study. According to Starbuck, typical examples of such models are provided by the work of Cyert and March (1963) and their associates. For Starbuck (1971), one of the main contributions of decision-process models was their realistic and promising approach, letting long-run patterns emerge as by-products of short-run decisions, something that most models of organizational growth did not do. Nevertheless, he pointed out the importance of developing knowledge about long-run learning, if such models are to be useful in the future. As he has put it, "virtually no evidence has been gathered about the way the organizational decision structure evolves – how it came to be and by what mechanisms it changes" (Starbuck, 1971, p. 82). Finally, he asserted that "methods must be discovered for handling decision-process models methodologically" (Starbuck, 1971, pp. 82-83). According to him, as the empirical base of these models becomes stronger, they become more complex and it is harder to understand why the models do what they do.

With respect to the attention devoted to causes and effects, Starbuck (1971) asserted that cell-division models tend to concentrate on effects and to ignore causes. At the opposite end of the spectrum are decision-process models. These would tend to concentrate on causes and to ignore effects, since effects are left to emerge as outputs from the dynamic processes. The two other types of models would be situated in between. Metamorphosis models describe both causes and effects, though the connexions between cause and effect remain vague. Finally, will-o'-the-wisp models tend to stress sequences of events and make time an explicit variable, giving more attention to connexions between cause and effect and to environmental influences.

Greiner's perspective (1972)

Greiner has proposed a metamorphosis model of organizational growth, which describes organizations moving through five distinguishable phases of

development. In his view, each phase contains a relatively calm period of growth, that he called evolutionary period, and that ends with a management crisis, a revolutionary period as he named it.

The proposed model takes into consideration the age of the organization, the size of the organization, and the growth rate of the industry. Greiner maintains that "while evolutionary periods tend to be relatively short in fast-growing industries, much longer evolutionary periods occur in mature or slowly growing industries" (p. 40). Though not mathematical, Greiner's model suggests that firm growth rates depend on organizational age and industry growth rate. However, its main emphasis is on the qualitative differences between each of the five phases.

The first stage – birth stage – is entrepreneurially oriented and ends with a leadership crisis, which is the first critical developmental crisis: "to locate and install a strong business manager who is acceptable to the founders and who can pull the organization together" (p. 42). With the installation of a capable business manager, Greiner anticipates a "period of sustained growth" (p. 42) – phase 2 – during which a functional structure is introduced.

A second crisis develops from "demands for greater autonomy on the part of lower-level managers" (p.42). As a decentralized organization structure is successfully applied, a third phase of growth takes place in a delegation-driven managerial style. A control crisis evolves to the extent that "top executives sense that they are losing control over a highly diversified field operation" (p. 43). Companies that solve this crisis find new solutions in the use of coordination techniques, a characteristic of phase 4.

The proliferation of coordination systems gradually produces a lack of confidence between line and staff, and between headquarters and the field, with procedures taking precedence over problem solving, and innovation being dampened. This fourth crisis leads to a collaboration phase – the fifth phase. Greiner has speculated about the sort of crisis that would follow the collaboration

stage. He suggested that "the revolution will center around the 'psychological saturation' of employees who grow emotionally and physically exhausted by the intensity of teamwork and the heavy pressure for innovative solutions" (p. 44). He has additionally suggested that "the phase 5 revolution will be solved through new structures and programs that allow employees to periodically rest, reflect, and revitalize themselves" (p. 44). In other words, through the implementation of dual organization structures, "a 'habit' structure for getting the daily work done, and a 'reflective' structure for stimulating perspective and personal enrichment" (p. 44).

According to Greiner, the cycle evolution-revolution cannot be avoided. Firms follow the phases he described in the sequence he proposed. In sum, "top leaders should be ready to work with the flow of the tide rather than against it; yet, they should be cautious, since it is tempting to skip phases out of impatience. Each phase results in certain strengths and learning experiences in the organization that will be essential for success in subsequent phases. ... I also doubt that managers can or should act to avoid revolutions" (p. 45).

Greiner maintains that such order enables managers to anticipate the new problems that organizational solutions bring for the future. Believing that "the future of an organization may be less determined by outside forces than it is by the organization's history" (p. 38), he maintains that "historical understanding" (p. 46) would put managers in a position to "*predict* future problems and thereby to prepare solutions and coping strategies before a revolution gets out of hand" (p.45). This might eventually enable managers to "decide *not* to grow" (p. 45). With respect to limits of growth, Greiner has left the question open, while acknowledging the need for more learning about processes of development in organizations. This should be done by means of research studies that should include the critical yet missing dimension of time.

territory. The last two stages are called extension stages, comprehending the conquest, exploitation and defense of business territory.

With respect to the stages model he proposed, Normann states that:

- i. The development of a line of business goes through certain specific stages that can be identified;
- ii. These stages require different types of organization, of planning and of control;
- iii. It is possible to identify the transition from one stage to another in an historical growth cycle, though more difficult to readjust accordingly.

In sum, while useful for long-term analysis, the stage model is not so useful in the short-term, by virtue of the difficulty in identifying the transitions between stages as they occur.

Besides advancing the stages model of growth processes, Normann derives two kinds of factors that contribute to growth:

- i. *Natural driving forces* – They refer to the impetus that arises without any active initiative on the part of the company's management (p. 52);
- ii. *Planning for growth* – A process of dialectic nature that needs to take place in an environment marked by a certain degree of tension and misfits (p. 97).

The natural driving forces include:

- i. *Principle of least resistance* – Most growing companies seem to follow such a principle, according to which their growth is really a form of repeated reproduction, as they try to extend over ever larger but still similar areas using their established business ideas (p. 52);
- ii. *Various kinds of interdependency* – Technical and other restrictions that regulate the relations between subcomponents in a larger system, as well as interrelatedness with certain subprocesses or subcomponents on the customer and supplier sides may give rise to opportunities of growth (p.53);

- iii. *Disturbances and variations* – They may well provide an important driving force to the generation of new business ideas, i.e., the elimination or exploitation of disturbances. They may also be interesting for another reason: it often suggests that somewhere in the system there is, at least temporarily, some sort of over-capacity, therefore new opportunities to be exploited (p. 54);
- iv. *Power relationships in the environment* – The power structure external to the firm as manifest in the technological, financial, regulation systems affects the shape of the company's development activities (p. 54-56).

Normann rejects the rational decision model such as Ansoff's (1965) "for complex questions such as choice of strategy and formulation of policy" (pp. 9). He holds instead that planning for growth is a dialectic process, and that success depends on handling tension and translating it into a driving force in the growth process. According to him, the art of dealing with the dialectic process consists of (p. 109):

- i. Searching for misfits, conflicts and imbalance in the company and in relations between company and environment;
- ii. Creating tension and misfits;
- iii. Transmitting tension to certain significant actors, or mapping into the structure in some way so that visions can be born and concrete action taken;
- iv. Exploiting tension.

Normann's view differs from Penrose's (1980) in two respects. The first concerns the classification of factors contributing to growth, and the second relates to the factors themselves. While Penrose distinguishes between internal and external factors, Normann opposes the notion of natural driving forces to planned growth. While the former encompasses the action of existing components in the firm and/or environment, the latter suggests the creation of a new component resulting from a dialectical process of conflict resolution. In what concerns the factors, Normann's natural driving forces have also been mentioned in Penrose's work as internal or external factors. However, Normann's

planned growth introduces a new idea not advanced before by Penrose: the dialectic process.

In line with Greiner's view, Normann argues that "a successful company ought to be able to alternate between different philosophies and structures as its growth problems change" (p. 141). A balanced growth culture made up of learning values and exploitation values is required to better manage firms towards growth. The dual culture maintains two groups of actors, each of which upholding different values: learning on the one side, and stability or exploitation on the other side. Such duality may generate "a field of tension in which two or more sets of ideas oppose one another" (p. 154). Calling these sets of ideas and values poles of tension, Normann advances five possible ways of dealing with tension, namely:

- i. **Expulsion** – One of the poles of tension is eliminated, either being expelled from the company, declared illegitimate, or suppressed in some other way. The remaining pole of tension then exerts undisputed influence on the dominating ideas (p. 154);
- ii. **Overlegitimation** – A budding threat to the dominating ideas or an incipient opposition is apparently accepted with open arms – possibly after a certain initial resistance – and allowed to acquire considerable influence. But it often turns out to be nothing more than a bit of pretty decoration, coexisting with the traditional values but quite non integrated to them (p. 154). What distinguishes situations like these seems to be that the established power centres are too weak to expel the new ideas without risking their own position (p. 155);
- iii. **Compromise** – It contains a mixture of elements from the two poles, that can coexist and to some extent even support one another, but they do not create a really new whole or ensemble (p. 156). A compromise is naturally only possible between ideas and values within the same frame of reference (or logic); you can give and take only so long as this remains the same. The parties involved will experience this as a "zero-sum" tension (p. 157);

- iv. **Incongruence** – If we try to reach a compromise across the borders of two frames of reference (for example, two business ideas), the outcome is most likely to become incongruent – a misfit – ridden aggregate of elements belonging to essentially different systems. This is an outcome that is qualitatively different from the original poles of tension, and to all the parties involved, an inferior one. We could perhaps call this a “negative-sum tension” (p. 157);
- v. **Synergy** – It is neither a reflection of one of the poles of tension nor a mixture of them both. Instead it represents something quite new in relation to either of the two poles of tension (p. 159).

Katz & Kahn's perspective (1978)

Adopting an open systems view of organizations, Katz & Kahn (1978) have examined the growth of organizational structures using a metamorphosis model. According to these authors, structures develop along three stages, and once developed they may grow in four different ways.

The first development stage is called the primitive system whose major determinants are environmental pressures, and the needs and abilities of the population, and whose “basis for the productive activities is the cooperative response of people based on their common needs and expectations” (p. 71). The second stage is characterized by efforts towards insuring stability of the structure through the building of devices for formulating and enforcing rules, i.e., an authority structure, and a maintenance system administering the systematic use of rewards. The third stage witnesses the development of subsystems at the boundaries of the organization in order to “institutionalize environmental relationships and guarantee such support” (p. 74). Once accomplished the third stage with the creation of boundary systems, pressures toward adaptation to the environment give rise to the creation of adaptive systems (R&D and planning, for example), and managerial systems meant to resolve conflicts and coordinate external requirements and organizational resources and needs. As a result, in a

fully developed structure, five subsystems can be found: production, maintenance, boundary, adaptive, and managerial.

Noticing that growth, expansion and development of organizations "has received more attention in research studies and theoretical treatments than breakdown, decline, and death", the authors identify as a possible, partial explanation "the optimistic value orientation of behavioral scientists" (p. 81). Katz and Kahn (1978) distinguish four kinds of organizational growth:

- i. by increasing the size of existing units without other structural change;
- ii. by increasing the number of units doing identical work - what they call intra-organizational replication;
- iii. by increasing differentiation and specialization;
- iv. by merging with other organizations.

According to Katz and Kahn, organizational growth "seldom proceeds at the same rate across all subsystems" (p. 80). By keeping unchanged the structures in place, the self-maintenance dynamics would tend to preclude organizational growth. Self-maintenance dynamics, however, is challenged by what they call the *maximization principle*. Such principle tends to override the maintenance dynamic for five basic reasons:

- i. the search for production proficiency generates an increase in organizational capabilities;
- ii. expansion through compromise solutions, for example, that only add up but do not cut benefits of contending departments, is the simplest method of dealing with problems of internal strain;
- iii. expansion through the absorption of suppliers and competitors, for example, is also the most direct solution in coping with problems of a changing social environment;
- iv. expansion through the creation of new roles, for example, is the immediate response to any evidence of system strain or externally induced pressure on the bureaucratic structure;

- v. organizational ideology encourages growth aspirations, since as the authors assert, "in America there is a positive cultural value placed on bigness and growth" (p.101).

The authors state that "a system that integrates the efforts of many people will be more effective in the accumulation of surplus than a system that integrates fewer people." (p.107) They also maintain that it is the surplus margin that allows for the organizational decision to grow, constituting, therefore, the basic variable in organizational growth.

Katz and Kahn's work has therefore established a distinction between the growth of organizational structure and organizational growth. The first was described by means of a metamorphosis model of the initial evolution (3 stages) of organizational structure, while organizational growth comprises the further development of the organization (4 types of growth). Moreover, they have advanced explanations of the growth process through the maximization principle, and the surplus variable, having remarked the optimistic value orientation of behavioral scientists and the American society as a whole with respect to the growth of the firm.

AN INTEGRATED VIEW OF THE REVIEWED LITERATURE

A study may contribute to theory in different ways. It may help to better *describe* the phenomenon, *explain* why and how things happen the way they do, *predict* the future or *prescribe* actions. Aiming at synthesizing the main contributions the reviewed works provide to growth theory, an integrated view is advanced seeking to uncover descriptive, explanatory, predictive and prescriptive traits in each work. Tables 2.1 to 2.4 summarize some of the most relevant issues they address. In a few cases, we have also added statements that may be implied from the original work.

Descriptive traits

Growth has been frequently described by means of a series of phases or stages that do not always refer to the same things. For example, while for Chandler (1962) and Greiner (1972) structural changes are embedded in the process of the growth of the firm, Normann (1977) describes the growth cycle of new ventures in the firm. Penrose (1980) on the other hand, classifies the types of growth formation as internal (development of internal ventures) or external (by means of mergers and acquisitions), while Katz & Kahn (1987) refer to the growth of the organizational structure, and to organizational growth. Finally, Starbuck (1971) identifies four different models of growth. Table 2.1 summarizes the descriptive traits in the reviewed works.

DESCRIPTION	
PENROSE (1980)	Growth Formation: Internal (development of internal ventures) External (mergers & acquisitions)
CHANDLER (1962)	Phases or Chapters of Growth: Initial expansion and accumulation of resources Rationalization Expansion into new markets and lines Development of a new structure
STARBUCK (1971)	Types of Models: Cell-division Metamorphosis Will-o'-the-wisp Decision process
GREINER (1972)	Phases of Organizational Growth: Birth Sustained growth Delegation Coordination Collaboration
NORMANN (1977)	Growth Cycle: Feeler Systems development Market development Stabilization
KATZ & KAHN (1978)	Growth of Organization Structure: Primitive system Maintenance Institutionalization Kinds of Organizational Growth: Intraunit growth Intraorganizational growth Specialization and differentiation Merger with other organizations

Table 2.1 – Descriptive Traits in the Reviewed Works

Explanatory traits

Several factors and mechanisms have been advanced to explain how and/or why organizations grow. Table 2.2 summarizes the main explanatory traits in the reviewed works. Penrose (1980) suggests that entrepreneurial and managerial skills constitute necessary conditions for the growth of the firm. While enterprising management guarantees a permanent commitment of resources to explore new avenues of profitable expansion, managerial skills are needed to coordinate resources. In the absence of the first, expansion may not take place, while in the absence of the latter expansion may become unprofitable. In addition, Penrose also advances factors inducing and precluding growth, as well as those favoring continued growth. In line with Penrose, Chandler (1962) stresses the role of skills in the process of growth, and emphasizes the entrepreneurial and venturing skill as a main growth propeller.

Starbuck (1971) advances processes and factors that explain how growth occurs. Drawing on Cyert & March's work (1963), Starbuck explains the choice of growth patterns as the outcome of bargaining and problem solving processes. He advances two types of growth promoter factors: organizational and managerial. Organizational factors include goals such as, cost reduction, revenue growth and profit increase. Managerial factors include the increase in prestige and power brought about in the course of growth. Inhibitor factors comprise resistance to change in goals, activities or interactions.

Normann (1977) advances the action on growth of factors he calls 'natural driving forces'. These comprise the action of existing elements inside and around the organization. The pressures they exert on the firm may induce firm expansion into similar or related business activities. In addition to the action of existing elements, Normann suggests that misfits, conflicts and imbalance may also give rise to expansion by means of processes of dialectic nature. These turn a certain degree of tension and misfits into a growth driver of new ventures and innovation. Mass customization provides an example of expansion that handles the conflict between mass production and product customization.

EXPLANATION	
PENROSE (1980)	<p>Necessary conditions – Entrepreneurial skills – versatility fund-raising judgment ambition</p> <p>Managerial skills</p> <p>Factors inducing and precluding growth – internal external</p> <p>Continued growth factors – excess capacity unused services of resources efficient managerial services</p>
CHANDLER (1962)	<p>Internal Skills: Marketing Engineering Scientific Managerial Opportunities identification Venturing identified opportunities</p>
STARBUCK (1971)	<p>Processes to Choose Growth Patterns: Bargaining Problem Solving</p> <p>Factors that Promote Growth: Organizational (cost reduction etc.) Management itself (prestige etc.)</p> <p>Factors that inhibit Growth: Resistance to change in: goals activities interactions</p>
GREINER (1972)	Promoters of change: crises
NORMANN (1977)	<p>Types of Factors: Natural driving forces – repeated reproduction customer & supplier interrelatedness disturbances such as overcapacity environmental pressures</p> <p>Planning for growth: dialectic process to create the new</p>
KATZ & KAHN (1978)	<p>Tension between: Self-maintenance Maximization principle Surplus feedbacks the growth process</p>

Table 2.2 – Explanatory Traits in the Reviewed Works

Tension as an agent of the growth of the firm is also stressed in Greiner's (1972) and Katz & Kahn's (1978) works. Greiner suggests that the tension generated in internal crises stimulate change in the organizational structure. Katz & Kahn, on the other hand, contrast a self-maintenance dynamics with what they call the maximization principle. The self-maintenance dynamics would tend to keep the organization unchanged, while the maximization principle would tend to override self-maintenance and contribute to growth. The mechanisms described include the increase in organizational capabilities derived from a search for production proficiency, the absorption of suppliers or competitors to cope with environmental changes, the creation of new roles as a response to any evidence of system strain, and organizational ideology praising growth. Interestingly, they also mention expansion through compromise solutions. These just add up benefits but do not cut any, constituting the simplest way of dealing with internal strain problems. Therefore, not only Katz & Kahn (1978) emphasize the generally accepted normative character of growth as an inducing factor, but also pinpoint mechanisms of growth (role creation, and compromise solutions) that do not necessarily contribute to the effectiveness of the firm in the long run.

Predictive traits

The predictions advanced are mainly qualitative. Penrose (1980) predicts the existence of increasing costs of growth that will impose limits to the growth of the firm. Instead of dealing with limits of the firm size, Penrose (1980) works with two rates: the rate of growth proper, and the rate of entry in new fields.

Chandler (1962) predicts that structural changes are to follow strategy changes if the firm intends to continue its growth path. Starbuck (1971) makes predictions concerning the propensity of individuals to resist change. Greiner (1972) predicts that the growth of the firm undergoes phases composed of evolutionary and revolutionary periods, and that each evolutionary period is followed by a revolutionary period, i.e., calm periods of operation are followed by turbulent ones. This could be viewed to a certain extent as similar to Chandler's (1962) four phases, which alternate periods of growth and periods of

consolidation, the difference being that Chandler's unit of analysis is at a more macro level than Greiner's (1972).

PREDICTION	
PENROSE (1980)	Growth limits: Rate of growth Rate of entry in new fields (due to increasing costs of growth)
CHANDLER (1962)	Change in structure follows change in strategy Each period of growth is followed by a period of consolidation
STARBUCK (1971)	The more the changes affect the reasons for joining the firm, the more intense the reaction to change
GREINER (1972)	Each evolutionary period is followed by a revolutionary period At each phase future problems can be anticipated
NORMANN (1977)	Behavior of certain variables throughout the stages The sequence of stages
KATZ & KAHN (1978)	Different growth rates across subsystems

Table 2.3 – Predictive Traits in the reviewed works

Both Greiner (1972) and Normann (1977) predict a certain sequence of stages. Greiner (1972) suggests that future problems can therefore be anticipated, while Normann (1977) suggests different profiles of behavior for certain organizational variables according to the stage of growth. Finally, Katz & Kahn (1978) point out different growth rates across subsystems throughout the growth process.

Prescriptive traits

Although most of the works reviewed did not aim at advancing prescriptions, a few suggestions can be identified. Greiner (1972) recommends

managers to admit the inevitability of stages and crises, managing them, instead of fighting against them. Normann (1977) suggests that firms interested in growing should develop a growth culture that balances learning and exploitation.

PRESCRIPTION	
PENROSE (1980)	To grow, a firm should develop certain skills (entrepreneurial, managerial)*
CHANDLER (1962)	To grow, a firm should develop certain skills (marketing, engineering, scientific, managerial, opportunities, handling)*
STARBUCK (1971)	Everything else being equal, the firm should undertake the growth move that less affects its employees reasons for membership*
GREINER (1972)	Managers should work with the flow of the tide Stages should not be skipped Revolutions should not be avoided
NORMANN (1977)	Growth culture should balance learning and exploitation
KATZ & KAHN (1978)	The firm that is intent on growing should concentrate efforts on accumulating surplus*

Obs.: an * indicates an implied, though not overtly stated prescription

Table 2.4 – Prescriptive Traits in the reviewed works

Although no overt prescriptions were identified in the remaining works, a few implied ones can be derived. From Penrose (1980) and Chandler (1962) it may be implied that firms that intend to grow should develop entrepreneurial and managerial skills among their personnel. From Starbuck's (1965) assertion regarding growth inhibitor factors it may be implied that everything else being

created by a firm's own activities but also of the effect of changes that are external to the firm and lie beyond its control" (Penrose, 1980, p. 4).

Conceptual clarity

According to Bunge (1996), *concepts* are "the units of meaning and hence the building blocks of rational discourse" (p. 49). Stating that "in scientific discourse every key concept ought to be elucidated" (Bunge, 1996, p.4), Bunge maintains that concepts are neither true nor false, but can be "exact or fuzzy, applicable or inapplicable, fruitful or barren" (p. 49).

The reviewed works share the common notion of growth as a change process. However, the very growth concept lacks clarity. Penrose (1980), for example, advances that "for the most part, though not always, the analysis of the growth of firms... is most directly applicable to their growth measured in terms of fixed assets" (p. 25). Starbuck (1971), on the other hand, defines growth as a change in size, which is measured through employment. Moreover, Greiner (1972) associates growth with transformations in the firm's structure, while other works, such as Chandler's, address changes in both the firm's business and its organization. Finally, Penrose (1980) introduces a dynamic notion of growth by means of the "continued growth" (p. 8) idea, a concept that is not developed further in the other reviewed works. In sum, authors have emphasized different properties of the firm, while studying growth-related change processes. As a result, the growth concept remains ill-defined.

Explanatory reach

As far as *explanation* is concerned, Bunge (1996) states that "a satisfactory explanation of any social fact will involve two or more levels – at a minimum, that of the whole and that of its parts. In addition to the components, the explanation will take into account the environment and the structure of the system" (p. 150). In fact, all the works reviewed address two levels: the firm and the firm's components. Explanations of firm growth include a number of

mechanisms at the parts level, such as entrepreneurial and managerial skills (Penrose, 1980; Chandler, 1962), bargaining, problem solving and resistance to change (Starbuck, 1971), internal crises (Greiner, 1972), internal impetus for growth (Normann, 1977), internal struggle between self-maintenance and the tendency to maximize size (Katz & Kahn, 1978). In addition, some authors have also mentioned the impact on growth of major environmental changes and of external relations involving suppliers and buyers. However, explanations advanced have not addressed higher levels of analysis, such as industry. In sum, the firm has been viewed as the whole and its growth has been explained by means of mechanisms occurring at the parts level – firm units, groups or individuals. Yet, explanatory reach could be extended should the firm also be regarded as part of a larger whole, allowing for the identification of mechanisms connecting the firm and its encompassing whole.

Penrose's prescription for theory on growth

According to Penrose (1980), to be comprehensive a theory of growth must do two things: to explain qualitatively different kinds of growth, and to account for changes inside and around the firm. It is beyond doubt that the body of knowledge on growth advances different kinds of growth. It also addresses several internal changes and some external ones. However, it is far less evident how comprehensive and robust is the cumulated knowledge on growth. Not only do concepts need further clarification, but the reach of the explanatory mechanisms is also limited at present.

Although the literature has advanced the understanding of why and how firms grow, cumulated knowledge would benefit from theory systematization efforts. These should aim at *reducing conceptual ambiguity*, as well as at *organizing and expanding explanation*. Not only should theory explain how firms grow, but also how firm growth affects the environment and vice-versa. In addition, special attention should be devoted to non causal explanations.

According to Bunge (1979), causality comprehends the idea that "*If C happens, then (and only then) E is always produced by it*" (p. 48). Therefore, causality implies a *necessary and sufficient* relation between two events. Opening the way to prediction, this relation allows for propositions endowed with predictive power. However, one can hardly expect to identify causation in such a complex phenomenon as the growth of the firm. Stating that "the causal principle is a particular case of the principle of determinacy" (Bunge, 1979, p. 26), Bunge proposes that causality "essentially obtains when determination is effected in a *unique* or unambiguous way by *external* conditions" (p. 26). Maintaining that "in real processes, several categories of determination concur" (Bunge, 1979, p. 30), Bunge states that "the causal principle holds approximately in certain domains. The degree of approximation is satisfactory in connection with certain phenomena and very poor with regard to others" (p. 30).

As a result, theory should systematically look for relations other than causal. Non causal relations include, for example, those based on *necessary yet insufficient conditions*. These do allow for prescription, although they provide less powerful predictions. Penrose's work (1980) has advanced two necessary conditions for growth: entrepreneurial and managerial skills. Therefore, it is possible to infer that should a firm be intent on growing it should develop entrepreneurial and managerial capabilities. It is also possible to predict that in their absence, growth will not occur. However, it is not possible to predict that whenever a firm has developed entrepreneurial and managerial capabilities, firm growth always will occur.

Systematic theoretical work on the growth of the firm will hopefully allow for clarification and expansion of the present body of knowledge. Such work is likely to avoid the trap into which extreme empiricists fall by "collecting micro-data blindly and in excessive quantities and to analyze them in unnecessary detail, hoping against reason to be able to infer regularities without exerting their imagination" (Bunge, 1996, p. 85). Having devoted efforts to reduce conceptual ambiguity and to organize and expand explanation, this thesis hopes to

contribute to a more systematic theory development on growth that will hopefully address Penrose's prescription for theory on growth.

CONCLUSION

The four essays in this thesis aim at theory building. Rather than testing existent models, the studies have sought to investigate some of the issues that constitute the foundations on which a theory of growth may eventually develop.

In line with the reviewed literature, the thesis views growth as a process of change in the *size of the firm*. As a result, an effort to reduce conceptual ambiguity was made to clarify the size of the firm concept. An indicator of firm size is advanced in chapter 5 that allows for the drawing of growth (and contraction) trajectories of firms over time. The empirical study in chapter 6 performs a longitudinal analysis of General Electric's and Westinghouse's trajectories, which were drawn by means of the size indicator proposed.

In addition, an effort was made to advance a view of the firm accounting for both economic and social relations. As a matter of fact, most authors have associated the firm with two sorts of properties: the economic-related ones and those of social nature. Penrose (1980) is a case in point. While studying the *economic growth* of the firm, she has introduced the notion of *administrative coordination* arguing that "a firm is more than an administrative unit; it is also a collection of productive resources the disposal of which between different uses and over time is determined by administrative decision" (p. 24). Another example is found in Chandler's work (1962), which has investigated the relationship between *economic expansion* of the firm and its *internal organization*. Katz & Kahn (1978) have also developed the notions of "*organizational growth*" and "*growth of the organizational structure*".

Building on the implicit notion of the dual nature of the firm, the thesis suggests describing the firm by means of the pair <*business, organization*>. The *business* component is the economics-oriented subsystem whose components encompass relationships related to the making/doing, selling and delivering of products and services, while the *organization* component is the social subsystem whose components entertain relationships oriented to the organizing and coordination of resources within and around the firm. The growth of the firm process would, therefore, encompass change processes in both subsystems. As a result, the study of growth should investigate the concomitant transformations in each subsystem. This view of the firm is employed in chapter 6 to help perform the comparative analysis of General Electric and Westinghouse.

Systematic theoretical effort to organize and expand explanation has been developed in chapters 3 and 4. A thorough examination of Chandler's *The Visible Hand* (Chandler, 1977) was done in chapter 3 so as to depict the theory of growth that lies in his historical account of the formation of the American modern enterprises. Chandler's text was scrutinized in order to depict theoretical insights on growth, having highlighted growth-related chains of necessary conditions, as well as, co-evolutive processes of growth involving the firms and industry. The other study in chapter 4 proposes a modes of change framework, which helps to identify qualitatively different kinds of growth, advancing as a result, several non causal relations associated with the growth process. Finally, the comparative study in chapter 6 draws on theoretical ideas developed in chapters 3 and 4 to perform the analysis of General Electric's and Westinghouse's trajectories, which were drawn with the help of the size indicator proposed in chapter 5.

Chapter 3

CHANDLER ON THE GROWTH OF THE FIRM

The management of complex issues cannot afford simplistic approaches. Growth is a case in point. Managing growth requires skills and capabilities to deal with deliberate and emergent transformations taking place inside and around the firm. Although essential for succeeding in growth efforts, understanding the main patterns of change is anything but simple. In fact, several scholars have devoted considerable effort to advance the knowledge on growth. One such scholar is Alfred Chandler.

It is widely recognized that Chandler's research provides a data-rich, broad perspective of the evolution of business in the last 150 years. Given the nature of his work – longitudinal historical studies on the economic development of business enterprises – Chandler reaches a diversified audience that includes those interested in economics, in business history, and in management. The impact of his ideas on these fields has been widely acknowledged.

Coriat and Weinstein (1995), for example, include Chandler in the select list of ten influential thinkers whose contribution to the development of economic theories of the firm has been major; a list that comprises well-known economists such as Adam Smith, Karl Marx, Joseph Schumpeter, Ronald Coase, and Herbert Simon. Another evidence of Chandler's influence, this time in the business history field, is provided in the numerous discussions taking place in academic journals in the field around the Chandlerian model (Abe, 1997), Chandler paradigm (Jones, 1997), post-Chandlerian lines of analysis (Galambos, 1997), Chandlerian analytical framework (John, 1997), to the point of having researchers categorized as "Chandlerians" or not, according to their affinity with Chandler's ideas. As a matter

of fact, it is not unusual for researchers in the business history field to self-proclaim as "Chandlerians"; as illustrated by Amatori's paper (1997) paper entitled *Reflections on Global Business and Modern Italian Enterprise by a Stubborn "Chandlerian"*. In management, the widespread use of Chandler's notions of functional (U-form) and multidivisional (M-form) organizational structures provides evidence of Chandler's significant influence on strategic management research.

Though very influential, Chandler's ideas have not gone unchallenged. For example, in an essay that considers the influence of Chandler's *The Visible Hand* twenty years after its publication, John (1997) identifies three broad categories of business historians: "*champions* who elaborated on Chandler's analysis and share his basic approach; *critics* who probed anomalies between Chandler's framework and their own research; and *skeptics* who challenged Chandler's basic assumptions and rejected his argument outright" (p. 177). The well-known debate concerning which comes first, strategy or structure (Hall and Saias, 1980), also illustrates the questioning of Chandler's theses among academics.

Notwithstanding the ample evidence that Chandler's work has been a source of inspiration and debate in a number of fields of study, the degree to which Chandler's ideas have been scrutinized is not commensurate with the amplitude of their reach. In the business history field, John (1997) mentions that examination of Chandler's *The Visible Hand* has often been superficial, stating: "It has been commonplace for historians to subject the most truly seminal works to detailed, line-by-line scrutiny. Measured by this criterion, *The Visible Hand* has still to take its place as one of the central works in American historiography" (p. 173).

The situation in the strategic management field is hardly different, yet perhaps more disquieting. Not only Chandler's ideas have not been examined in detail, but they seem to have undergone a dangerous process of oversimplification, to the point of acquiring a ritualistic character. His historical studies have described numerous change processes occurring inside and around the firms, as these underwent growth. These studies have also advanced explanatory mechanisms of

change at several levels of analysis. However, only a few isolated propositions – such as structure follows strategy – have been retained, tested or debated in strategic management studies.

Widely recognized as Chandler's most representative works, his three books report three major research projects whose results build on each other. *Strategy and Structure* (Chandler, 1962) examines the transformations in strategy and structure of four large American companies, suggesting among other things that as the firm grows, the internal structure of firms sooner or later also undergo changes of certain kinds. The second one, *The Visible Hand* (Chandler, 1977), examines the rise and growth of large American enterprises, thoroughly examining how the modern multiunit business enterprise ended up replacing the traditional enterprise. Finally, *Scale and Scope* (Chandler, 1990) performs a comparative historical analysis of the rise and growth of the modern industrial enterprise in three countries, the United States, Great Britain, and Germany, suggesting the occurrence of different types of capitalism in each country.

From a longitudinal perspective, Chandler's works have been content cumulative, and mostly scope expanding. In *Strategy and Structure*, Chandler has studied organizational innovation by performing "an experiment in comparative history" (Chandler, 1962, p. 1). He examined organizational changes in four American companies as they grew, suggesting the existence of patterns of change, including the celebrated connection between strategy and structure. In *The Visible Hand*, Chandler investigated the rise of the modern business enterprise in the United States advancing the view that the new class of managers, metaphorically called "the visible hand" in opposition to Adam Smith's "invisible hand", lay at the heart of such transformation. In *Scale and Scope*, the focus of the study is both enlarged and narrowed. It is enlarged geographically by examining the rise of the modern industrial enterprise in the three countries – United States, Great Britain, Germany – that "accounted for just over two-thirds of the world's industrial output in 1870" (Chandler, 1990, p. 3); it is narrowed by studying only the modern industrial enterprise - "a subspecies of the modern business enterprise" (Chandler, 1990, p. 14). Therefore,

in terms of cumulative content, all the works have addressed organizational innovation but also the theory advanced in *The Visible Hand* is reinforced in *Scale and Scope*. As for the expanding scope of analysis, while *Strategy and Structure* performs a detailed investigation on four firms, *The Visible Hand* examines the evolution of a large number of industries in the United States, while *Scale and Scope* analyzes the evolution of the 200 largest companies in three countries, although it concentrates on a subset of the modern business enterprise.

Understanding that Chandler's works have provided a comprehensive account of the evolution of business, and in particular, of the growth of the firm, this essay aims to uncover, within a process-oriented perspective (Mohr, 1982), the growth-related theory in Chandler's research. Although his three books – *Strategy and Structure*, *The Visible Hand*, *Scale and Scope* – each relate to the growth of the firm issue, this essay focuses on *The Visible Hand*. For the purposes of this study, *Strategy and Structure* is both content and scope limited, and *Scale and Scope* has had to trade some content richness for a larger geographical coverage. On the other hand, *The Visible Hand* provides rich descriptions and explanations of the growth process and transformation of the American economy, and what is more significant, it advances the bulk of Chandler's theory on growth.

Two investigations have been undertaken: the literature in strategic management was reviewed to identify the retention, disputing and testing of Chandler's ideas in *The Visible Hand*; and the book itself was scrutinized to uncover its theoretical content on the growth of the firm process. The lenses used to examine Chandler's work are oriented to the strategic management of the growth of the firm, to explore Chandler's theoretical contribution to understanding the growth process, its management and dynamics. As a result, the outcome of this approach bears little resemblance to the way Chandler has structured his writings – as historical accounts of economic transformations. Instead, this essay has organized Chandler's ideas in terms of processes occurring inside and around the firm. Chandler's ideas have been mapped into four main classes of processes: formation of the modern business enterprise, development of modern business enterprises, formation of industries,

and development of industries.

The review of literature that cited Chandler's theory revealed retention of fragments of the theory, but no evidence was found that ideas have been tested. Moreover, no single work was found to view *The Visible Hand's* ideas as an integrated perspective of the growth of the firm. Instead, the literature has captured, discussed and criticized only fragments of Chandler's ideas.

This essay seeks to fill this gap. By scrutinizing and organizing Chandler's ideas on the growth-related processes he has identified, the essay suggests the main contributions of Chandler's towards a theory on the growth of the firm. His account of the rise and continuing growth of managerial business enterprises was found to provide comprehensive rather than simplistic descriptions and explanations. Chandler's account not only suggests a number of contributing factors occurring inside and around the firm, but also identifies mechanisms pertaining to the co-evolution of firms and industries.

However, his account of the continued dominance of large firms was significantly less comprehensive. Also, in view of *The Visible Hand's* well-defined scope and purposes, Chandler does not discuss firm contraction and its eventual decay. The analysis presented in this essay distinguishes chains of necessary conditions in Chandler's account of growth-related processes to identify instances of misinterpretation and undue extrapolation of Chandler's work in the literature.

Four sections constitute the body of this essay. In the first, the research method is described; next, the results of the analysis of the reviewed literature on strategic management are advanced; then, the results of the thorough examination of *The Visible Hand* are presented; and finally, the results of both analyses are discussed. The concluding section emphasizes the contributions of a process-oriented perspective towards escaping from simplistic analyses of the growth of the firm, and towards the development of dynamic theories of growth.

RESEARCH METHOD

Two investigations have been carried out. The first one consisted of researching representative literature in the strategic management field in order to depict the retention, disputing, and testing of Chandler's ideas in *The Visible Hand*. The other one comprised a close examination of *The Visible Hand*, so as to bring forth the theory on growth inside *The Visible Hand*. Given the distinct nature of these investigations, different research methods were employed for each investigation. Each method is described below.

Researching the strategic management literature: Method description

To identify the impact of *The Visible Hand*'s ideas within the strategic management field, eleven journals were selected to undergo scrutiny. Macmillan's survey conducted among business scholars (Macmillan, 1991), concerning a Forum for Strategic Management Scholarship, provided the reference list of representative journals in the field. Then, the Social Sciences Citation Index (SSCI) was examined in order to identify citations of *The Visible Hand* appearing in the previously selected journals over the period 1977-1995. The breakdown of the 109 articles identified in SSCI is shown in table 3.1.

Among the articles read, there were eight book reviews two on *The Visible Hand* (Brooks, 1978; George, 1979) and one on *Scale and Scope* (Leblebici, 1991). The other five book reviews (Nielsen, 1980; Perrow, 1992; Pitts, 1980; Sockell, 1988; Sproull, 1990) focused on books by different authors mentioning Chandler's ideas. The examination of these books revealed that in only one of them (Best, 1990) a number of notions Chandler had advanced in *The Visible Hand* had considerably been referred to, some of which had been disputed. As a result, this book was included in the set of representative literature on *The Visible Hand* to be analyzed.

Examining *The Visible Hand*: Method description

Thorough examination of Chandler's ideas entailed a line-by-line scrutiny of the book. The analytical procedures employed are described below:

- i. ***Data Collection*** - comprised the reading of chapters in the original sequence of their arrangement in the book, identifying portions of text to undergo detailed analysis. The selection procedure sought to identify statements that contained propositions, definitions, descriptions of processes, explanations, in sum, statements that potentially are theory builders. Factual historical descriptions were ruled out unless some theory-related element could be identified;
- ii. ***Data Preparation and Data Analysis*** - consisted of transcribing and analyzing the selected texts using a two-columns document. The selected text was placed in the left column of the document and given a reference number. Immediately after its transcription, the text was content analyzed so as to identify definitions, process descriptions, explanations, prescriptions, and predictions. Based on the original text, statements were phrased in a generalization-oriented style and placed in the right column of the document. These statements were given an alphanumeric identification indicating they had been derived directly from the author's work. In addition, theoretical ideas and conceptual interconnections inspired by the text were also recorded under a special code indicating they constituted the analyst's inferences. Finally, evidence for elements of a process theory (Mohr, 1982) was sought for: phases, cycles, states, and the corresponding necessary conditions for phase-, cycle- and state-change to occur. The search for necessary conditions sought to identify expressions like need(ed) to, require(d), necessary, necessitate, essential to, have(had) to, requisite, as well as the negative expression associated with a necessary condition: 'in the absence of X, Y does not occur'. In addition, elements of a variance theory (Mohr, 1982) were also identified, i.e., relationships where a precursor

Structure (1962), but significantly smaller in *The Visible Hand*.

The literature retained but fragments of the complex web of statements Chandler built to describe and explain the rise and growth of the firm. In ten papers (identified by an * in table 3.2), Chandler's ideas in *The Visible Hand* were criticized, shown their limitations, misinterpreted or wrongly extrapolated. These ten articles together with Best's Book (1990) which disputes some of Chandler's ideas are commented in the discussion section of the essay.

Use of Chandler's ideas	Papers
1. History related issues	
Historical data	Barley & Kunda (1992) Bettis (1983) Bluedorn et al. (1994) Brooks (1978) Brown & Schneck (1979) Carney & Gedajlovic (1991) Cespedes (1990) Conner (1991) Drucker (1988) Fombrun (1986) Freeman & Boeker (1984) Harrigan (1984) Harrigan (1985) Hennart (1994) Huber (1990) Kerfoot & Knights (1993) McCraw (1984) Mizruchi & Steams (1994) Mosakowski (1991) Mowery & Rosenberg (1985) Porter & Millar (1985) Roy (1981) Schoemaker (1993) Stone & Luchetti (1985) Warner (1987) Wren (1987)
Historiography	Goodman & Kruger (1988)
2.Theoretical perspectives	
Agency theory	Jones & Butler (1992) Oviatt (1988)
Business alliances	Gerlach (1987)

Business ethics	Donaldson & Dunfee (1994)
Cooperation	Jorde & Teece (1989)* Nielsen (1988)*
Diversification	Mahoney (1992)
Efficiency & productivity	Morrison & Roth (1993)
Information technology	Child (1987) Porter & Millar (1985)
Joint-ventures	Kent (1991)
Management buy-outs	Wright (1986)*
Management of meaning	Czarniawska (1986)
Managerial choice	Cameron (1986) Delacroix & Swaminathan (1991) Geeraerts (1984) Knights & Morgan (1995)
Middle managers	Van Cauwenbergh & Cool (1982)
Nonprofit institutions strategy	Nilesen (1982)
Organization theory	Astley & Van de Ven (1983)
Organizational control	Gaertner, Gaertner & Akinusi (1984)
Organizational decline	D'Aveni (1989)
Organizational effectiveness	Miller & O'Leary (1989)
Organizational innovation	Hayes (1979) Lant & Mezias (1990) Lieberman & Montgomery (1988) Mezias & Glynn (1993)
Organizational structure and strategy	Gaertner & Ramnarayan (1983) Miller & Leary (1989) Miner (1984) Ollinger (1994) Palmer, Jennings & Zhou (1993) Rowlinson (1995)* Sanchez (1995)
Planning	Leontiades (1982)* Nielsen (1981)
Population ecology	Aldrich, McKelvey & Ulrich (1984)* Astley (1985) McKelvey & Aldrich (1983)*
Rationality	Brunsson (1982) Kent (1991) Useem (1982)
Related acquisitions	Leontiades (1982)
Resource-based view	Mahoney & Pandian (1992)

Other books review	Leblebici (1991) Nielsen (1980) Perrow (1992) Pitts (1980) Socell (1988)* Sproull (1990)
ii. Reference for further reading	Goldhar & Jelinek (1983)

Table 3.2 – Retention of Chandler's ideas in the literature

It is our contention that most criticisms of Chandler's ideas in *The Visible Hand* are inappropriate. This may be a result of misunderstanding or disregard for the book's scope and purposes. Either way, a process-oriented analysis of *The Visible Hand* is presented next, aiming at clarifying the main growth-related ideas in it. Then, in the following section, both analyses are discussed to assess the criticisms made and *The Visible Hand's* theoretical content.

CHANDLER'S IDEAS IN *THE VISIBLE HAND*

Being an economics historian, Chandler is concerned with describing, understanding and explaining historical economic processes. As he states in the introduction to *The Visible Hand*, "the book concentrates specifically on the rise of modern business enterprise and its managers. It is a history of a business institution and a business class" (p. 1). Moreover, the study aims at explaining "the initial appearance of modern business enterprise: why it began, when it did, where it did, and in the way it did", as well as its continuing growth, i.e., "where, how, and why an enterprise once started continued to grow and to maintain its position of dominance" (p. 11).

Embedded in his descriptions and explanations of the rise and continuing growth of the modern business enterprise (MBE) are descriptions and explanations

of the formation of industries and of the industry concentration process. Four main classes of processes can therefore be identified: Formation of MBEs; Development of MBEs; Formation of industries; Development of industries. This section is, therefore, organized along these four classes of processes. Figure 3.1 provides an overview of the processes identified.

	MBEs (Managerial Business Enterprises)	INDUSTRIES
FORMATION	<p><i>Appearance</i> process of emergence of the MBE</p> <p><i>Replacement</i> process of substitution of the traditional firm by the MBE</p> <p><i>Form evolution</i> evolution of MBEs from family- and financier-controlled into management-controlled</p>	<p><i>Industry growth capability</i> process of formation of standards in emergent industries</p>
DEVELOPMENT	<p><i>Continued existence</i> process that provides the seeds of MBEs continued existence</p> <p><i>Continuing growth</i> mechanism whereby MBEs keep expanding in volume and scope</p> <p><i>Self-perpetuation</i> MBE's self-perpetuating capability</p>	<p><i>Industry concentration</i> process of formation of oligopolies</p>

Figure 3.1 – Overview of growth-related processes and mechanisms

MBE formation processes

Chandler distinguishes three main arrangements of the economic activity: *single-unit firms*, *multiunit firms* and *federations of firms*. The traditional American business firm was a single-unit business enterprise. This kind of firm has the following characteristics (p. 3):

- i. an individual or a small number of owners operated the establishment out of a single office;
- ii. it normally handled only a single economic function, dealt in a single product, and operated in one geographical area;
- iii. its activities were coordinated and monitored by market and price mechanisms.

A *multiunit firm*, on the other hand, contains many distinct operating units - such as production, distribution - each of which has the following characteristics (pp. 1,3):

- i. it has its own administrative office;
- ii. it is administered by a full-time salaried manager;
- iii. it has its own set of books and accounts which can be audited separately from those of the large enterprise;
- iv. it could theoretically operate as an independent business enterprise.

Finally, *federations* consist of a group of autonomous units whose owners and managers maintain an agreement on common buying, pricing, production, and marketing policies. In the absence of managers, these policies are determined and enforced by legislative and judicial rather than administrative means (p. 7).

Maintaining that in the traditional capitalist firm "owners managed and managers owned" (p. 9), Chandler reasons that "the traditional capitalist firm can, therefore, be properly termed a *personal enterprise*" (p. 9). In contrast, the MBE "required more managers than a family or its associates could provide" (p. 9). Moreover, depending on who held the majority of stock, three types of MBE could

be distinguished: *entrepreneurial (family-controlled) enterprise*, *financier-controlled enterprise*, and *managerial enterprise*.

Entrepreneurial MBEs were those where "the entrepreneur and his close associates (and their families) who built the enterprise continued to hold the majority of stock" (p. 9); *financier-controlled* MBEs, those where "the creation and growth of an enterprise required large sums of outside capital" (p. 9); and *managerial MBEs* those where "neither banks nor families were in control" (pp. 9-10).

Three processes associated with the formation of MBEs can be identified in Chandler's work: the *appearance of the multiunit firm process*, the *replacement process* of single-unit by multiunit firms and the *form evolution process* of multiunit firms from entrepreneurial and financier-controlled to managerial MBEs. In view of the close interconnection between the appearance and replacement processes, their discussion is integrated in a single topic.

- ***Appearance and Replacement processes***

In a number of statements, Chandler advances the favorable conditions for the appearance of the multiunit enterprise and for the replacement of the single-unit by the multiunit firm. His assertions can be synthesized by means of a chain of statements identifying necessary conditions for changes to occur (refer to figure 3.2).

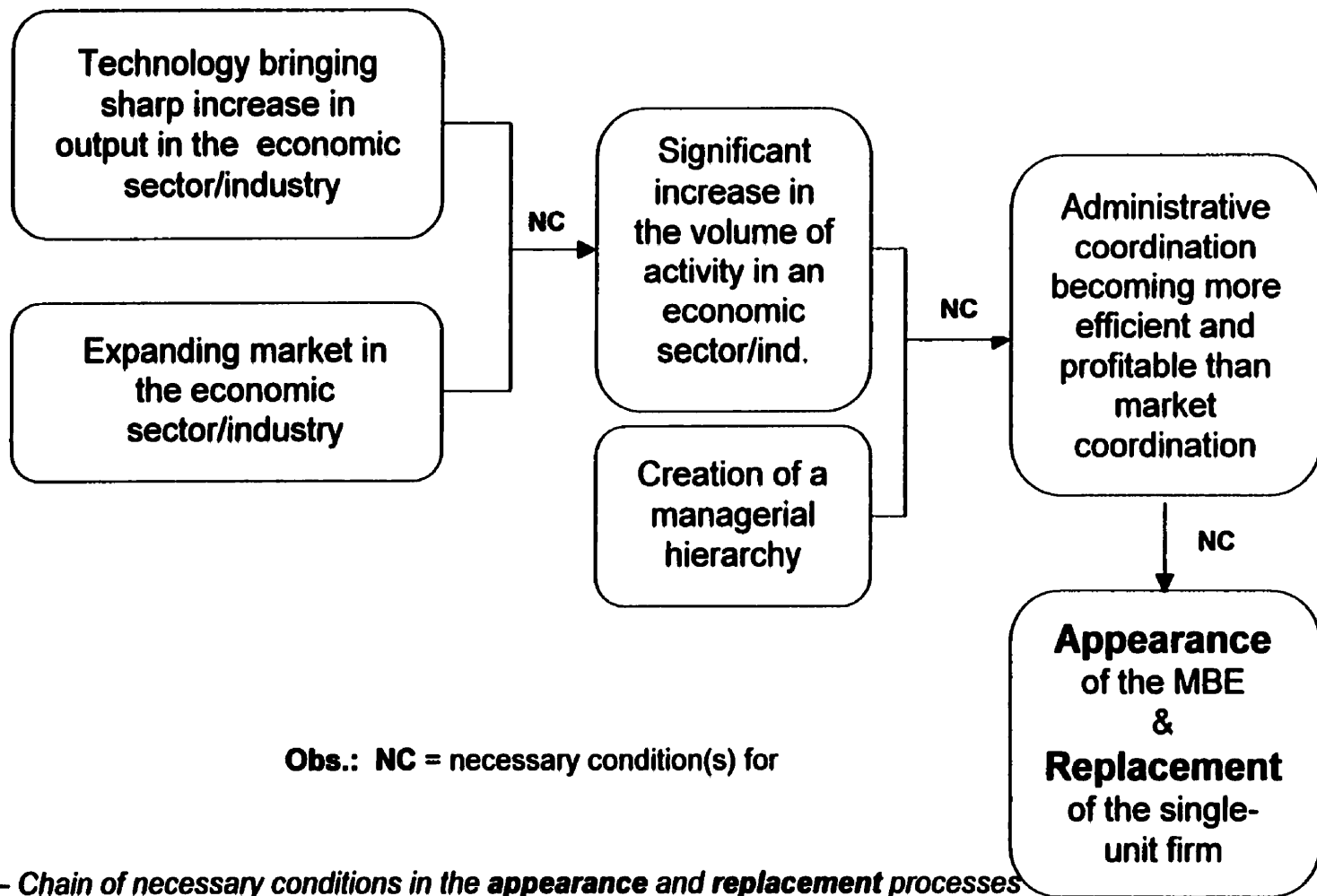


Figure 3.2 – Chain of necessary conditions in the appearance and replacement processes

Chandler's assertions are presented next:

- i. The MBE "first appeared, grew, and continued to flourish in those sectors and industries characterized by new and advancing technology and by expanding markets. Conversely, in those sectors and industries where technology did not bring a sharp increase in output and where markets remained small and specialized, administrative coordination was rarely more profitable than market coordination. In those areas modern business was late in appearing and slow in spreading" (p. 8).

While the relationship between enlarged markets and volume of economic activity is quite straightforward, further understanding is needed regarding the reasons why traditional technology was a major constraint to the development of multiunit business enterprises both in commerce and production. As Chandler explains, "the traditional transportation technologies offered little opportunity for improvement. By 1840 the speed of a stagecoach, canal boat, or sailing ship, or the volume carried by these facilities, could not be substantially increased by improving their design. ... New technology had not yet lifted the old-age constraints on the speed a given amount of goods might be moved over a given distance. Such constraints, in turn, put a ceiling on the volume of activity a commercial enterprise was called upon to handle" (p. 35-36). In what concerns the traditional enterprise in commerce (distribution), Chandler notices that despite "a steadily increasing population ... spreading across the continent" (p. 49), and the concomitant increase in the volume of trade through the economy, the MBE did not appear "as long as the movement of goods through the economy continued to be powered by the traditional sources of energy – wind and animal power" (p. 49). What in fact happened as the population grew and expanded geographically was the growth in the number of units handling the trade, and their increasing specialization. As a result, although the number of transactions between units multiplied, "the amount of goods and the number of transactions handled by an individual unit within a given time period remained much the same" (p. 49).

Although scarcity of labor in the United States was a more important constraint on the size of the production firm than it was in the commercial one, Chandler maintains that "the technological limitations on output appear to have been even more of a constraint to the growth of the enterprise than the scarcity of labor" (p. 50). Defining *factory* as a "large industrial establishment, with its battery of machines, foundries, or furnaces that relied on a central source of power and heat and was operated by a large number of workers who had no other source of income than their wages" (p. 51), Chandler reports that in only two types of manufacturing firms had factories appeared in substantial numbers: textile and firearms. "Textile manufacturers overcame technological constraints by harnessing the power of large rivers" (p. 51), while "firearms manufacturers were willing to pay the high costs of production and distribution because the army guaranteed their market in order to have a domestic supply of arms" (p. 51).

In sum, as long as technological development could not provide a significantly higher speed of movement of goods nor a central source of energy to operate factories the traditional enterprises in commerce and production did not become multiunit firms. Therefore, both expanding markets and technological development constituted necessary conditions for a sharp increase in the volume of the economic activity.

ii. MBEs "appeared for the first time in history when the volume of economic activities reached a level that made administrative coordination more efficient and more profitable than market coordination" (p. 8).

This statement advances the idea that the attainment of a certain volume level of economic activities constituted a necessary condition for administrative coordination to become more efficient than market coordination.

iii. The advantages of "internalizing the activities of many business units within a single enterprise could not be realized until a managerial hierarchy had been created" (p. 7).

Chandler claims, in fact, that in the absence of the formation of a managerial hierarchy, internalization of activities could not take place, i.e., the formation of a managerial hierarchy was a necessary condition for the firm to profitably perform administrative coordination. In addition, without such managers, a multiunit firm "remains little more than a federation of autonomous offices (p. 7), and as it is shown in iv below, federations fell short of reaping all the benefits that administrative coordination could provide.

iv. The MBE "replaced the small traditional enterprise when administrative coordination permitted greater productivity, lower costs, and higher profits than coordination by market mechanisms" (p. 6).

The *explanatory mechanism* for the superiority of administrative coordination over market coordination comprehends a number of characteristics the MBE has developed. The MBE came into being by internalizing activities - for example, buying, distributing - and the transactions between them. The internalization of such activities allowed for the routinizing of transactions between units, the linking of production units with buying and distributing units, the coordination of the flow of goods between units, and the scheduling of flows. The advantages these features provided were (p. 6-7):

- . Routinizing transactions: the *costs of transactions* between units were lowered;
- . Linking production, buying and distributing units: *costs for information* on markets and sources of supply were reduced;
- . Flow of goods between units: more effective *scheduling of flows*;
- . Scheduling flows: more intensive use of production and distribution, i.e., *greater productivity*;

In addition, administrative coordination provided "a more certain cash flow and more rapid payment for services rendered" (p. 7). Finally, the savings resulting from administrative coordination, the argument goes, were much greater than those resulting from the market coordination.

Market coordination (the invisible hand) enabled a reduction in transactions and information costs, by means of the *specialization* mechanism. As a matter of fact, in the traditional enterprises in commerce, "transactions became increasingly routinized and systematized. Information on a single trade in a few ports was easier to come by than for many trades in many ports. Specialization in this way reduced transactions and information costs" (p. 38). However, it was *administrative coordination (the visible hand)* that not only enlarged the scope of these reductions but also enabled gains due to greater productivity. Mass marketers, for example, "replaced the merchants as distributors of goods ... because they internalized a high volume of market transactions within a single large modern enterprise. They reduced the unit costs of distributing goods by making it possible for a single set of facilities to handle a much greater number of transactions within a specific period than the same number of workers could if they had been scattered in many separate small facilities" (p. 236).

Market coordination produced small-sized firms, while administrative coordination brought about large enterprises. However, in MBEs "*economies* resulted more from *speed* than from *size*" (p. 244). As Chandler explains, "it was not the size of a manufacturing establishment in terms of number of workers and the amount and value of productive equipment but the velocity of throughput and the resulting increase in volume that permitted economies that lowered costs and increased output per workers and per machine" (p. 244). According to Chandler, *increased productivity* and *decreased costs* were key factors in the superiority of administrative coordination over market coordination, a necessary condition for the appearance of MBEs and for the replacement of single-unit firms by MBEs.

As for federations, these were "formed to control competition between units or to assure enterprises of sources of raw materials or outlets for finished goods and services" (p. 7). Although they were "often able to bring small reductions in information and transactions costs" (p. 7-8), they fell short of reaping the benefits provided by the scheduling of flows of goods, i.e., federations could not increase productivity. In sum, federations could not provide *administrative coordination* "that

became the central function of modern business enterprise" (p. 8).

In sum, in the absence of administrative coordination, small firms were not likely to be replaced by MBEs. In other words, administrative coordination was a necessary condition for the replacement of single-unit firms by MBEs.

- ***Form evolution process***

The MBEs took three forms: entrepreneurial (family-controlled), financier-controlled and managerial. Mass marketers, for example, were entrepreneurial, since the builders of the firm and their families remained the major stockholders, making the long-term planning and the corresponding resource allocation. Railroads, on the other hand, required an amount of capital that barely no family or small group of associates had. Financiers were called upon to invest in the roads, integrating therefore the group of senior executives in charge of major decisions. Chandler maintains that, as MBEs grew over time, they tended to take the managerial form, i.e.:

- i. The MBE "grew in size and diversity and as its managers became more professional, the management of the enterprise became separated from its ownership" (p.9);
- ii. "As family- and financier-controlled enterprises grew in size and age they became managerial" (p. 10).

As figure 3.3 illustrates, entrepreneurial and financier-controlled firms might then be conceived as initial or intermediary forms in the process of growth of MBEs.

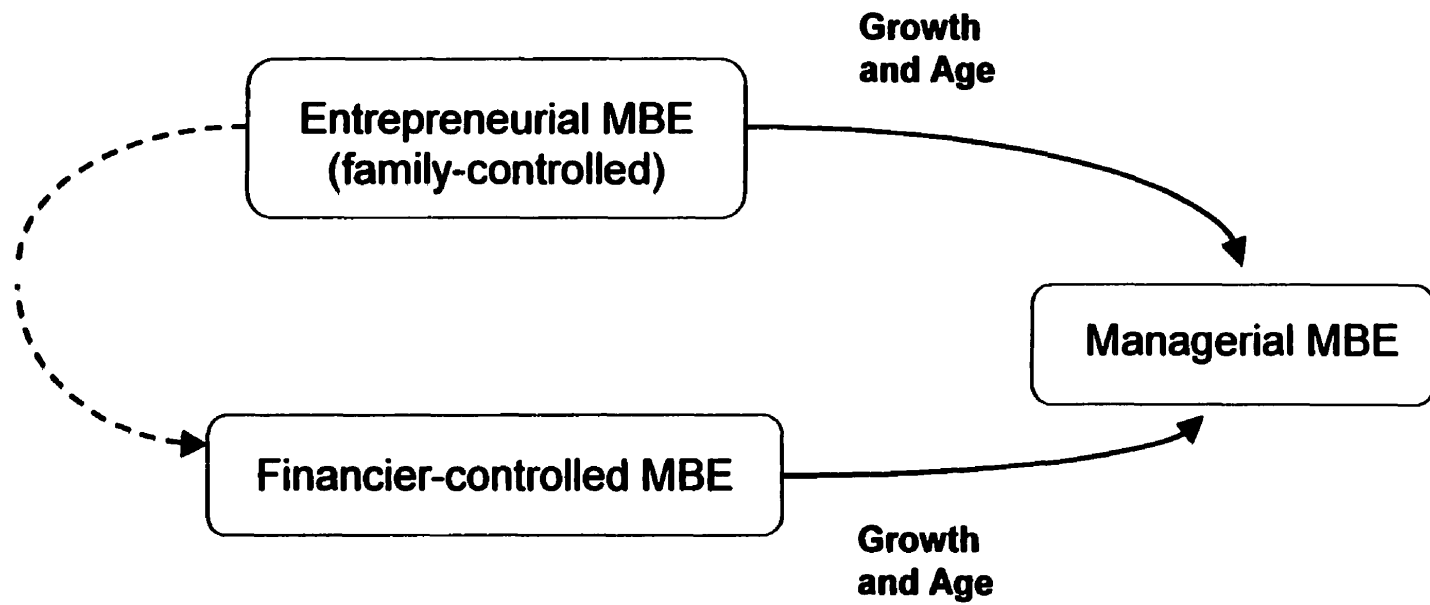


Figure 3.3 – Form evolution process of MBEs

Chandler *explains* this transformation in terms of the time, information and experience required from owners and representatives of financiers to fully participate in top-level decisions. Over time, as firms grew in size, their complexity increased requiring full-time dedication of decision-makers in order to acquire information and experience. As Chandler states, "Unless the owners or representatives of financial houses became full-time career managers within the enterprise itself, they did not have the information, the time, or the experience to play a dominant role in top-level decisions" (p. 10). Moreover, although owners and representatives of financiers, as members of the board, did hold veto power and could even replace senior managers, "they were rarely in a position to propose alternative solutions. In time, the part-time owners and financiers on the board normally looked on the enterprise in the same way as did ordinary stockholders. Of necessity, they left current operations and future plans to the career administrators" (p. 10). In sum, increased size and administrative complexity took "full-time salaried executives to dominate top as well as middle management" (p. 416) leaving owners no place to administer the firm.

Until full-time salaried executives took over top management, growth tended to result from ad hoc, emergent processes rather than from planned moves. While owners still managed, "the growth of the enterprise was only occasionally planned with an eye to long-term changes in supply, demand, and technological innovation. Growth came rather as a response to short-term needs and opportunities as perceived by different sets of middle managers" (p. 413). Absorbed in the details of day-to-day operation, owner-managers "did not plan systematically for the continuing growth of the enterprise" (p. 414). Organizational structure had developed in a similar, ad hoc way: "in the entrepreneurial firms, the departments had been built by the middle managers in an ad hoc fashion to meet current needs" (p. 431), whereas at GE, which originated from a merger of two companies, "order was imposed from the top" (p. 430). As a matter of fact, GE took the managerial form right from its inception, since "from almost its very beginning the key policy makers at GE were ... its full-time salaried managers, Charles Coffin and his departmental vice presidents" (p. 431).

MBE development processes

According to Chandler, among the necessary conditions for the appearance of MBEs (refer to figure 3.2), two play a special role in the development of the modern business firm: the creation and development of a managerial hierarchy, and effective administrative coordination. Managerial hierarchy of professional managers provided the continuity needed for the *MBE continued existence process*. Administrative coordination, on the other hand, gives rise to the *continuing growth process*, whereby MBEs keep growing the volume and scope of their activities. In turn, these two processes - continued existence and continuing growth - provide MBEs with a *self-perpetuating capability*.

- ***Continued existence process***

A hierarchy of managers has occupied center stage in the transformation processes of MBEs into large firms. Among other things, the managerial hierarchy provided the modern firm with the *seeds of continued existence*. While "traditional enterprises were short-lived" (p. 8) because partnerships were often disbanded or reconstituted at the death, retirement or departure of a partner, "when a manager died, retired, was promoted, or left an office, another was ready and trained to take his place" (p. 8). In other words, the managerial hierarchy had a *regenerating capability*, which enabled the firm to outlive its members. As a result, the formation of a managerial hierarchy constituted the starting point of the continued existence process, because the regenerating capability allowed for a steady provision of managers through the training of newly hired or existing personnel (refer to fig. 3.4a). In Chandler's words, "the hierarchies that came to manage the new multiunit enterprises had a permanence beyond that of any individual or group of individuals who worked in them" (p. 8).

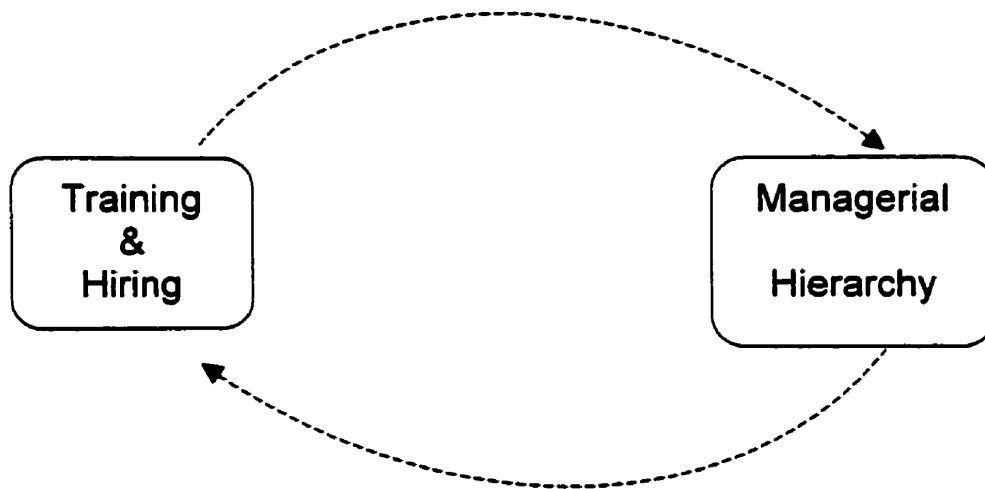
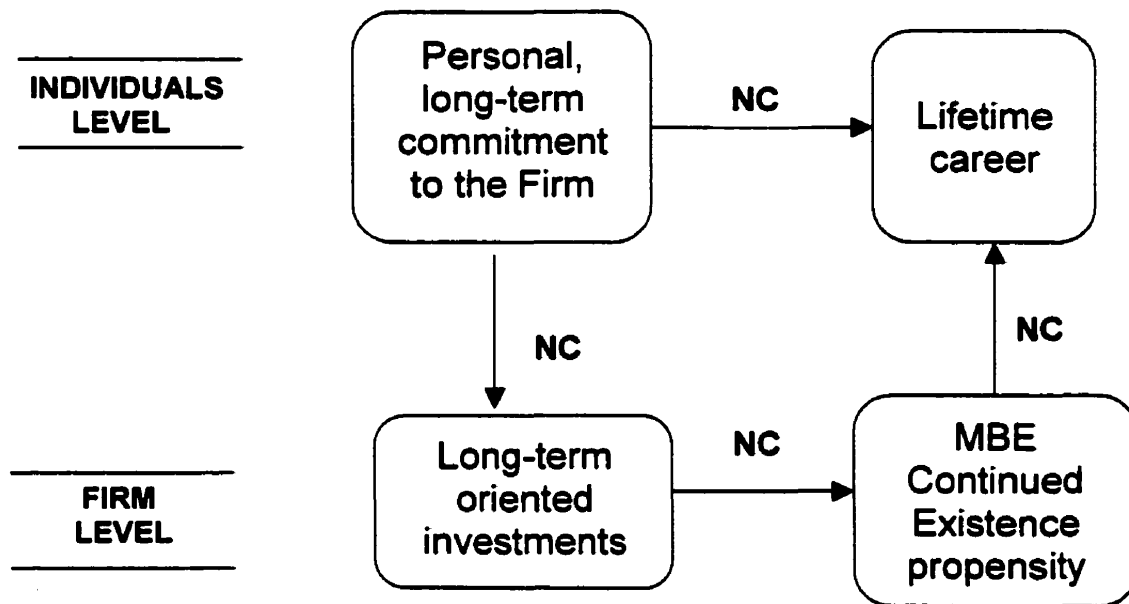


Figure 3.4a – Regenerating Capability

Another seed of continued existence was the pursuit of a lifetime career by managers. As Chandler asserts, “for salaried managers the continuing existence of their enterprises was essential to their lifetime careers” (p. 10). In other words, the continued existence of the MBE constituted a necessary condition for a lifetime career to develop. In turn, the achievement of lifetime career by managers, and continued existence of the firm required:

- i. at the individual level - managers nurturing a personal and long-term commitment to the firm. After all, a long-term commitment is a necessary condition for one to develop a lifetime career in a firm;
- ii. at the firm level - long-term investments. As a matter of fact, long-term investments constitute a necessary condition for a firm to experience a continued existence. Fig. 3.4b illustrates the two-levels chain of necessary conditions, which relate the individual and organizational behaviors involved in the continued existence process of the MBE.



Obs.: NC = necessary condition(s) for

Figure 3.4b – Continued existence process

In this respect, career managers not only had a “personal commitment to the continuing health of their enterprise” (p. 87), but they also “preferred policies that favored the long-term stability and growth of their enterprises to those that maximized current profits” (p. 10). Chandler emphasizes the role career managers played in long-term oriented policies as opposed to entrepreneurs, financiers and speculators. Except for speculators, who made of instability a profitable way of living, the other actors favored stability. Entrepreneurs and financiers would give priority to “maintaining dividends that would assure a reasonable continuing rate of return on their investment” (p. 146). Managers, on the other hand, would be “willing and indeed usually preferred to reduce dividends to assure long-term stability” (p. 146).

This apparent conflict of priorities was handled in different ways. As long as

entrepreneurial firms enjoyed a high-volume cash flow, as meat-packers did, owners "rarely asked for budgets. In the more routine expansion of existing operations and facilities they responded to ad hoc requests of middle managers. These were normally approved. As owners -- and very wealthy ones at that -- they saw little reason to veto such plans for expansion. On the contrary, as owners they had much to gain. What could be a better investment than to plow back profits in order to make existing resources still more lucrative?" (p. 414).

However, when cash flow was insufficient to fund expansion, as was the case of railroads, "investors were ... reluctant to spend large amounts of capital for expanding a road's facilities" (p. 146). In such cases, should speculators create disturbances that might threaten the long-term survival of the firm, investors would play "a passive role and the managers and speculators an active one" (p. 148). As a matter of fact, speculators would play a catalyst role at convincing investors to undergo expansion strategies. Reporting the formation of the large railway transportation systems that would replace existing alliances between railroads, Chandler maintains that speculators "were the first to disrupt the existing alliances. They undermined the viability of the regional railroad cartels since they had more to gain from violating than from maintaining rate agreements" (p. 148). As a result, "once the moves of speculators helped to emphasize the futility of depending on cooperation to assure continuing traffic and dividends, ... , the investors had little choice but to delegate the making of strategy and its execution to their managers" (p. 170).

In sum, the seeds of the continued existence of the firm lay in the ability to easily replace members of the managerial team (fig. 3.4a), and in the managers' pursuit of lifetime careers, an objective that, as fig 3.4b illustrates, favors individual and organizational behaviors that constitute necessary conditions for the continued existence of the firm.

- ***Continuing growth process***

The growth of the firm is anything but an spontaneous process. Expansion moves result from decisions to commit time and resources in order to increase the volume or scope of activities. Notwithstanding this purposeful trait of expansion decisions, administrative coordination contains the *seeds of a self-reinforcing mechanism of continuing growth*.

As Chandler maintains, increased productivity and decreasing costs were key factors in the development of the superiority of administrative coordination over market coordination; and managers' primary goal "was to assure continuing use of and therefore continuing flow of material to their facilities" (p. 10). Accomplishing this goal required the identification of threats and opportunities to the full and profitable use of existing resources and skills.

Sources of threats and opportunities to the continuing, profitable use of resources and skills were found both inside and outside the firm. *External sources* comprise all sorts of technological, economic, political, legislative and social changes. In particular, Chandler stresses the managerial concern for eventual shortage of supplies, disruption in the distribution of the firm's products, or entry of new competitors. Be it internal or external, an opportunity would induce expansion into new products and markets, while a threat would inspire vertical integration backward or forward. On the other hand, *internal sources* of opportunities and threats to the continuing use of resources included:

- i. Underutilized or idle resources;
- ii. Resources and skills that were transferable to the production and distribution of other products and markets;
- iii. Cash flow pressures exerted by high fixed costs, which might lead to a higher but less profitable use of resources.

As Chandler describes, after World War I a strategy of diversification into new products for new markets evolved from the previous concept of full line of products: "top managers began to search consciously for new products and new markets to make use of existing facilities and managerial talent. ... Their goal was ... to use more intensively all or part of the existing organization. ... The new strategy was aimed at assuring the long-term health of an enterprise by using more profitably its managers and facilities" (p. 473). The process of growth for the purpose of using existing facilities more intensively had a *self-reinforcing capability* that would result in the continuing growth of the firm. In the packing industry, for example, "the pressure to keep existing facilities fully used caused the managers at Armour and other packers to push the enterprise into obtaining additional facilities. Such expansion, in turn, required the creation of new, autonomous managerial suborganizations to evaluate, coordinate, and plan the activities of these units" (p. 399). In addition, the increasing number and types of operating units increased "the likelihood that units might be underutilized" (p. 489). As a matter of fact, "it was rare for all units in such an enterprise to be operating at the same speed and capacity. Such disequilibrium provided constant pressure for the growth of the firm" (p. 489). Figure 3.5a illustrates the self-reinforcing mechanism in the continuing growth process.

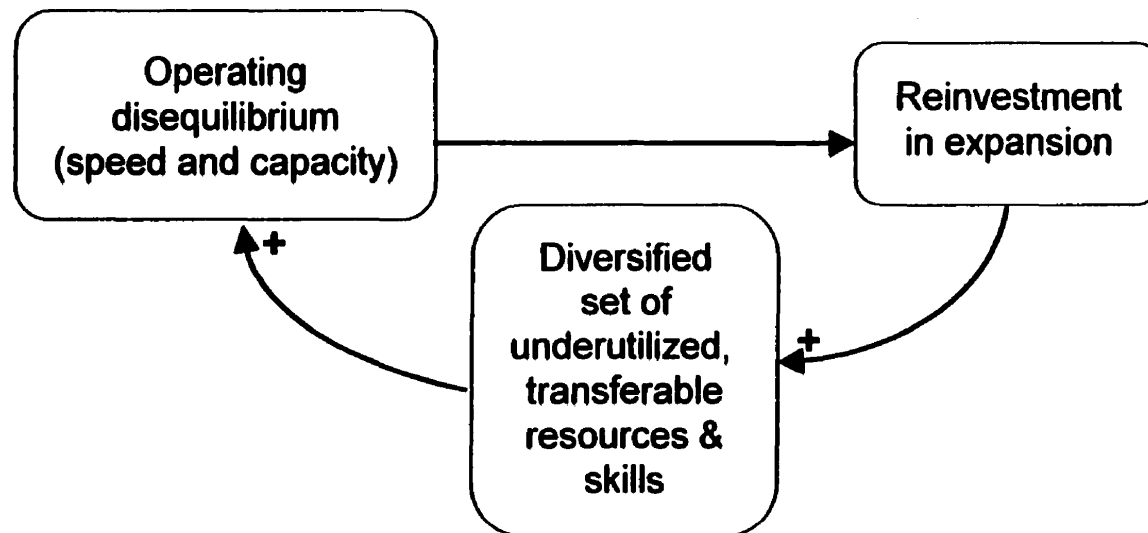


Figure 3.5a – Self-reinforcing mechanism of continuing growth

Chandler distinguishes two types of *motives* guiding expansion decisions: *productive* and *defensive*. While productive motives would *promote change*, defensive ones would *control change*. Productive expansion, also called positive, aimed to "add new units, permitting by means of administrative coordination a more intensive use of existing facilities and personnel" (p. 487). As Chandler states, this type of expansion "increased productivity by lowering unit costs" (p. 487). The other type of expansion, called defensive or negative, "stemmed from a desire for security. Its purpose was to prevent sources of supplies or outlets for goods and services from being cut off or to limit entry of new competitors into the trade" (p. 486). Defensive expansion rarely increased productivity.

— Productive expansion was associated with opportunities while defensive expansion with threats to a more intensive use of facilities and skills. Therefore, the managerial goal of assuring their continuing use could be attained in two different ways, which either promoted or controlled change:

- i. by increasing the volume and scope of operations, i.e., by fostering further use of existing resources and skills in new products and markets (productive growth);
- ii. by keeping steady the volume, scope and throughput of operations, i.e., by assuring a continuing inflow of inputs, a continuing outflow of products, as well as by limiting the intensity of competition (defensive growth).

Productive growth started up a diversification process having an expansion-generating capability. Diversification into new products and markets resulted from two *mechanisms*:

- i. Detection of underutilized resources;
- ii. Identification of existing resources and skills that might be transferable to the production and distribution of other products for other markets.

As long as the undertaken expansion would continue to produce some degree of idle resources, and/or to enrich the set of resources and skills that might be transferable to other products and markets, growth would contain the seeds of

further growth. In other words, this kind of diversification had a self-reproducing feature that would generate *continuing growth*. As a result, Chandler maintains that "such productive expansion was inherently more profitable than defensive expansion, and so set the direction in which the enterprise grew" (p. 489). Figure 3.5b adjusts the representation of the self-reinforcing mechanism of continuing growth by specifying the kind of reinvestment expansion more likely to foster continuing growth.

Finally, depending on the kind of business activity, continuing growth was more or less likely to occur. Large integrated industrial firms, for example, "had a wider variety of resources that could be transferred to the production and distribution of other products for other markets" (p. 489). In addition, "because the large integrated industrial had more and different types of operating units than other kinds of business enterprises, the likelihood that units might be underutilized was greater" (p. 489). In sum, the more diversified the set of skills and resources the greater the likelihood that the enterprise would experience continuing growth.

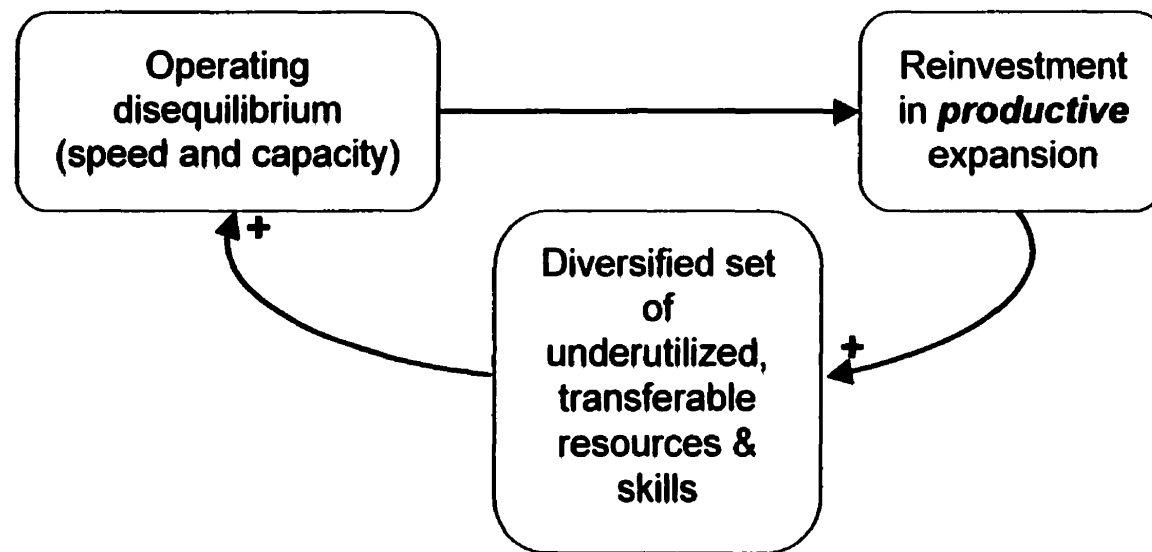


Figure 3.5b – Self-reinforcing mechanism of continuing growth
(clarifying the kind of expansion)

- ***Self-perpetuating capability of MBEs***

The self-perpetuating capability of MBEs is the outcome of two processes: continued existence and continuing growth of the firm. As Chandler maintains, "once an enterprise had set up a managerial hierarchy and once the organization had provided efficient administrative coordination of the flow of materials through the processes of production and distribution it became self-perpetuating" (p. 372).

Nevertheless, self-perpetuation will not occur in the absence of the necessary conditions for: the very existence of the MBE; its continued existence; its continuing growth. As Chandler states, "these self-perpetuating human organizations appeared and continued to flourish only in those industries where the technology of high-volume production and the needs of high-volume distribution offered the greatest potential for the administrative coordination of the flow of goods through the economy" (p. 372). Moreover, should a firm fail to develop a hierarchy of salaried managers nurturing a long-term commitment towards the stability and growth of the firm, the self-perpetuating capability would not develop.

A synthetic view of the formation and development processes of MBEs is provided in Figure 3.6.

Industry formation process: industry growth capability

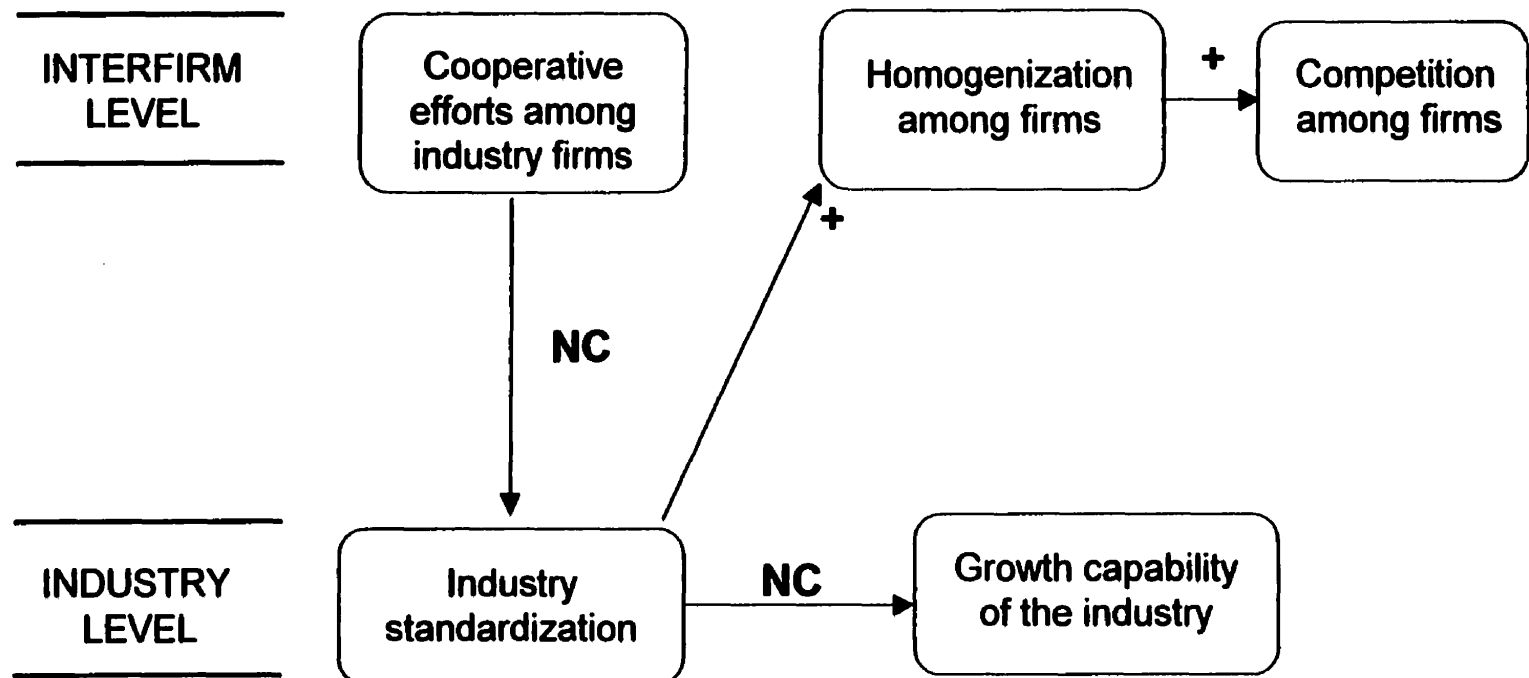
Industries form around some standardized elements, such as technologies, procedures, products and processes. However, at the very beginning of their existence, industries often fall short of standards. American railroads by 1861, for example, "used different gauges and different types of equipment" (p. 122). Differentiation at the early stage of an industry may be simply the outcome of a large number of independent innovation efforts or a defensive weapon vis-à-vis competitors. In railroads, for example, differentiation had been used as a defensive weapon. As Chandler reports, "in the early years this differentiation had been made purposely so that freight shipped on a railroad sponsored by the merchants of one city could not be syphoned off by those of another" (p. 122). As a result, "cars of one railroad could not be transferred to the track of another" (p. 122).

Whenever differentiation is perceived to constrain business volume in an industry, managers in the industry's firms become willing to seek some degree of standardization to foster growth. Railroads management, for example, identified important business opportunities in through traffic. As a matter of fact, "as the railroad network grew, as it became more interconnected, through traffic passing from one line to the next was increasingly important to the profits of the individual railroad companies" (p. 121). However, in the absence of standardization, the costs and delays of unloading and reloading freight were quite high, putting a ceiling to the volume of through traffic. According to Chandler, industry standardization constitutes, therefore, a necessary condition for the development of growth capability in an industry.

Industry standardization calls for some degree of cooperation between the industry firms. In the grain trade, for example, modern commodity dealers had standardized and systematized marketing procedures carried out by the exchanges of grain. These exchanges gave rise to "cooperative efforts to standardize grading, weighing, and other procedures on a national basis" (p. 211). In railroads, "standardization of equipment and operating procedures called for detailed and

prolonged discussions among the managers of the many roads" (p. 123). Cooperation is thus a necessary condition for the establishment of industry standards.

However, in addition to being a growth-enabler, standardization enhances interfirm competition. As Chandler reports, "the very success of interfirm cooperation increased interfirm competition" (p. 123). In fact, since standardization reduces differentiation among firms in some respects, competition is likely to increase. Figure 3.7 illustrates the chain of necessary conditions for the development of growth capability in an industry and its effect on the degree of interfirm competition.



Obs.: NC = necessary condition(s) for

Figure 3.7 – Chain of necessary conditions for the development of *growth capability in an industry* and its effect on the degree of interfirm competition

Industry development process: industry concentration

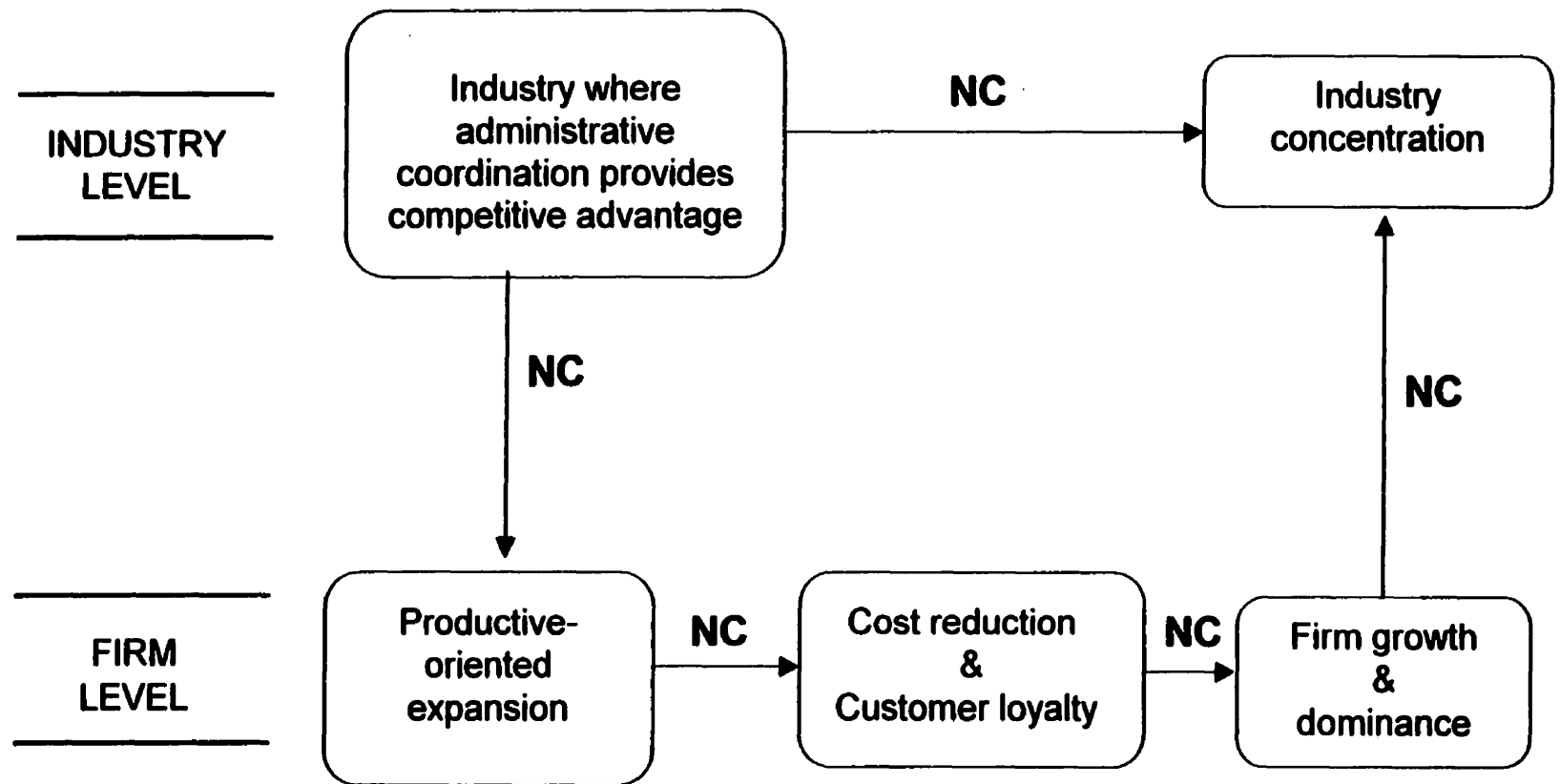
Cooperation was sometimes looked upon as a vehicle to control competition. Railroads, for example, established alliances and, later on, formal federations to control rates cutting. Chandler reports that "the need to assure a steady flow of traffic created a constant pressure for railroad managers to obtain through freight from other roads on parallel routes. They did so by cutting rates and by aggressively advertising and selling. To control such competition railroad managers turned to cooperation ... creating some of the largest and most sophisticated cartels ever attempted in American business. But these cartels rarely worked. If cooperation to expand the flow of through traffic proved to be a great success, cooperation to control competition was a resounding failure" (p. 123).

Notwithstanding the increased competition that standardization brought about, in some industries a number of firms grew large and their industries underwent a process of concentration. According to Chandler, a number of factors could *not* explain industry concentration and the concomitant firm dominance in certain sectors. Among these were entrepreneurial talents, capital markets and public policy:

- i. "*entrepreneurial ability* can hardly account for the clustering of giant enterprises in some industries and not in others. The most brilliant industrial statesmen or the most ruthless robber barons were unable to create giant multinational companies in furniture, apparel, leather, or textile industries. Yet in other industries, the first to try often succeeded" (p. 373);
- ii. "enterprises did not grow large and industries become concentrated because the entrepreneurs who built them had privileged *access to capital* ... What the enterprises that integrated production and distribution did have was a much greater supply of internally generated capital" (p. 373);
- iii. "*tariffs* were as high on the products of industries that remained competitive as they were on those that became concentrated" (p. 374). *Patents*, on the other hand, "had a greater effect than tariffs" (p. 374). However, it was the effectiveness of the global organization that provided it with protection: "a set

- ii. productive expansion constituted a necessary condition for obtaining cost reductions and customer loyalty;
- iii. cost reduction and customer loyalty were necessary conditions for firms to grow and dominate;
- iii. firm growth and domination were necessary conditions for industries to become concentrated.

Figure 3.8 illustrates the chain of necessary conditions for industrial concentration and firm dominance.



Obs.: NC = necessary condition(s) for

Figure 3.8 – Chain of necessary conditions for industry concentration

Chandler's ideas summarized

Chandler clearly delimits the scope of the book by mentioning its concentration on the rise of modern business enterprise and its managers. The objectives of the study comprehend explaining the initial appearance of modern business enterprise (MBE) – why it began, when it did, where it did, and in the way it did -- as well as its continuing growth – where, how and why an enterprise once started continued to grow and to maintain its position of dominance.

A number of conditions were necessary for the appearance of this new organizational form, the MBE. Advanced technology, expanding markets, sharp increase in the volume of economic activity, and the creation of a managerial hierarchy inside the firm constituted necessary conditions for the development of the superiority of administrative coordination over market coordination (fig. 3.2). In turn, this superiority of administrative coordination was a necessary condition for the appearance of the MBE. However, MBEs were likely to appear only in those sectors of the economy for which technology did bring a sharp increase in output and where markets were undergoing expansion.

Depending on who was in control of the major decisions in the MBE, this new organization could take three forms: entrepreneurial (family-controlled), financier-controlled, and managerial (management-controlled). As the MBE grew, it increasingly needed full-time dedication of decision-makers. Consequently, over time the MBE tended to take the managerial form (fig. 3.3), i.e., a managerial hierarchy of middle and top level managers would be in control of operational and long-term oriented decisions.

Managers provided the MBE with a continuing existence propensity for two reasons: they could be replaced and they sought for a longtime career in their firms (figs 3.4a and 3.4b). By performing administrative coordination, managers aimed at assuring the continuing and profitable use of the firm's resources and skills. This, in turn, encompassed a self-reinforcing mechanism of continuing growth whereby

expansion undertaken in order to augment the profitable use of resources and skills generated other sorts of underutilized resources and skills, calling for further expansion, and so on. The continued existence and continuing growth properties constituted necessary conditions for the development of the MBE self-perpetuating capability. Moreover, expansion undertaken for productive rather than defensive motives was more likely to contribute to the development of continuing growth (fig. 3.5b).

The MBE appeared concomitantly with the emergence of new industries where administrative coordination could potentially provide greater efficiency than market coordination. In emerging industries, standards constitute a necessary condition for the development of its growth capability. However, some degree of cooperation among rival firms is required for achieving industry standardization. In turn, a higher degree of competition is produced, because standardization reduces differentiation among rivals, as well as uncertainty in technology and/or product and process design, stimulating therefore the overall activity in the industry by existing and new firms (fig. 3.7).

The co-evolution of MBEs and their industries produced firm dominance and industry concentration. The necessary conditions for these transformations to occur comprehend industry characteristics – being an industry where administrative coordination provided competitive advantage – and the firm ability to achieve cost reductions and customer loyalty. These, in turn, required productive- rather than defensive-oriented expansion (fig. 3.8).

DISCUSSION

The discussion of *The Visible Hand* contributions and limitations to the understanding of the growth of the firm is organized in three subsections. The first discusses the extent to which Chandler's historical account of the rise and growth

of American firms in the late 19th and early 20th centuries can contribute to our understanding of firm growth in recent times; the second comments on the criticisms of Chandler's ideas stated in the strategic management literature; and finally the third considers the limitations and contributions of the book towards the building of a theory of the growth of the firm.

Extent of contribution in Chandler's historical account

Maintaining that "historical perspective is the study of a subject in light of its earliest phases and subsequent evolution", Lawrence (1984) distinguishes historical perspective from history. While "the object of historical perspective is to sharpen one's vision of the present, not the past...history provides raw materials for historical perspective" (p. 307). This section examines the extent to which Chandler's historical account can potentially help to sharpen our vision of the growth of the firm in the present, rather than in the past. In sum, it seeks to answer the question: What elements in Chandler's ideas on the growth of the firm are transhistorical? (Lawrence, 1984, p. 308).

It is hardly evident that Chandler's account might apply to the study of growth in the present. For one, it explains the emergence and growth of multiunit firms as a result, among other things, of major revolutionary, technological changes in transportation and energy – clearly a historically embedded scenario. In addition, several changes in the business landscape seem to undermine the suitability of Chandler's descriptions and explanations for modern times:

- i. The incipient managerial job market of the past has become strong and competitive. As a result, it is highly questionable whether the pursuit of a lifetime career in the firm still constitutes a major personal goal for managers;
- ii. In view of the current, highly active stock markets, it is doubtful whether managers still favor long-term stability and growth to maximizing short-term profits;
- iii. While the firms Chandler described underwent an internalization process of different economic activities as they grew, outsourcing has been prevalent

in several industries in the last decades of the 20th century.

It is beyond doubt that Chandler's analysis focuses on a specific time period. For example, his account explains why and how *MBEs appeared for the first time in history* and ended up replacing single unit firms. As a result, Chandler's analysis of the MBE appearance process clarifies a well-defined historical situation: according to Chandler, MBEs did not appear until goods could be moved at a significantly higher speed and factories were provided with a central source of energy.

However, Chandler's ideas on the appearance and replacement processes are potentially transhistorical. In fact, by advancing necessary conditions for volume increase in a sector/industry (refer to fig. 3.2), Chandler's account admits that not every economic sector/industry did experience the appearance and replacement processes. Consequently, the chain of necessary conditions regarding the appearance and replacement processes could potentially be tested over time, whenever a sector/industry structure undergoes a transformation from the traditional to the MBE firms.

Interestingly, although the appearance and replacement processes encompass the very essence of the visible hand concept that inspires the book – by the way, the most frequently retained idea (refer to table 3.2) – other processes provide a potentially far greater contribution to the understanding and building of a theory of the growth of the firm. These are the MBEs development processes – continuing growth, continued existence and self-perpetuation – and the industry formation process.

Continuing growth

Chandler suggests that, in contrast to the traditional firms, MBEs have a self-perpetuating capability. In addition, he advances two necessary conditions for the materialization of this capability (figure 3.6): setting in motion continuing growth mechanisms and developing a continued existence propensity. Chandler's

continuing growth mechanism (figures 3.5a and 3.5b) explains how MBEs grew by diversifying their economic activities. The continued existence process (figures 3.4a and 3.4b) he proposes explains how MBEs came to develop a continued existence propensity.

Chandler's account of firm growth mentions a number of internal and external expansion opportunities associated with the continuing, profitable use of resources and skills. In particular, he explains how an operating disequilibrium in productive speed and capacity can potentially set in motion a continuing growth process. In line with Penrose's (1980) notion of excess capacity due to resources indivisibilities, and with one of Normann's (1977) natural driving forces also associated with overcapacity, Chandler maintains that the managerial quest for more intense and profitable use of facilities and skills impels towards firm expansion. Far from solving the disequilibrium, growth fuels the existent disequilibrium by increasing the set of underused resources and skills in quantity and in quality.

Building on these views, a general structure for the continuing growth process of the firm is suggested (refer to figure 3.9). Three main blocks can be identified:

- i. Imbalance – some sort of disequilibrium occurring inside or around the firm;
- ii. Expansion – some type of expansion resulting from the perception of growth opportunities associated with the imbalance;
- iii. Reinforcing mechanism – some type of change brought about in the course of the expansion process causes existing imbalance to increase or new types of imbalance to appear.

In view of the atemporal characteristics of its constitutive blocks, the continuing growth process may be considered transhistorical.

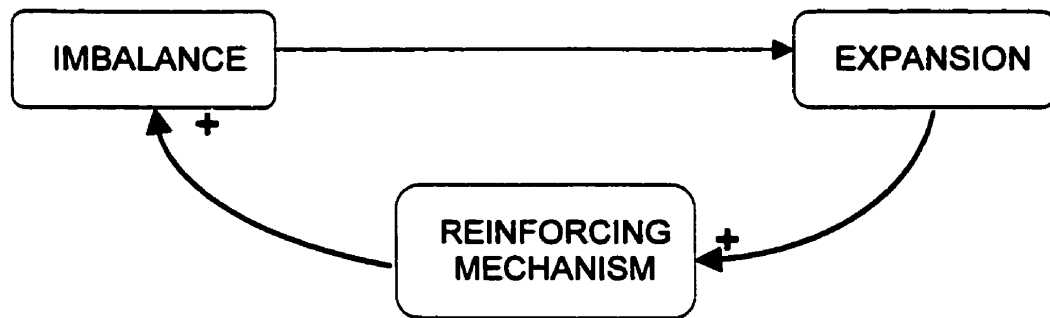


Figure 3.9 – General structure of the continuing growth process

- **Continued existence**

Both Chandler (1977) and Penrose (1980) emphasize the fundamental role of managerial skills. In Penrose's view, these skills cannot be bought in the market as commodities, because they include the development of interpersonal relations that take time to evolve. So much so, that the availability of managerial skills constitutes one of Penrose's three types of limits to the growth of the firm. Chandler, on the other hand, suggests that by building a managerial hierarchy the firm develops the seeds of its continued existence. According to him, by hiring and training new and existent people, the firm can regenerate its capabilities (figure 3.4a), while managers' long term commitment to the firm is a necessary condition for providing the firm with a long-term perspective, and a continued existence propensity (figure 3.4b).

Two facts seem to challenge Chandler's perspective regarding the continued existence of the firm. For one, the managerial job market has developed to such an extent that one may well wonder whether the pursuit of a lifetime career is still as strong as it may have been throughout the historical period Chandler describes. Moreover, stock markets have become ever more important and short-term oriented. Chandler's perspective on the continued existence of the firm would therefore seem to be historically embedded.

So it is, as far as managerial motivations for developing a lifetime career in

a company are concerned. In fact, human motivation may undergo changes as societal values and individual needs change over time. Consequently, as present-day job and stock markets seem to create stimuli that are at variance with the development of a continued existence propensity, it might be argued that Chandler's ideas on continued existence actually are historically embedded.

However, continued existence's historical embeddedness may not be the case. For sure *managers' need* for enjoying a lifetime career in a single firm does not seem to be transhistorical. Yet, the *firm's need* for talented people to develop lifetime careers inside the firm may be so. Inter-firm managerial mobility can be expected to preclude or significantly slow down firm's growth and its continued existence. In fact, such mobility would not only prevent the development of enduring interpersonal relations (Penrose, 1980), but would also inhibit long-term initiatives. After all, by maintaining a short-term commitment to the firm, managers may fall short of inducements to champion long-term investments. Therefore, it seems that although talented managers may not need to spend lifetime careers in a company, the firm still needs this behavior to occur, if it pursues its continued existence.

In sum, should a firm aim at its continued existence, it should find ways to stimulate managerial long-term commitment, as well as long-term oriented investments, despite the highly active managerial job and stock markets. Moreover, failure to promote these conditions would be expected to bring about firm discontinuance sooner or later. This essay takes the view, therefore, that the continued growth process Chandler proposes also has transhistorical characteristics.

- ***Self-reinforcing capability***

According to Chandler, two processes – continuing growth and continued existence propensity – constitute necessary conditions for the MBE self-perpetuation capability to develop. Since both these processes were shown to have transhistorical properties, self-perpetuation can also be said to be transhistorical.

It is arguable that IBM's open design was the single most determining factor in the outcomes of the war that Apple and IBM products fought to become the personal computer standard. After all, for a good many years the Apple design was not only more innovative than IBM-PC's, but it was also believed to better fulfil users' needs. On the other hand, IBM-PC's increasing production volume and competition not only brought down its prices, but also gave rise to a continuing growth process.

As important as fulfilling information processing needs of the world population at large, inter-systems compatibility was a much needed property personal computers had to develop. In addition to individual data processing use, people started to communicate among themselves by exchanging digital files. User-friendliness needed to encompass inter-systems compatibility. Compatibility came to constitute a reinforcing mechanism as shown in Figure 3.10 below.

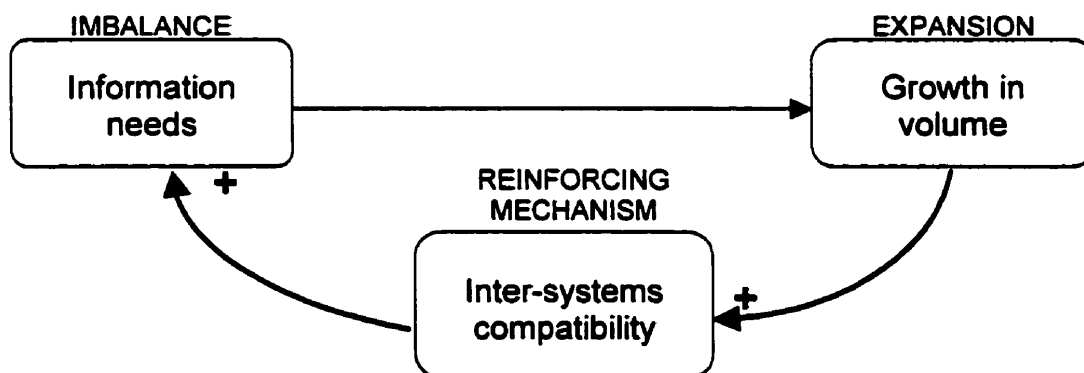


Figure 3.10 – Continuing growth process in the personal computer industry

Continuing growth in the PC industry had the following characteristics:

- i. Unfulfilled information processing needs were a source of opportunity for PC manufacturers;
- ii. The PC industry would then expand its production volume to satisfy those needs;
- iii. The more the industry expanded into more of the same, the greater inter-systems compatibility;

- iv. The greater inter-systems compatibility, the more new uses were conceived or perceived for PCs. Therefore, the more information processing needs increased.

Interestingly, IBM's decision to seek cooperation to produce the PC ran counter to IBM's tradition. Much like Chandler's firms, IBM had grown as an integrated manufacturer. Throughout its existence, IBM had developed advanced technological capabilities in software, hardware and telecommunications, yet for non-technological reasons – timing reasons in fact – management decided to enter the PC race by outsourcing components for the product it had designed. By so doing, IBM did not own property rights of outsourced components, including software, the component that came to play one of the most important roles in inter-systems compatibility. As a result, Microsoft, IBM-PC's software manufacturer, underwent a continuing growth process, which is similar to the one described in figure 3.10, while IBM did not develop any substantial competitive advantage in the PC business.

Apparently, IBM's non-integrated approach contradicts Chandler's view that integration preceded specialization. As a result of the outsourcing of IBM-PC's parts, manufacturing specialization preceded integration. Commenting on Adam Smith's pin factory, Chandler states: "Even here integration preceded specialization and subdivision. Only after the integration of production of all parts of a gun within a single establishment did specialization come in the manufacture of each part of the gun: the lock, stock, and barrel" (p. 72). It should be noticed, though, that Chandler's assertion referred to new, complex developments. In such cases, technological complexity calls for the concentration of activities during the learning period, until a stabilized model is conceived. Thereafter, complexity is progressively reduced and specialization may follow.

What could possibly explain why the IBM-PC, a new, revolutionary product did not follow the integration-precedes-specialization rule? The IBM-PC was undoubtedly a new product that revolutionized the computer industry. Yet, for IBM, the PC was far from complex. In fact, its design was a simplified version of the much

larger, sophisticated mainframe computers IBM produced. By outsourcing, IBM aimed at speed to the market, having failed, however, to reap as much benefit as other partners, such as Microsoft.

The preceding analysis of the PC industry has showed the adequacy of Chandler's transhistorical ideas in explaining firm growth in the present. As for self-perpetuation, by its very nature, to be examined, it requires more than a few decades of firm existence. Chapter 6 performs such analysis by comparing General Electric's and Westinghouse's growth trajectories over 12 decades.

Criticisms and misuses of Chandler's ideas in the strategic management literature

Chandler's ideas were examined in 10 articles (Aldrich, McKelvey & Ulrich, 1984; Butler & Carney (1983); Jorde and Teece, 1989; Leontiades, 1982; McKelvey & Aldrich, 1983; Nielsen, 1988; Robins, 1987; Rowlinson, 1995; Sockell, 1988) and one book (Best, 1990). Some of them have made criticisms, or pointed out limitations of Chandler's book, while others have misinterpreted or wrongly extrapolated his ideas. Each of the 11 works is addressed next.

- i. *Aldrich, McKelvey & Ulrich (1984)* - Adopting a population perspective, the authors maintain that organizational design should take account of the state of the environment. In addition, they suggest four environmental states. Their critique of Chandler's ideas reads as follows: "The assumption that individual intentionality is the root cause of the behavior of organizational entities is based on a biased sample of all possible behaviors by people in organizations. Descriptions of successful organizational actions ... are invariably constructed after the fact by someone trying to make sense of some outcome" (p. 73).

It is true that Chandler, as much as Penrose (1980), explicitly emphasizes intentionality. Both authors take the view that growth is but spontaneous process and

that entrepreneurial and managerial skills are needed for growth to occur. However, Aldrich et al.'s criticism seems inaccurate in two respects. First, though important, intentionality is but one of the intervening factors Chandler mentions. In fact, these also include several sorts of environmental changes – infrastructure, technology, and markets – in the absence of which firm growth cannot occur. Therefore, associating intentionality with the root cause of growth seems to be an overstatement. Second, although Chandler mainly describes successful growth moves, Chandler also accounts for less successful moves. By classifying managerial motivations for growth as productive and defensive, Chandler advances the notion that when inspired by defensive motives, intentionality may not succeed in producing continuing growth, a necessary condition for self-perpetuation, according to Chandler. Therefore, it seems Chandler has observed and sought to explain both successful and less successful growth moves.

- ii. Best (1990) – Concerned about the decline of the American industry, the author advances what he calls a new paradigm of competition, whereby continuous improvement takes the place of mass production systems. As the author states: "The argument of this book is that American Big Business suffers from rigid command and control production organizations -- a rigidity made apparent by the emergence of an alternative production paradigm termed the New Competition" (p. 7). Alternative organizational forms to the large integrated industrial American company are analyzed: the Japanese firms, and the Third Italy firms. Criticisms of Chandler are shown below:
 - . Referring to Bernard Elbaum's and William Lazonick's work that built on Chandler's *The Visible Hand*, Best argues: "Chandler's analysis, as applied to Britain by Elbaum and Lazonick, does provide a compelling account of the decline of British industry, but it does not explain the decline of American industry, the rise of Japanese industry, or the international success of groups of small firms in Germany, Italy, and elsewhere that have never been dominated by hierarchical organization" (p. 7);
 - . "the success of regions dominated by groups of small firms ..., from the Chandlerian perspective, are simply cases of pre-modern industrial

organization waiting for mass production technology and a managerial hierarchy to bring them into the modern world" (p. 8).

The Visible Hand has unequivocally aimed at describing and explaining growth rather than contraction and decline. Decline therefore lies outside the book's scope. However, as our analysis of the personal computer has shown, Chandler's ideas could help to explain IBM's downturn in the early and mid 1990s. For sure, more work should be done in this direction by examining several other industries and firms which have experienced loss of competitiveness in the global market place. However, IBM's case seems to indicate that Best may have jumped to a conclusion that simply may not hold.

Best also advances that, from a Chandlerian perspective, small firms would be waiting for mass production technology and a managerial hierarchy to be brought into the modern world. As a counter-example, Best mentions the successful Italian industrial districts, constituted by small family-owned firms operating in industries where technology has not brought a sharp increase in output, such as textiles, furniture, and clothing. Our analysis did not identify this sort of implication. On the contrary, it seems clear that Chandler's view does not predict that MBEs will dominate every sector of the economy. His statements maintain that certain major technological changes constitute a necessary condition for MBEs to appear and replace small firms. Therefore, from a 'Chandlerian perspective', all one can say is (a) that given the technological constraint in the industries Best mentions, it is hardly likely that these small firms grow becoming MBEs; and (b) that should these family-owned firms be failing to build a managerial hierarchy, it is hardly likely that such firms develop a self-perpetuating capability.

Moreover, Best's mention of small-firms based successful regions seems to indicate that size has been erroneously equated with success. By the way, their success seems to be in line with Chandler's ideas concerning productive motives. Best describes a cooperative marketing venture in the region of Tuscany. The consortium provides collective marketing- and distribution-related services to its

members, small-sized furniture firms. Therefore, cooperation motivated by productive rather than defensive motives is a major factor in their commercial success. However, should success be equated with self-perpetuation, the lack of a managerial hierarchy would most likely indicate, for Chandler, the prospects of failure in the future.

- iii. **Butler & Carney (1983)** – The authors examine the organizational boundaries issue by analyzing make-buy decisions. According to them, their paper “does not support the view expressed by a number of recent writers (e.g. Chandler, 1977) that markets are inevitably being replaced by internal organization, although we would have to agree with Chandler that the ‘visible hand’ is at work, but within the context of the marketplace and the price mechanism” (p. 229).

These authors seem to misinterpret and exaggerate Chandler’s assertions. In fact, they seem to ignore some of Chandler’s statements, such as “the new bureaucratic enterprises did not, it must be emphasized, replace the market as the primary force in generating goods and services. The current decisions as to flows and the long-term ones as to allocating resources were based on estimates of current and long-term market demand. What the new enterprises did do was to take over from the market the coordination and integration of the flow of goods and services from the production through the several processes of production to the sale to the ultimate consumer. Where they did so, production and distribution came to be concentrated in the hands of a few large enterprises” (pp. 10-11).

- iv. **Jorde and Teece (1989)** - The authors suggest the need for a new balance between cooperation and competition among rival firms, stating that “whereas cooperation among firms was once a subject confined to antitrust case books, it is increasingly a topic for discussion in schools of management” (p. 25). They criticize Chandler by stating: “Chandler’s analysis did not, however, continue into the 1970s and 1980s, where much of what he observed earlier began to unravel. By drawing his analysis to a close in

the early post-war period, Chandler did not have to contend with a relatively new phenomenon, the venture capital funded entrepreneurial firm. Companies like Sun Microsystems, Genentech, Compaq, Advanced Microdevices, and Apple Computers are archetypical examples. Whereas large integrated firms like IBM and Exxon have relied upon integration and administrative processes to effectuate coordination, the "Silicon Valley" startups have in the main eschewed integration and relied extensively on outsourcing" (p. 29).

The authors correctly notice that Chandler's study does not continue into the 1970s and 1980s. However, their assertion of the adequacy of Chandler's notions to explain growth in the last two decades is disputable. For one, our analysis of *The Visible Hand* has depicted the dynamics of competition and cooperation among competing firms, which describes the co-evolution of firms and industry, rather than an antitrust issue. Also, our brief analysis of the computer industry has shown how some of Chandler's ideas on growth are suitable to explain firm growth in more recent times. Interestingly, it has examined a typical "Silicon Valley" industry that includes some of the firms Jorde and Teece mention. In addition, it has advanced how and why IBM, a company the authors believe to typify the large integrated firms, has recently followed a non integrated path and relied extensively on outsourcing. In sum, Chandler's ideas were shown to apply to a modern industry like the personal computer.

- v. Leontiades (1982) – Arguing that "unrelated diversification is consistent with a historical view of corporate development (p. 5), Leontiades builds on Chandler's *Strategy and Structure* (1962) and *The Visible Hand* (1977) to extend some of Chandler's ideas in the context of unrelated acquisitions. According to Leontiades, "We are again indebted to Alfred Chandler for anticipating that unrelated diversity, to be successful, must include organizational changes for its effective administration. The focal point of change in this instance has been the creation of planning departments, adoption of formalized planning systems and techniques, as well as the

development of skilled chief planners to run the systems and departments" (p. 12).

The author seems to have wrongly extrapolated Chandler's ideas. For one, the continuing growth mechanism describes related rather than unrelated growth. Chandler suggests that existing, underutilized resources and skills are found new, more profitable uses. Except for one single type of resource – capital – unrelated acquisitions do not seem to fit the continuing growth mechanism. Moreover, Chandler emphasized that throughout firm's growth, organizational innovation did contribute to increase the firm's productivity. It is rather debatable the extent to which formalized planning and techniques do enhance firm's productivity.

- vi. *McKelvey & Aldrich (1983)* - The authors propose a population perspective to the study of organizational science. On Chandler, they state: "... explanations in the literature invariably attribute the behavior of organizations to individuals in organizations ... Many analysts are reluctant to give up this view, ... Perhaps the critics are correct in resisting a new, possibly very blind, variation; ... or perhaps it is a residue of the pre-Copernican need of people to see the earth as the center of the universe, now replaced by a need to attribute causality to a visible hand (Chandler 1977)" (p. 117).

In line with Aldrich, McKelvey & Ulrich (1984), the paper criticizes the notion that individual behavior in organizations, epitomized in Chandler's visible hand concept, explain organizational behavior. The arguments advanced when discussing Aldrich et al.'s paper (1984) equally apply in this case.

- vii. *Nielsen (1988)* – the author acknowledges Chandler's contribution to understanding why "internal coordination and cooperative strategies within large organizations can be more efficient than relying on external market mechanisms" (p. 489). He however states that "we do not have, as yet, a rigorous ecosystem or any other theoretical elaboration of why interorganization strategies are efficient, such as Williamson and Chandler

have developed for internal coordination within large organizations" (p. 489).

Although Chandler's work does not allow for the elaboration of a rigorous ecosystem on interorganizational strategies, the author seems to have ignored Chandler's description of cooperative interorganization strategies. The co-evolutionary process of firm and industry growth in fact suggests increasing competition as an expected consequence of cooperation among rival firms in emerging industries.

- viii. *Robins (1987)* - Transaction cost approaches are reviewed by examining two perspectives of analysis, one of which is historical analysis. Chandler's work is associated with this perspective. Chandler's account of the transformation of market coordination into administrative coordination is qualified as "misleading... The transformation discussed by Chandler involved more than just organizational change; it also involved fundamental change in the nature and level of economic activity in American society. ... The rise of the large firm was associated with an increase in the level of commerce, i.e., with growth in the density and activity of the economy (Bruchey, 1975). The history of nineteenth-century economic development is less a story of hierarchy displacing markets than a tale of social and political centralization creating the conditions for large-scale production of goods (Knowles, 1967)" (pp. 76-77).

Robins seems to have developed an incomplete understanding of Chandler's proposition. An examination of the necessary conditions for the replacement of the traditional firm by the MBE (fig. 3.2), i.e., the replacement of the invisible by the visible hand, reveals that the nature of the necessary conditions for the replacement to occur is both internal (managerial hierarchy and administrative coordination) and external (advanced technology, expanding markets, volume of economic activity) to the organization. Another evidence of Chandler's comprehensive account is provided by the multiple levels of analysis involved in several of his chains of explanation (figs. 3.4b, 3.7 and 3.8).

- ix. **Rowlinson (1995)** - A case study on the British-based chocolate confectionery Cadbury is reported. A particular period of the firm's history is analyzed, the 1960s, emphasizing the strategy, structure and organizational culture issues. The criticism of Chandler's ideas is stated as follows: "Because Chandler does not specifically examine the cognitive, cultural, structural or political context in which strategic choice ... is 'embedded' ..., he ends up invoking the vague 'psychological commitment' of executives (Chandler, 1977, p. 463) to explain their decisions. In particular, Chandler does not consider how the culture of a company in general, or labour management issues in particular, might shape the orientation of executives. If culture is closely related to labour management, then Chandler is largely indifferent to it" (p. 122

Rowlinson (1995) rightly identifies some limitations of Chandler's study. These concern the absence of certain dimensions of analysis including cognitive, cultural, structural and political contexts within the organization. It is worth noticing, though, that from the standpoint of the continued existence process (fig. 3.4b), Chandler associated managerial commitment with the pursuit of a lifetime career in the firm, a goal not so vague as 'psychological commitment'.

- x. **Sockell (1988)** - *The Visible Hand* is cited within another book's review. Mentioning the importance of unions and governments, Sockell states: "It is noteworthy that these factors are often ignored in historical studies of how, when, and by whom enterprise decisions are made (see, for example, Chandler, 1977)" (p. 661)

Sockell rightly points out another limitation of Chandler's work.

- xi. **Wright (1986)** - the author refers to Butler & Carney's article (1983) commented in (iii). In line with these authors, Wright states: "As they argued, managed markets use the techniques of internal organizations but avoid the

need for buyer and seller to be part of the same legal entity. These types of markets move organization theory beyond Chandler's (1977) notion of market being replaced by internal organizations and hence beyond Williamson's (1975) M-Form organization" (p. 443).

Comments advanced in iii equally apply in this case.

Having discussed the eleven works that criticized, pointed out limitations, misinterpreted or wrongly extrapolated Chandler's ideas, *The Visible Hand's* limitations and contributions are summarized next.

Limitations and contributions of *The Visible Hand*

Despite its broad scope and multiple levels of analysis, *The Visible Hand's* explanatory reach is not without limits. Chandler's study was conceived to answer specific questions in a particular time period in the history of American business. These constitute fundamental limitations that can only be overcome by undertaking complementary studies. In addition, we contend that certain purposes were more successfully fulfilled than others. Chandler has aimed at explaining the initial appearance of the MBE, and its continuing growth, that is, explaining "where, how, and why an enterprise once started continued to grow and to maintain its position of dominance" (p. 11). Very successful at disclosing the necessary conditions for the appearance of MBEs, as well as at uncovering the continuing growth mechanism, Chandler was, however, less successful at explaining continued dominance.

A number of conditions were required for firm dominance to be achieved: the industry should be such that administrative coordination would generate competitive advantage, investments should be productive- rather than defensive-oriented, cost reductions and customer loyalty should be achieved. However, in what concerns continued dominance, Chandler does not advance an equally dynamic and comprehensive account, although he mentions the need for R&D investments for the

firm to maintain achieved dominant positions. Continued dominance should take into account change processes both internal and external to the firm, such as organizational ageing and changing states of environmental uncertainty. In sum, rather than assuming a rest state, where things change in a quantitative way, the study of continued dominance would call for further investigation of the dynamics inside and around mature organizations, something that would considerably extend the scope of Chandler's study.

It is beyond doubt that Chandler's study provides a far-reaching contribution to the understanding of the co-evolution of firms and industry in emergent industries where administrative coordination can be more efficient and profitable than market coordination. The multilevel longitudinal perspective takes into consideration changes occurring both inside and around the firms, providing a dynamic view of the growth process. Besides, some of Chandler's ideas are potentially transhistorical, opening up the way for generalizations and theory testing. Finally, the scrutinizing of Chandler's descriptions and explanations is likely to be helpful in further theoretical development of strategic management issues. Growth is a case in point, and two examples are provided next.

The first one concerns what we call the *growth dilemma*. This dilemma has been inspired by the process that associates cooperation with competition (fig. 3.7). In several circumstances, to foster growth firms need to undertake actions that may eventually end up constraining their growth later on. The American railways, for example, in order to benefit from the through traffic market, underwent a strong collaborative effort to standardize technology and procedures, which later on gave rise to a higher degree of competition. A similar situation is faced by those small firms which to get access to venture capital and grow need to patent their inventions. In so doing, they run the risk of having their invention circumvented by stronger, smart rivals which could benefit from the knowledge rendered public through patenting. The growth dilemma might be stated as follows: *to what extent should management undertake certain strategies to foster growth, if these very strategies are likely to constrain firm growth later on?*

Another example relates to what we call *dominance dilemma*. The source of inspiration of this dilemma has been the process describing the achievement of dominance (fig. 3.8), according to which productive rather than defensive expansion is needed for one to achieve dominance. However, sooner or later, one is compelled to undertake defensive strategies to keep one's dominant position. The dominance dilemma could be stated as follows: *to achieve dominance growth-propelling strategies are required, whereas to maintain dominance growth-constraining strategies are called for.*

As a result, the management of growth would therefore require the management of these two dilemmas. We argue here that although Chandler implicitly identified these dilemmas, he did not elaborate on them.

CONCLUSION

This essay reports on a study undertaken in order to identify growth-related theoretical content in Chandler's *The Visible Hand*. A process-oriented perspective was used to scrutinize Chandler's text to uncover process-related elements. Four classes of process have been identified concerning the formation and development of firms and industries. The adoption of a process-oriented perspective, which included the search for necessary conditions for changes to occur, has contributed to clarifying the rich web of processes and mechanisms found in Chandler's longitudinal multilevel account of the rise and continued growth of the modern business enterprise.

In the light of this analysis, the impact of *The Visible Hand* on the strategic management literature was assessed. In terms of retention, it was found that the text has been referred to either as a source of historical data or as an acknowledged contribution to theoretical development. In what concerns the testing of ideas, no

evidence was found that the ideas in this book have been undergoing systematic tests. As for criticisms identified in the literature, most of them seem inappropriate because critics sometimes appear to ignore important details of the complex explanatory web of Chandler's study. In addition, others have misunderstood his arguments, or have wrongly extrapolated his ideas. A process of oversimplification of complex ideas seems to have taken place in the strategic management literature examined.

Chandler's account of the rise and continuing growth of managerial business enterprises is comprehensive and dynamic. Moreover, some of Chandler's statements appear to be transhistorical, allowing for theory building on growth. In particular, this essay has advanced a general structure of Chandler's continuing growth process. However, Chandler is less successful in explaining continued dominance of large firms. We contend that a study of continued dominance should include Penrose's (1980) notions of entrepreneurial judgment (in the absence of which the firm will tend to consistently make mistakes, over-estimate what they can do, guess wrongly the future course of events) and willingness to search for ways of avoiding risk and still expand. This would require the introduction of some additional dynamic elements to account for changes inside and around the organizations. Chapter 4 advances a framework of modes of change that may be helpful in addressing the handling of change inside and around a firm. This framework is applied in chapter 6 to investigate the growth trajectories of General Electric and Westinghouse.

Through the application of a process-oriented perspective to strategic management theory, the present study has brought to light *The Visible Hand's* main ideas on growth. These, in turn, have inspired the formulation of two dilemmas: *the growth dilemma*, whereby the very strategies undertaken to foster growth are likely to constrain growth later on; *the dominance dilemma*, where to achieve dominance growth-propelling strategies are required, whereas to maintain achieved dominance growth-constraining strategies are called for. The study, however, has limitations. Although it encompasses Chandler's main growth-related ideas, the processes and

mechanisms reported in this essay are not exhaustive. As a matter of fact, *The Visible Hand* describes some other not so central processes that have not been covered here, for example, the concomitant process of innovation inside and around the firm. Notwithstanding these limitations, it is our hope that the process-oriented approach used in this essay may have helped to clarify a complex web of ideas while escaping the simplistic approach trap.

Chapter 4

IDENTIFYING THE BUILDING BLOCKS OF GROWTH DYNAMICS

Firms grow because, and sometimes in spite of, changes going on inside and around them. And while growing, deliberately or not, firms end up changing their environment and transforming themselves. This has been acknowledged in many ways. At the empirical level, Chandler's *The Visible Hand* (Chandler, 1977) provides a rich account of the wide variety of environmental and organizational changes that took place as firms and industries have emerged and grown. Penrose's theoretical work on growth (Penrose, 1980), on the other hand, not only advances some change mechanisms, but also prescribes requirements for a theory on growth. According to Penrose, "a comprehensive theory of the growth of the firm must explain several qualitatively different kinds of growth and take into account of the sequence of changes created by a firm's own activities, and of the effect of changes that are external to the firm and lie beyond its control" (Penrose, 1980, p. 4).

As a result, to fully understand why and how firms succeed or fail in their growth efforts, the identification of the intervening changing pressures and mechanisms is essential. In sum, the scrutinizing of the *dynamics of growth* is *crucial* for the development of knowledge on the growth of the firm. Yet, insufficient dynamism seems to characterize the study of the firm. As a matter of fact, a claim for more dynamic studies of firms has been made in several instances. In a review study of the theory of multinational firms, Buckley has maintained that the growth of firms should be mapped within a dynamic context of changing technologies, products, firms and industries over economic space and time (Buckley, 1983). Similarly, in a review of the international business field, Melin (1992) has stated that "models and methods in the international management field are overly static". He has also maintained and that "studies of internationalization as a strategy process

must capture the development and dynamics over time, the driving forces of the process, and the content of the process" (p. 115). Finally, even Porter, often criticized for his static perspective resulting from the assumption of a stable industry structure, has acknowledged the insufficient degree of dynamism in the study of the firm (Porter, 1981; Porter, 1991).

Several paths have been suggested to address this deficiency. Porter (1991), for example, has indicated three promising lines of inquiry towards a "truly dynamic theory of strategy" (p. 106) – game theoretical models, commitments under uncertainty, and the resource-based view. Other authors, such as Buckley and Melin, believe that the extensively advocated dynamic perspective is to be achieved through the study of organizational processes of change. However, research falls short of comprehensive frameworks accounting for change.

This essay aims at *uncovering relevant elements of the dynamics of growth*. Assuming that change occupies center stage in the study of growth dynamics, a set of qualitatively different kinds of change is proposed. The essay submits that the set members constitute building blocks of growth dynamics. Either individually or organized into more complex arrangements, these blocks can be helpful in describing and explaining change phenomena such as growth.

Drawing on Bunge's philosophy (Bunge, 1979), a framework of modes of change was derived, comprising the elementary building blocks of a dynamic approach to growth. When applied to growth concepts, each individual block, i.e., each mode of change, allows to distinguish a different feature of the process of growth, while complex arrangements of these blocks describe the simultaneous operation of different features.

It is our belief that the suggested framework of modes of change may contribute to the management and understanding of growth. Research work may benefit from:

- i. Enlarged concepts of growth-related issues that take into consideration

qualitatively different modes of change. For example, besides environmental scanning for opportunities and threats, search comprises among others: R&D efforts, power assessment of the industry, and search for conflicts or misfits;

- ii. Building more comprehensive variables to operationalize enlarged concepts;
- iii. The use of enlarged concepts as a data collection guide, for example, in the preparation of surveys, the structuring of interviews or the planning of in-site observation;
- iv. Applying operationalized variables to perform more robust tests of growth-related propositions.

In *The Visible Hand*, Chandler maintains that growth strategies stimulated by defensive motives are less likely to contain the seeds of continuing growth than those strategies triggered by productive motives (Chandler, 1977). This proposition suggests, therefore, that the identification of the motives impelling growth strategies provides some indication on their potential contribution to the continuing growth of the firm. For practitioners, therefore, an enlarged conceptualization of *growth-related issues* may:

- i. Allow the identification of the patterns of expansion strategies their firms have been undertaking over time, distinguishing, for example, productive and defensive types of strategy (Chandler, 1977);
- ii. Stimulate the reassessment of defensive strategies implemented by their firms in the past. Although most of them may have been of high strategic relevance as of their conception, some may not hold this position anymore, becoming therefore candidates for discontinuance;
- iii. Help the examination of ongoing expansion-related efforts. By identifying the growth motives entertained and search routines being used by their firms, an evaluation of their potential contribution to the continuing growth of the firm can be performed. This would help the development of a continuing growth-oriented management of resources;
- iv. Provide the resource allocation process with complementary criteria that

would emphasize the potential contribution of investments to the continuing growth of the firm.

The text is made up of three sections followed by a brief conclusion. The proposed framework of modes of change is advanced in the first section. In the second section, the elementary units of the growth dynamics are introduced. As a way to illustrate its ability to enlarge concepts, the proposed framework is applied to growth-related concepts such as search and capabilities, and defensive and productive strategies (Chandler, 1977). The third section introduces the complex units of the growth dynamics advancing complex arrangements of individual modes of change. Finally, the concluding section summarizes the main contributions of the essay.

THE PROPOSED FRAMEWORK OF MODES OF CHANGE

This section is organized into three parts. The first one reviews the works of Van de Ven & Poole, two active researchers on organizational change, who have made valuable contributions to the theory of organizational change. In the second, our suggested framework of modes of change is presented, and finally, the two frameworks are compared and commonalities and differences are highlighted.

Van de Ven & Poole's process theories framework

Van de Ven & Poole have advanced a classification of development theories into four families: life cycle, teleology, dialectic and evolution (Van de Ven and Poole, 1995). These four types, the authors maintain, would form a framework of process theories. A brief description is provided below (Van de Ven & Poole, 1995, pp. 520-521):

1. *A life-cycle model depicts the process of change in an entity as progressing through a necessary sequence of stages. An institutional, natural, or logical*

program prescribes the specific contents of these stages.

2. A *teleological model* views development as a cycle of goal formulation, implementation, evaluation, and modification of goals based on what was learned by the entity. This sequence emerges through the purposeful social construction among individuals within the entity.
3. In *dialectical models* of development, conflicts emerge between entities espousing opposing thesis and antithesis that collide to produce a synthesis, which in time becomes the thesis for the next cycle of a dialectical progression. Confrontation and conflict between opposing entities generate this dialectical cycle.
4. An *evolutionary model* of development consists of a repetitive sequence of variation, selection, and retention events among entities in a designated population. Competition for scarce environmental resources between entities inhabiting a population generates this evolutionary cycle.

Van de Ven & Poole (1995) have submitted that the framework made up of the above mentioned four types of process theories constitutes a step towards more parsimonious explanations. These four theories, they state, represent motors of change whose advantages include:

- (i) the ability to "serve as theoretical "primitives" facilitating the integration of related explanations" (p. 511);
- (ii) the ability to serve normative functions with the four basic theories "providing useful standards to evaluate the form, completeness, and the tightness of specific developmental theories" (p. 511);
- (iii) the ability to promote "new theories by identifying possible explanations of organizational change and development that do not yet exist in the literature" (p. 511);
- (iv) the ability to support inductive research, since rather than working from preconceived change theories, it is possible to test the existence of the primitive motors in order to see which fits the phenomenon under scrutiny.

In sum, according to these authors, the four basic theories may serve as building blocks for explaining processes of change in organizations. However, the framework is not without limitations. Recognizing that the four ideal types do not account for more complex phenomena, the authors argue that "because the organizational context of development and change extends over space and time in any specific case, it is possible for more than one motor to come into play" (p. 526). Moreover, as they remark, certain *elements* in one ideal type may explain other elements in another ideal type. For example, "the selection process in the evolutionary model can be used to account for termination in the life-cycle; the implementation step in the teleological cycle can trigger the start-up event in the life cycle and the antithesis in the dialectic. The synthesis in the dialectic could be the source of variation in the evolutionary cycle. There are many other possible interrelations. In short, events from any other models are useful to remedy the incompleteness of any single model of change" (p. 527).

This essay subscribes to Van de Ven & Poole's idea of primitive motors as *building blocks of theoretical descriptions and explanations of complex change phenomena* having the four properties above mentioned. However, the proposed primitives – teleological, dialectical, life-cycle, evolutionary – constitute complex structures. A typology of change at a more elementary level is therefore needed. This would enable the identification of elementary building blocks of the dynamics of change based on which complex motors of change could be theoretically conceived and empirically identified. In an effort to derive such a typology, this essay draws on philosophy to develop the framework of modes of change described next.

The Modes of Change Framework

In this essay, Bunge's philosophy – *systemism* – has provided the philosophical foundations to handle world-view issues associated with the growth of the firm (Bunge, 1973-1989). Adopting a comprehensive perspective, this philosophy synthesizes opposing philosophical views whenever appropriate, resulting in a philosophical perspective of the world that stresses the dynamic features of reality.

Systemism reconciles two opposing ontological views: individualism and holism, keeping the strengths of each and discarding their weaknesses. This is accomplished through the introduction of the concept of emergent property, a property of a thing that emerges from its components, and such that no individual component possesses it. Also, it is compatible with the constructionist view – a dynamic approach in social studies – according to which social systems are formed by the action of human agents, enabled and constrained by the social structural properties of these systems (Giddens, 1979).

Bunge (1979) has identified two different meanings to the word 'determination' as used in science: (1) a property that unambiguously characterizes a thing; (2) a necessary, constant and unique connection among things or events or among states or qualities of things. Such meanings, he argues, lack "the essential ingredient of productivity" (Bunge, 1979, p.11), since the scientific meaning of the word 'determination' does not coincide with a third acceptance of it, namely "the way (act or process) whereby an object acquires a property" (Bunge, 1979, p. 11). In his view, besides quantitative variations in things there are qualitative changes. This has prompted him to advance the hypothesis that "events happen in one or more definite (determinate) ways, that such ways of becoming are not arbitrary but lawful, and that the processes whereby every object acquires its characteristics develop out of preexisting conditions" (Bunge, 1979, p.13). Furthermore he categorizes the modes of determination that compose the spectrum of categories of determination (p. 17-18):

- i. *Quantitative self-determination*: determination of the consequent by the antecedent. It is the category of determination prevailing in the continuous unfolding of states that differ from one another in quantitative respects only;
- ii. *Teleological determination*: of the means by the ends, or goals, where goal-directed structures, functions, and behaviors need not be purposefully planned by anybody;
- iii. *Dialectical determination (or qualitative self-determination)*: of the whole process by the inner "strife" and eventual subsequent synthesis of its essential opposite components. In opposition to quantitative self-

determination, internal dialectics involves qualitative changes, and it has nothing to do with logical contradiction;

- iv. *Interaction (or reciprocal causation, or functional interdependence)*: determination of the consequent by mutual action (this rather than causation is the prevailing category of determination in social matters). It comprises both competitive and collaborative processes;
- v. *Causal determination, or causation*: determination of the effect by the efficient (external) cause. This category is particularly conspicuous when the main changes are produced by external factors (when one says that C is the cause of E, one means that if C happens, then (and only then) E is always produced by it);
- vi. *Structural (or wholistic) determination*: of the parts by the whole. The behaviour of an individual is determined by the overall structure of the collection to which it belongs. The whole, far from being prior to its members, is in turn determined by them;
- vii. *Statistical determination*: of the end result by the joint action of independent or quasi-independent entities.

Each mode of determination is associated with a different *change mechanism*, which characterizes the uniqueness of each mode:

- i. **Quantitative mode**: repetitive use of existing procedures;
- ii. **Teleological mode**: goal-directed structures precede and determine the means;
- iii. **Dialectical mode**: conflict resolution bringing about the new;
- iv. **Interactional mode**: interdependence among things of a same kind (eg. competing firms in an industry);
- v. **Causal mode**: the existence of necessary and sufficient conditions for external factors to bring about change;
- vi. **Structural mode**: interdependence among things and its constitutive parts (eg. firms vis-à-vis industry);
- vii. **Statistical mode**: independence or quasi-independence of joint action (randomness).

Based on Bunge's modes of determination, a framework of modes of change is delineated in table 4.1. Each mode identifies a qualitatively different element of change since each one is associated with a unique mechanism of change. In addition, this framework has the theory development properties Van de Ven & Poole have advanced (Van de Ven and Poole, 1995):

- i. It may facilitate the integration of related explanations of change phenomena, since it may be used to derive or identify complex motors of change constituted of combinations of the elementary modes;
- ii. It may serve normative functions with respect to the evaluation of completeness and tightness of change theories, as well as to the constitution of enlarged concepts. For example, by applying the framework to the notion of innovation, complementary nuances can be derived in addition to the most common idea of producing the new. In fact, the framework allows the identification of different processes whereby innovation comes into being;
- iii. It may support inductive research by providing the researcher with a set of possible modes of change whose occurrence is not hypothesized a priori. In sum, they may serve as theoretical guides to the inspection and analysis of the situation under study;
- iv. It may account for complex phenomena by means of the combination of the elementary modes. In fact, they may help to identify the simultaneous action of qualitatively different modes of change in the object of study.

CHANGE MODE	WHAT IS CHANGED	HOW IS IT CHANGED
Quantitative	A thing's property(ies)	By replicating procedures. This produces more of the same property(ies)
Dialectical	Two or more conflicting properties	By solving the misfits. This produces a new property(ies)
Interactive	A relational property between/among things	By competition and/or cooperation. This changes how things relate to one another
Causal	A thing's property(ies)	An external event causes the change in a thing's property(ies)
Structural	An emergent property of the thing	By competition and/or cooperation among system's components. This changes properties a thing has by virtue of being a component of a system
Random	A thing's property(ies)	By the action of independent or quasi-independent events/processes. This may change any type of property of the thing
Goal-directed	A thing's property(ies)	By fixing a priori into what will the property(ies) change

Table 4.1 – The Framework of Modes of Change

Moreover, it is our belief that by using the suggested modes of change framework, the integration of related explanations of change may be more easily achieved than through Van de Ven & Poole's framework of process theories. Since the proposed framework of modes of change is situated at a more elementary level of analysis than Van de Ven & Poole's, it enables the generation of numerous combinations of the modes of change. These constitute complex motors of change that could be theoretically conceived and empirically identified. A detailed comparison of the two frameworks is presented next.

The two frameworks compared

Similarities and differences can be observed between the two frameworks. The concepts behind the teleological and dialectical motors are common to both propositions. However, while our proposed framework is mainly concerned with identifying qualitatively different ways whereby change may occur, Van de Ven & Poole's framework envisages change by means of processes constituted of well-defined phases or cycles.

The life cycle motor, for example, is a complex structure hypothesizing the occurrence of consecutive stages of development. Each stage, in turn, is activated by means of one or more mechanisms of change. Greiner's theory on the growth of the firm provides an example of life cycle theory in the study of growth (Greiner, 1972). His model describes the evolution of organizations through five distinct phases. Each phase contains two periods of growth: a relatively calm period, named evolutionary, and a turbulent one, called revolutionary, that ends up with a management crisis and prompts the organization to advance into the following phase of the process. In Greiner's model, *conflict* is the change mechanism activating subsequent stages. It originates a crisis and gives rise to new organizational features. In sum, this model assumes the action of the dialectical mode of change throughout the process of growth of the firm.

In addition, the two frameworks refer to different levels of aggregation. While the proposed framework of modes of change advances elementary modes of change, the framework of process theories advances complex structures of change. In fact, the evolution motor is a complex structure: it has three components - variation, selection and retention - which are constituted of more elementary modes of change. For example, variation might be produced by a random or a dialectical type of change, while selection could be associated with the interactional mode (competition), and retention with the quantitative mode characterized by repetitive use of existing procedures.

The proposed framework of modes of change is unquestionably less parsimonious than Van de Ven & Poole's (1995) proposition. However, by suggesting the existence of qualitatively different *elementary* modes of change that may be combined to explain more complex phenomena, the framework may promote new theories by identifying different arrangements of the elementary modes. The proposed modes of change can therefore be said to constitute *elementary building blocks of dynamic theories of organizational change*.

In the next two sections, the framework of modes of change is applied to the study of growth: at first the elementary units of the growth dynamics are identified, and then complex units are discussed.

ELEMENTARY UNITS OF THE GROWTH DYNAMICS

In this section, the individual modes of change allow the identification of elementary units of the growth dynamics. First, the modes of change are shown to distinguish different growth paths of firms. Then, their ability to produce enlarged concepts is argued for, and finally growth-related concepts such as search, capabilities, productive and defensive strategies (Chandler, 1977) are developed.

Growth paths derived

By applying the framework to examine growth, qualitatively different growth paths can be distinguished.

Quantitative: growth is achieved by doing basically more of the same. Unchanged operating procedures are applied in order to *replicate* the functioning of other operating units in the firm. For example, routine expansion of plants, stores, or services replicating ongoing operations. The

quantitative type of growth could be associated with the *exploitation* concept used in strategic management studies.

Goal-directed: the pursuit of growth goals set at the beginning of a period *triggers* growth processes. As a result, operating and investment procedures are conceived to achieve global goals of performance, or to implement specific features sought for in existing products/services.

Dialectical: growth is brought about by means of innovation on products, processes or services. Innovation emerges from misfits, conflicts or observed imbalance. New operating procedures reconcile opposing or conflicting objectives or properties requiring from members of the organization the ability to handle a number of tensions (Dougherty, 1996). Mass customization processes illustrate this type of growth. The qualitative type of growth could be associated with the *exploration* concept used in strategic management studies.

Interactionally-developed: growth is carried out in two non excluding ways:
• *Competitively*, where firm's actions towards growth interdepend on rivals' actions. As a result, firm growth is achieved by taking market share from rivals;

• *Cooperatively*, where firm's actions towards growth interdepend on partners' actions. The cooperation of rivals to promote standardization may bring about the growth of the market in which the firms compete;

Opportunity-led: growth is reached by taking hold of opportunities brought about by changes in the environment and/or neutralizing potential threats. Operating procedures are conceived in response to external changes or in anticipation to them. For example, Monsanto's change from chemicals to biological technology in agriculture (Magretta, 1997). Hanson's acquisitions provide another example of opportunity-led expansion, where acquisitions did not affect industry structure.

Structural: growth is determined by the existing relations within an industry. Powerless firms tend to grow by following the established rules, while powerful companies try to grow by changing the balance of power in the industry. Operating procedures put to work may cause change in the industry

structure, modifying the dependence relations of the industry players. Mega mergers provide an example of this kind of growth. Established macro rules and relations confer the structural motor with a relative stability for industry participants which make use of one or more of the other types of motors to operate and compete.

Random: growth is accomplished by chance, i.e., by undertaking activities whose successful outcomes have a probabilistic distribution. A number of independent contenders put to work search routines whose likelihood of success is random. R&D investments in the pharmaceutical industry illustrate this motor.

Generating enlarged concepts

The modes of change framework can help the development of enlarged concepts comprehending the several ways whereby things come into being or transform themselves in the course of their existence. Such enlarged conceptualization allows for the building of more comprehensive variables, and may contribute to data collection design. In turn, this enhanced comprehensiveness may allow the carrying out of more robust tests, because conceived variables may provide more a complete operationalization of concepts.

Innovation is taken as an example here. In addition to the widely spread notion of innovation as producing something qualitatively new, organizational studies have mentioned other instances of innovation. In sum, innovation can also be associated with modes of change other than the dialectical one:

Quantitative mode: minor refinements and extensions of established design concepts (Clark, 1985) that tend to produce more of the same things;

Goal-directed mode: "complex systems, such as communications networks, weapons systems, or moon missions, that take many years and many millions of dollars to accomplish. Such innovation is characterized by thorough, long-range planning that assures that the requisite technologies

will be available and that they will all fit together when the final development stage is reached" (Marquis, 1969), p. 43;

Interactional: "the "nuts and bolts" kind of innovation. Modest as it is, such innovation is absolutely essential for the average firm's survival. So long as your competitors do it, so must you. If your competitor comes out with a better product, you must make a technical change in your own - innovate - to get around the advance in his" (Marquis, 1969, p. 43);

Opportunity-led mode: whenever an innovation is developed to face changes occurring in the environment, such as changes in safety-related or environment-preserving regulations;

Structural mode: comprehends the emergence of a dominant design in an industry compelling firms to adopt it (Utterback, 1994). With the emergence of a dominant design, there comes a reduction in the scope of innovation, since new improvements are supposed to comply with the dominant design characteristics. On the other hand, dominant designs allow for industry expansion by means of the quantitative mode, i.e., by undergoing minor refinements and extensions;

Random mode: Burgelman's evolutionary model of internal corporate venturing (Burgelman, 1983) provides an example of this mode. As the author reports, autonomous initiatives of entrepreneurially inclined technologists (statistical process of generation of new ventures) constitute the source of innovation giving rise to "an internal selection environment in which the autonomous strategic initiatives emerging from below competed for survival" (Burgelman, 1983, p. 240).

Should research need to qualify how innovation-oriented a firm is, an inspection of the above described instances of innovation might be helpful in building a variable to measure this property of the firm. This might for example be done by examining the implemented procedures and routines that facilitate or inhibit the development of innovation in each instance. It would encompass not only R&D efforts, but also misfits detection systems, benchmark procedures in order to outperform competitors, environmental scanning for technological and scientific

innovation and continuous improvement types of programs. As a result, this enlarged conceptualization of firm orientation towards innovation would possibly help the design of data collection instruments – surveys, structured interview, on-site observation plan.

Enlarging growth-related concepts

Growth-related concepts have been selected to be examined in the light of the modes of change framework. They comprise: search, capabilities, as well as, Chandler's notions of defensive and productive strategies (Chandler, 1977). Table 4.2 synthesizes the analysis on search and capabilities, while table 4.3 synthesizes the examination of defensive and productive strategies.

- **Search**

Search is commonly associated with the idea of scanning the environment for new opportunities. However, search may occur in the presence of well-established routines. Franchises such as McDonald's expand by applying proven routines and procedures to the development of new markets. Reducing the concept of search may negatively affect theory on growth. Nelson & Winter (1982), for example, have advanced a model of growth in which they assume that "if firms are sufficiently profitable they do no "searching" at all. They simply attempt to preserve their existing routines, and are driven to consider alternatives only under the pressure of adversity" (p. 211).

It is our understanding that although some successful firms may not do any search at all, most firms are likely to implement search mechanisms that differ from one another in terms of the degree of potential novelty and change they may bring to their ongoing operations. Moreover, by applying the modes of change framework to the notion of search mechanisms, it is possible to derive qualitatively different categories of growth-oriented search routines. For example:

- *Quantitative mode:* search for markets for replication of ongoing operations;

- . **Goal-directed mode:** benchmarking as a way to search for new challenges to be accomplished;
- . **Dialectical:** search for creatively solving misfits, trade-offs and conflicts;
- . **Interactional:** market research comprising own and rivals' products/services; follow-up procedures of actual sales and market share dynamics; taking part in events in the industry such as industrial expositions; improving the personal network of contacts;
- . **Causal:** environmental scanning for external changes (technological, social, economic, political, legislative);
- . **Structural:** power assessment of players in the industry, searching for ways to modify the balance of power;
- . **Random:** R&D projects whose success may be affected by the concurrent, independent efforts applied by other research groups.

- **Capabilities and resources**

These are central strategic concepts that help explain the acquisition and sustainability of competitive advantage. According to Barney (1997), firms possess VRIO resources and capabilities when these are *valuable* (V), *rare* (R) *difficult to imitate* (I) and the firm is *organized* to exploit the full competitive potential of its resources and capabilities (O). In what concerns growth, it can be expected that different resources and capabilities should be required to implement different types of growth. The modes of change framework allows the identification of different types of resources and capabilities to implement growth:

- . **Quantitative growth:** efficiency in replicating ongoing operations;
- . **Goal-directed growth:** the ability to set viable, challenging goals supported by planning and control systems;
- . **Dialectical growth:** the ability to creatively handle conflicts and tensions that generate innovation;
- . **Interactionally-led growth:** the ability to constantly follow up rivals' and partners' actions to prompt for adequate responses;
- . **Causal growth:** the organizational capability to identify medium and long term

external changes;

Structural growth: holding technological, economic, and/or political power within the industry, as compared to the relative power position of other members;

Random growth: requires time and capital to enable knowledge to develop, and eventually allow the firm to win the worldwide competition for innovation.

GrowthType	Mechanisms	Search examples	Capabilities & Resources
Quantitative	Well succeeded replication is rewarded	Markets for replication	Efficiency in replication
Qualitative	Trade-offs are creatively solved	Search for trade-offs	Ability to creatively handle conflicts
Interactional			
Competitive	Rivalry	Follow-up of rivals actions	Short-term responsiveness
Cooperative	Cooperation	Common interests and needs; complementary skills and resources	Ability to cooperate and exchange knowledge
Causal	Opportunity grasping	Environmental scanning	Responsiveness to external changes
Structural	Structure shaping or compliance	Power assessment at the industry level	Power positioning competence
Random	Randomness	R&D	Time and capital
Goal-directed	Ends determine means	Benchmarking	Viable, challenging goal-setting

Table 4.2 – Enlarging growth related concepts: search routines, capabilities and resources

• ***Productive and Defensive Strategies***

Chandler distinguishes two types of motives stimulating expansion (Chandler, 1977). *Productive motives* are those whose aim “was to add new units, permitting by means of administrative coordination a more intensive use of existing facilities and personnel” (Chandler, 1977, p. 487). *Defensive motives*, on the other hand, “stemmed from a desire for security. Its purpose was to prevent sources of supplies

or outlets for goods and services from being cut off or to limit entry of new competitors into the trade" (Chandler, 1977, p. 486). While the productive one increased productivity, the defensive one rarely did.

Stating that "the basic strategy of growth for the mass marketers was, then, one of productive expansion ... by adding new outlets and new lines that permitted them to make more complete use of their centralized buying, goods handling, and administrative facilities" (Chandler, 1977, p. 487), Chandler observes that banks and other financial and service enterprises followed a similar path, "by adding new branches or outlets that permitted them to make more intensive use of their centralized services and facilities" (p. 487). However, in the growth of railroad, telegraph, and mass manufacturing enterprises, both motives were significant. While productive motives stimulated the building of the basic transportation and communication network, defensive motives directed investments thereafter. In Chandler's words, "where lines already existed with capacity to carry current traffic, the building or buying of additional roads resulted almost wholly from defensive measures. The costs of such expansion were far greater than any savings that might be achieved from more efficient coordination of flows" (p. 487). As for mass manufacturers, the initial reasons for integrating the marketing and purchasing functions were positive: "in the beginning the creation of a buying and selling network was essential to insure the administrative coordination needed to keep their production facilities fully employed" (Chandler, 1977, p. 488). However, integration into the control of materials tended to be more defensive than productive. "It was productive where ... suppliers were numerous and scattered. ... But where suppliers were limited or could be easily controlled by a small number of enterprises, expansion was defensive" (Chandler 1977, p. 488). In sum, Chandler advances that long-term expansion strategies are motivated by two kinds of motives: productive and defensive.

Comparing the effect of productive (or positive) and defensive motives, Chandler (1977) states that "positive motives appeared and played a larger role than did defensive ones in the *continuing* growth of the large integrated industrial

enterprise" (p. 488). Chandler suggests, then, that productive motives play a larger role than defensive ones in the continuing growth of the firm.

It is our belief that management oriented towards the continuing growth of the firm would greatly benefit from understanding and distinguishing different kinds of productive as well as defensive strategies. Moreover, such understanding can be fostered with the help of the modes of change framework. The modes of change framework is applied below, enabling to distinguish different sorts of expansion strategies of the productive and defensive kinds (table 4.3 summarizes this analysis):

Quantitative mode

Growth by doing more of the same is the generic kind of growth in this mode. Successful replication of well-established routines is the underlying mechanism that stimulates further growth. Typical examples are provided by service chains such as Wal-Mart, McDonald's, and Blockbuster. Productive growth may be associated with adaptive replication, while unchanging replication characterizes defensive growth. Adaptive replication occurs when the replicated business formula is adjusted to the needs of new markets, opening up new opportunities for growth in the markets the firm already operated. As they enter new markets, Wal-Mart and McDonald's have been doing adjustments, some of which are spread throughout the organization later on. For example, some of McDonald's menu changes undertaken to serve one new country, have spread over other countries where it already operates. Blockbuster, on the other hand has so far kept unchanged its business model, adopting a defensive strategy. So much so that it had to leave Germany for not carrying adult movies.

Goal-directed mode

The establishment of dynamic kinds of goals foster the development of productive strategies, while static, precise goals impel defensive types of strategies. Setting precise targets in terms of quantity, geography, and diversity may engender a too focused behavior that may result in missed

opportunities for the firm. More comprehensive goals set to surpass certain upper or lower targets are more likely to induce productive strategies.

Dialectical mode

In this mode, growth occurs by doing new things that are an outcome of perceived conflicts, tensions or misfits. Creatively solving conflicts that bring about innovation is the mechanism impelling growth. Innovation such as mass-customization at National Bicycle exemplifies the productive kind of growth. Defensive innovation, on the other hand, would avoid endangering existing products, leading therefore to innovation 'within safe boundaries'. A typical example, is innovation that avoids cannibalizing existing products.

Interactional mode - Competitive

When rivalry propels growth, growth occurs at the expense of others' growth. Gaining market share by outperforming competitors characterizes the productive growth strategy in this mode, and the rise of Wal-Mart winning over rivals such as K-Mart exemplifies productive growth. Acquisition-oriented growth to control competition, however, constitutes defensive growth. American railroads provide an example of this kind of strategy. As Chandler reports (Chandler, 1977), the inability of railroads to cooperate to control competition led to them to build giant, uneconomical systems.

Interactional mode - Cooperation

With cooperation impelling expansion, growth takes place with the help of others' growth. The growth of complementary products, such as Intel's chips and Microsoft's software, typifies the productive kind of growth in the cooperative mode. Growth achieved as a result of cooperation developed to control competition, such as in the action of cartels, characterizes the defensive kind of growth.

Causal mode

In the causal mode, growth results from shifts in markets and technology.

Grasping perceived opportunities is the underlying mechanism fostering growth. The expansion of firms into Asia and Eastern Europe in recent years provide an example of productive growth. However, backward integration into the production of materials so as to avoid occasional shortages of material sometimes constitutes a defensive move: though strategically justified in the short-run, it eventually ceases to be justifiable.

Structural mode

In the structural mode, growth occurs within the growth of the macro-structure of which the firm is part. During the 80's and 90's, software companies developing products in conformance with Microsoft's Windows standard constitute an example of productive growth, where the whole industry was experiencing growth by conforming to the standard. Mergers that gave rise to companies such as General Electric constitute another example of productive growth, because they were motivated by a desire for productivity. However, Microsoft's expansion strategy that consisted of preserving and protecting the Windows standard provides an example of defensive strategy in the structural mode. Another example is given by mega mergers stimulated by the desire for security, rather than productivity.

Random mode

In the random mode, growth results from random processes. In the productive kind, growth results from long-term, high risk investments in R&D, such as those incurred by pharmaceutical companies and large industrials such as General Electric. On the other hand, random diversification undertaken to hedge against economic downturns, such as Greyhound's diversification in the 60's and 70's, exemplify the defensive kind of expansion.

Modes of Change	Productive growth strategy	Defensive growth strategy
Quantitative	Adaptive replication (qualitative variation is perceived as opportunity)	Unchanging replication (qualitative variation is perceived as exception to be eliminated)
Qualitative	Replacing EITHER-OR trade-offs by AND-AND solutions	Bounded innovation meant to avoid cannibalization of existing products
Interactional		
Competitive	Outperforming competitors	Acquisition-oriented growth to control competition
Cooperative	Growth through complementary products	Cooperation to control competition
Causal	Taking hold of opportunities for expansion into new domains and new technology	Backward integration stimulated by a desire for security
Structural	Expansion in line with growing industry; mergers aiming at productivity enhancement	Mergers stimulated by a desire for security
Random	Long-term oriented R&D investments	Intensive unrelated diversification to hedge against economic downturns
Goal-directed	Growth strategies triggered by comprehensive, dynamic goals	Growth strategies triggered by static, precise goals

Table 4.3 – Enlarging growth-related concepts: productive and defensive strategies

The application of the modes of change framework has therefore allowed the identification of different types of productive and defensive growth strategies. The desire for productivity (productive motives) can inspire a number of strategies, which produce quantitative or qualitative variation, or comprise different sorts of relations with other entities in the business landscape. In a similar way, the desire for security (defensive motives) can stimulate a number of qualitatively different strategies.

The advanced framework not only enlarges concepts such as Chandler's (1977) concepts of motives for growth, and Nelson & Winter's (1982) concept of search routines, but also allows the development of more comprehensive variables to operationalize the enlarged concepts. These concepts, if used as a data collection

guide, may help in the preparation of surveys, structured interviews, or in-site observation plans.

Practitioners, on the other hand, can use the proposed framework as a guiding tool to identify deliberate and emergent transformations occurring inside and around the organization. Management can thus perform an evaluation of the firm's engagement in continuing growth efforts, both at present and in the past. An inventory of search routines currently in place will depict the growth directions being pursued, if any. An assessment of the underlying motives inspiring these efforts will indicate the relative proportion of productive and defensive motives. As a result, management can draw a picture describing how the firm has been coping with the various modes of change, and how engaged it is in continuing growth efforts. Based on this analysis, resource allocation can be directed towards promising productive-oriented new avenues, while defensive-oriented strategies can be submitted to thorough scrutiny.

In what concerns the evaluation of past efforts, analyzing realized investments in the light of the proposed framework will allow the identification of the growth directions and the underlying motives. This enables management to reassess, for example, defensive moves once undertaken for strategic reasons. Should their strategic importance have declined, their discontinuance might be considered.

We submit therefore that the modes of change advanced in this essay constitute elementary building blocks of dynamic theories of organizational change. When applied to the study of growth, they allow the identification of qualitatively different growth paths, as well as the enlargement of growth-related concepts. In addition, the combination of these elementary building blocks give rise to complex units of the growth dynamics. Some such complex units are discussed in the next section.

COMPLEX UNITS OF THE GROWTH DYNAMICS

It was previously argued that Van de Ven & Poole's primitive motors (Van de Ven and Poole, 1995) constitute complex structures of change, while the modes of change framework consists of elementary modes of change. Moreover, the combinatory property of the elementary modes of change was shown to enable the constitution of more complex units – motors as Van de Ven & Poole have named it. Inspired on Chandler's *The Visible Hand* (1977), this section will advance some complex units of the growth dynamics: the co-evolutionary motor, the evolutionary motor and the continuing growth motor.

- ***The co-evolutionary motor***

The scrutinizing of *The Visible Hand* in the previous essay has inspired the advancement of two dilemmas. The *growth dilemma* states that the very strategies undertaken to foster growth are likely to constrain growth later on. It is associated with the development of growth capabilities in an industry so that, through cooperation, firms promote industry standardization, which increases the growth capability of the industry. However, such cooperation, and the resulting standardization, gives rise to higher competition among rival firms constraining the growth of individual firms. Three modes of change are in operation here: cooperation, competition, structural. We therefore suggest the existence of the *co-evolutionary motor* whereby competition and cooperation operate in the building of higher level systems.

- ***The evolutionary motor***

The *dominance dilemma* states that to achieve dominance growth-propelling strategies are required, whereas to maintain achieved dominance growth-constraining strategies are called for. Preserving achieved dominance may put into action an *evolutionary motor* similar to Van de Ven & Poole's. In fact, retention, variation and selection may be expected to occur. The adoption of defensive strategies to protect achieved dominance characterize a tendency to retain what has

been successful, and therefore, to do more of the same (quantitative mode). However, variation through bounded innovation may be introduced so as to avoid the cannibalizing of existing products and services. As a result, ineffective variation will be selected out in the course of competitive processes. An *evolutionary motor* can therefore be suggested where three modes of change come into operation: quantitative, qualitative (dialectical) and competition.

- ***The continuing growth motor***

Chapter 3 advanced the general structure of the continuing growth process, which comprises three main blocks: imbalance, expansion and reinforcing mechanism. In the context of the present essay, this structure could be called a *continuing growth motor*. Applying the modes of change framework to the imbalance block enables to derive different types of continuing growth motors. Table 4.4 below shows such motors:

Type of Motor	Nature of imbalance	Expansion type	Reinforcing mechanism
QUANTITATIVE	Unmet demand for more of the same products	Replication of ongoing operations increases product users	Diffusion of product benefits increases demand for same products
QUALITATIVE	A trade-off, an OR/OR situation	Innovation turning OR/OR into AND	Trade-off solving ends up generating other trade-offs
INTERACTIONAL	Firm competitive advantage in some respects	Acquisition of weaker rivals	Increase in firm's VRIO resources and skills, which enhances compet. advantage
STRUCTURAL	Operating imbalance due to underutilized, transferable skills and resources	Related diversification	Increase in firm's resources and skills diversity, which generate other operating imbalances
RANDOM	Inability to predict individual behavior	Replication of ongoing operations increases number of cases	Enhanced predictability power of mass behavior
CAUSAL	Need to comply with new legislation	Innovation	Law enforcement and diffusion enhance the perception of need to adapt to new legislation

Table 4.4 – Types of continuing growth motors

A few observations apply. First, table 4.4 presents but a few possible motors – one example per mode of change. Second, a continuing growth motor is likely to cease operation after a certain amount of time. For example, when demand is met, the diffusion mechanism ceases to work; when no more weaker rivals are left, the VRIO resources mechanism does not apply anymore. In sum, under conditions of equilibrium, growth is not likely to occur. Third, it would seem that continuing growth processes are in fact made up of consecutive and/or concomitant continuing growth motors. For example, a causal type of imbalance may last for a short yet sufficient

amount of time to trigger another sort of imbalance that undergoes self-reinforcement, and therefore starts a continuing growth motor.

It is our belief that longitudinal studies on the growth of firms will allow to verify the occurrence of the above suggested motors as well as to identify other complex units of the growth dynamics.

CONCLUSION

— In an effort to uncover relevant elements of the dynamics of growth, this essay has advanced a framework of modes of change. It is our belief that the proposed framework allows for the mapping of change occurring inside and around the organization, constituting therefore a helpful tool for more dynamic accounts of organizational phenomena.

Growth is a complex issue, and its understanding and management are anything but simple. Accordingly, the suggested framework advances a set of modes of change conceived as elementary units of the growth dynamics. When combined, these elementary units give rise to motors, i.e., complex units of the growth dynamics.

Contributions for both academics and practitioners are envisaged. Research, for example, can benefit from enlarged concepts of growth-related issues, which allows for the building of more comprehensive variables operationalizing these concepts. Moreover, enlarged concepts can be used as a data collection guide, in the preparation of surveys, interviews or cognitive maps. As for practitioners, such enlarged conceptualization allows the identification of present and past patterns of expansion their firms have been undertaking, as well as the identification of the underlying motives. This may stimulate the reassessment of defensive strategies implemented by their firms in the past and help the examination of the growth

Chapter 5

DESCRIBING THE GROWTH TRAJECTORIES OF FIRMS

The growth notion is anything but straightforward. Yet, growth is indisputably one of, if not the most, important issues on management's agenda. Multidimensionality seems to be at the root of the concept ambiguity. In fact, growth has been equated both with size change and success, although neither of them has one unique definition.

This essay addresses these issues advancing an *indicator of firm size*, which shows the company's relative growth and automatically corrects for inflation. The proposed indicator produces a measure that is comparable over time, across firms and across industries. As a result, it allows for the drawing of growth trajectory curves. Such curves enable the visual description of a firm's growth path throughout the economy, as well as the identification of continuing growth (Chandler, 1977) and continuing contraction periods throughout a firm's existence. In addition, the procedure used to generate the size indicator can also be applied to produce other measures, such as productivity, that are comparable over time, across firms and across industries. In sum, the proposed approach equips both research and practice with longitudinally-oriented analytical tools.

The need for longitudinal studies has been acknowledged in several instances. In his review of the theory of multinational enterprises, Buckley (1983) suggests the avoidance of certain kinds of reductions in the study of the multinational firm, such as by fixing a point in time. In his view, the *growth of firms should be mapped over economic space and time*. In addition, a process rather than a content view of strategy has been argued for (Mintzberg, 1990; Melin, 1992; Mintzberg, 1994). Viewing internationalization as a strategy process, Melin (1992) has classified internationalization process studies into four longitudinal types: time

series of events, relatively short episodes, longer epochs, and biographic history. In his study, he found that the last two types are the less frequent ones, having concluded that *models and methods in the international management field are overly static.*

Static pictures of firms have been criticized in favor of more dynamic accounts. Porter (1981, 1991), for example, acknowledges the static perspective of studies drawing on the Industrial Organization premises, such as the assumption of a stable industry structure. He has maintained that the "view that strategic choices do not have an important influence on industry structure is nearly dead" (Porter, 1981, pp. 615-616). He has further argued that despite some fundamental structural parameters of an industry, *industry evolution can take many paths*, "depending on such factors as the luck of the draw in terms of the identity of industry rivals and uncertain events, as well as, on the strategic choices firms actually make that follow from their unique objective function." (p. 616)

Management has also been prescribed the adoption of a longitudinal perspective in business. Miller's study on the declining paths of a number of formerly successful firms (1990) is a case in point. Besides identifying different downward trajectories where success can lead to failure, Miller has suggested a longitudinal view of business as a way to counter the "myopia induced by cohesive configurations." (Miller, 1992, p. 31) Maintaining that "self-knowledge cannot be attained in a vacuum" (p. 32), Miller has advised managers at many levels and from a variety of departments to gather relevant information so as to enable them to monitor trends. According to him, "a static statistic tells us much less than a trend, *so monitor everything over time. Plot graphs of information so that trends become apparent.*" (Miller, 1992, p. 33, italics were added to the original text)

The suggestions advanced in this essay allow for the mapping of growth over economic space and time (Buckley's suggestion), as well as, for the plotting of relevant information over time (Miller's prescription). They also enable to visualize industry distinct paths (Porter's assertion) and advance a procedure for generating longitudinally comparable measures of the firm, addressing in this way Melin's (1992)

criticism of overly static models and methods.

The text is made up of four sections. The first one examines the multidimensionality of the growth concept. The second proposes the size indicator, applying it to the top ten firms in the 1956 Fortune 500 list. The third section applies the procedure to generate other relevant measures to the analysis of firm development over time. Finally, the concluding section summarizes the essay's contributions to both research and practice.

THE MULTIDIMENSIONALITY OF THE GROWTH CONCEPT

More often than not, no clear-cut definition of growth is included in texts on the growth of the firm. Penrose (1980), for example, developed a theory of the process of growth, viewing size as "but a by-product of the process of growth" (p. 2). In her view, rate of growth would "vary depending on the measure of size adopted, whether total sales, assets of one kind or another, employment, or something else" (p. 213). In sum, to Penrose, growth is associated with change in size, although size could be associated with firm resources, or firm outputs.

Other authors equate growth with change in the organization's size. Starbuck (1971), for example, measures size in terms of the organization's membership or employment. Iriji & Simon's model of business firm growth (1971), on the other hand, states that size may be measured either by the total assets of the firm or its sales volume. Therefore, while Starbuck associates size with firm resources, in Iriji & Simon's view, both firm resources and firm outputs may indicate organization size.

Growth has also been associated with success. Drucker (1954), for instance, views growth as a success indicator, stating that growth is a result of success. More recently, success has been associated with firm value and value creation. A number of measures have been promoted in the management literature, such as *market capitalization*, *market value creation* and *economic value creation*. Concern for measuring the firm's market capitalization is deeply related to the widespread notion

size measures comparable over time or across industries. In the course of time, technology may bring about productivity increases, affecting, therefore, the amount of assets and/or employment needed to perform activities in a given industry. As a result, a firm might be increasing its *business size* – sales – while decreasing its *organizational size* – assets and/or employment. Moreover, across-industry comparisons might be meaningless so far as industries differ with respect to the intensity of resources use.

Yet, size measured in terms of firm outputs – sales – allows for longitudinal comparisons. Business size, when properly adjusted for inflationary and deflationary effects does enable the longitudinal study of firm growth. In practice, the most common analyses include: same quarter sales comparison, annual sales comparison, and firm sales as compared to industry sales. Although all these analyses compare firm sales over time, they present limitations. For one, the length of time analyzed usually does not exceed a few years, precluding therefore the identification of long-term trends. This limitation could conceivably be fixed by extending the time horizon used in such analyses. However, the most limiting aspect of these analyses concerns their *inward focus*. Same quarter and annual sales comparisons typically compare the firm to itself over time, no matter what is going on around it. On the other hand, the *relative measure* – firm sales as compared to industry sales – incorporates an outward look to firm growth by accounting for the general state of the industry. Yet, it is inwardly focused at industry level, not taking into account the general state of the economy.

In sum, there are many ways of assessing the growth of the firm. Growth is generally viewed as change in firm size. Size can be measured in terms of business or organizational size. From an organizational viewpoint, it may seem adequate to employ an internally-oriented indicator equating size with, for example, the total number of employees. However, such an indicator provides no additional information on how well or poorly the firm is performing in the business landscape. From a strategic viewpoint, it would be preferable to devise an externally-oriented indicator of size such as sales. Yet, such a measure should be time-invariant, i.e., not affected by phenomena such as inflation and deflation. In addition, it should measure firm size relative to the business landscape so as to provide a wider perspective of the

firm's trajectory over time.

AN INDICATOR OF SIZE

This essay proposes a relative measure of firm size that satisfies the two requirements above stated: external orientation and time-invariance. The *size of a firm* in the American economy in a given year should be measured by calculating *the firm's total annual sales as a percentage of the US GNP*. Size is therefore expressed in the following way:

$$\text{SIZE}_i = \frac{\text{SALES}_i \cdot 100}{\text{GNP}_i}$$

where

SIZE_i = firm size in year i

SALES_i = total annual sales in year i

GNP_i = US GNP in year i

This indicator can be said to express the *firm's share of the economy at a certain point in time*. The curve of the firm's share over long periods of time describes *the growth trajectory of the firm throughout its existence*. In essence, it provides a concise description of the evolution of the firm over long periods of time allowing for the identification of growing, declining and stationary periods. Furthermore, the proposed indicator of firm size produces an adimensional value automatically adjusted for inflationary and deflationary changes in currency value. Finally, it allows for inter- and intra-industry longitudinal comparisons.

To illustrate the application of the size indicator, growth trajectories of the top ten companies in the 1956 Fortune 500 list will be drawn. Table 5.1 lists the top ten companies in 1956 and their situation as of December 1998.

Ranking in 1956	Situation in December 1998
1. General Motors	Number 1 in 1999 Fortune 500 list
2. Exxon	Number 4 in 1999 Fortune 500 list
3. Ford	Number 2 in 1999 Fortune 500 list
4. U S Steel (USX)	Number 47 in 1999 Fortune 500 list
5. Chrysler	Merged with Daimler-Benz in 1998
6. General Electric	Number 5 in 1999 Fortune 500 list
7. Swift	Acquired in 1972
8. Bethlehem Steel	Number 346 in 1999 Fortune 500 list
9. Armour	Acquired in 1982
10. Dupont	Number 16 in 1999 Fortune 500 list

Table 5.1 – Top ten companies in the 1956 Fortune 500 list

Growth trajectories are shown in figures 5.1 to 5.7. Same industry firms were plotted in the same graph (figures 5.1, 5.3 and 5.4). With one exception, Chrysler, trend curves were produced using Microsoft Excel's *add trend line* option. In fact, Chrysler's trend curve (figure 5.2) was plotted apart from GM's and Ford's with the help of Matlab, a software which allows the drawing of sinusoidal trend curves. As a result, figure 5.2 displays Chrysler's trajectory and trend curves in a slightly different way from the other figures in this chapter.

The proposed indicator allows the visualization of the trajectory a firm performs in the economy over time. Continuing growth, stationary and continuing contraction periods can be identified with the help of the time-invariant measure of size that automatically corrects for inflation. DuPont (figure 5.5), for example, exhibits a continuing growth period (during the 1940s) that is followed by a quite stable period (late 1940s to early 1980s). Exxon (figure 5.4) has also experienced rather stable periods (mid 1920s to early 1940s; mid 1950s to mid 1970s), continuing growth in the 1970s and continuing contraction from the 1980s on.

Accentuated descending paths can be observed in US Steel, Swift, Bethlehem Steel, and Armour (figures 5.2 and 5.3). The long duration of the descending path in these four companies is suggestive of deterioration processes that may have been overlooked at some critical points in time. It is conceivable to

suppose that deterioration processes might possibly have been reverted had they been identified, understood and fixed early on. However, these conjectures will remain mere speculations unless a thorough analysis of these companies histories is done.

Interestingly, more often than not, their annual sales curves exhibit an upward trend (refer to Figures 5.8 to 5.11, which plot total annual sales in US\$). The examination of figures 5.8 to 5.11 in light of figures 5.2 and 5.3 helps realize how deceiving certain kinds of analyses can be. Management usually performs comparison of the firm's annual sales in a given year with its annual sales over a short period of time in the past. As figures 5.8 to 5.11 show, such comparisons may indicate a slight sales reduction, or even sales recovery, while the four companies were in fact reducing their share of the economy for decades. Another analysis usually done compares the firm with the industry. Once more, this can be deceiving if the whole industry is undergoing contraction and firms keep mimicking each other, i.e., if organizational isomorphism takes place (DiMaggio & Powell, 1983).

The examination of the trajectories of the automobile manufacturers (refer to figure 5.1) reveals three rather different paths. More often than not, Ford has been performing an ascending trajectory. General Motors (GM) on the other hand, seems to be experiencing contraction for quite some time. In fact, the distance between GM and Ford curves has been decreasing over time. In contrast to the other two automobile companies, Chrysler's size has oscillated within a limited zone. In fact, as figure 5.7 shows, its trend curve performs a sinusoidal kind of pattern.

In sum, our proposed indicator of firm size produces an adimensional value automatically adjusted for inflationary and deflationary changes in currency value. Moreover, it is helpful in the drawing of growth trajectories of firms, and allows for longitudinal inter- and intra-industry comparisons. Yet, the longitudinal analysis of a firm's evolution should include other measures that can also be comparable over time, across firms and across industries. Next section addresses this issue.

GENERATING OTHER MEASURES OF THE FIRM

Though eloquent as the growth trajectories may be in describing the trajectories of firms in the economy over long periods of time, their explanation calls for deeper analyses. This comprises the scrutinizing of the firm's and the industry's history, as well as, the generation of other quantitative measures. While elaborating on the historical analysis lies outside the scope of this essay, a procedure will be suggested to address the second issue.

Other accounting-based measures of the firm should be derived to complement the portrayal of the firm's evolution over time. Such measures should have the same characteristics the size indicator has, i.e., external orientation, time invariance and implicit adjustment for inflation and deflation in order to enable longitudinal comparisons. As a result, we suggest *that other accounting-based measures be derived by calculating the correspondent percentage of the US GNP.*

One such measure is profit. By applying the % of US GNP operator to annual profits, it is possible to produce profit curves comparable inter- and intra- industry. Figures 5.12 to 5.14 illustrate this indicator as applied to the top ten firms in the automotive, meat packing and steel industries, while figure 5.15 shows GE's sales and profits evolution over time. Figures 5.12 to 5.15 allow us to identify different growth and contraction scenarios. For example, during World War II's last 3-4 years, firms grew in size but not in profits; in the post-World War II years most industries grew in size and in profits; while in the Great Depression years firms contracted their size and their profits.

Perhaps more interesting than visualizing the effects of major macroeconomic factors on firms' trajectories is the ability to help analyze growth paths of firms. In fact, by examining figures 5.13 and 5.14, it is possible to realize that meat packers' and steel manufacturers' several decades long size contraction occurred in an all-encompassing contraction scenario, where the firms' profits paths indicate performance decline and reduction of financial capacity to grow. Also, figure 5.15 enables to identify GE's size contraction periods in the 1980s and 1990s within

a profit expansion path – a path, which in fact started in the 1970s. In sum, by including profits paths in the analysis of the growth trajectory of the firm it is possible to introduce a longitudinal indication of performance improvement/decline.

Other accounting-based measures can be conceived, such as retained earnings, and productivity and/or profitability per employee. The creation of such measures faces, however, one major limitation: the compatibility of accounting systems over long periods of time. Special attention should, therefore, be devoted to evaluate historical accounting procedures and financial data so as to guarantee uniformity over time.

CONCLUSION

After identifying the sources of ambiguity in the growth concept, this essay has proposed a size indicator that represents the firm's share of the economy over time. Several advantages can be identified: the indicator is both simple and powerful, it uses information that is in general easily available and consistent over time, it shows a company's growth relative to the economy, and it automatically corrects for inflation.

A procedure to generate other longitudinally comparable measures has also been advanced. It uses the % of US GNP operator, which automatically corrects accounting-based measures for inflation or deflation over time. As a result, the procedure enables the creation of other measures of the firm that may help longitudinal analyses of firm and industry evolution.

In this way, the suggestions advanced here equip both research and practice with analytical tools to perform longitudinal analyses of firms and industries. They enable the mapping of the growth of firms over economic space and time, the plotting of relevant information on the firm evolution over long periods of time, and the visualization of industry evolution. They, therefore, address the criticism of overly static models and methods in the study of the firm.

Yet, the suggestions are not without limitations. Longitudinal compatibility of data in historical data series is a major requirement. Therefore, the creation and use of additional accounting-based measures may face limits in the event of changes that accounting systems may have experienced over time. For example, it might be argued, that value added, i.e., sales less value of purchased goods, relative to GNP would be a stronger indicator firm size. However, it seems likely that longitudinally consistent data on value added measures would be hardly available. In sum, special care is needed to avoid inconsistency in the measures produced.

Another limitation pertains to this essay's scope, which is circumscribed to the growth of firms in the American economy. It is reasonable to suggest that by replacing the US GNP operator by another country's GNP growth trajectories of firms in other economies could be drawn in a similar way. However, more work is required to account for the growth trajectory of firms experiencing increasingly higher levels of globalization.

The descriptive power of the growth trajectory curves seems evident. What is far from clear is their prediction power, if any. On the one hand, the declining curves eloquence is undoubtedly impressive. On the other hand, more work should be done to support any degree of predictive power. Notwithstanding this, the curves descriptive capability can contribute to both research and practice. Academics may benefit from the indicators suggested to start visualizing the trajectory of firms examined in longitudinal studies. This would allow industry studies to compare and better understand the role played by different firms in the formation, development and eventual decline of both firms and industries. Practitioners, on the other hand, by extending the breadth and depth of their analyses, can perform a reality check and aim at better understanding their firms and the industries they operate in.

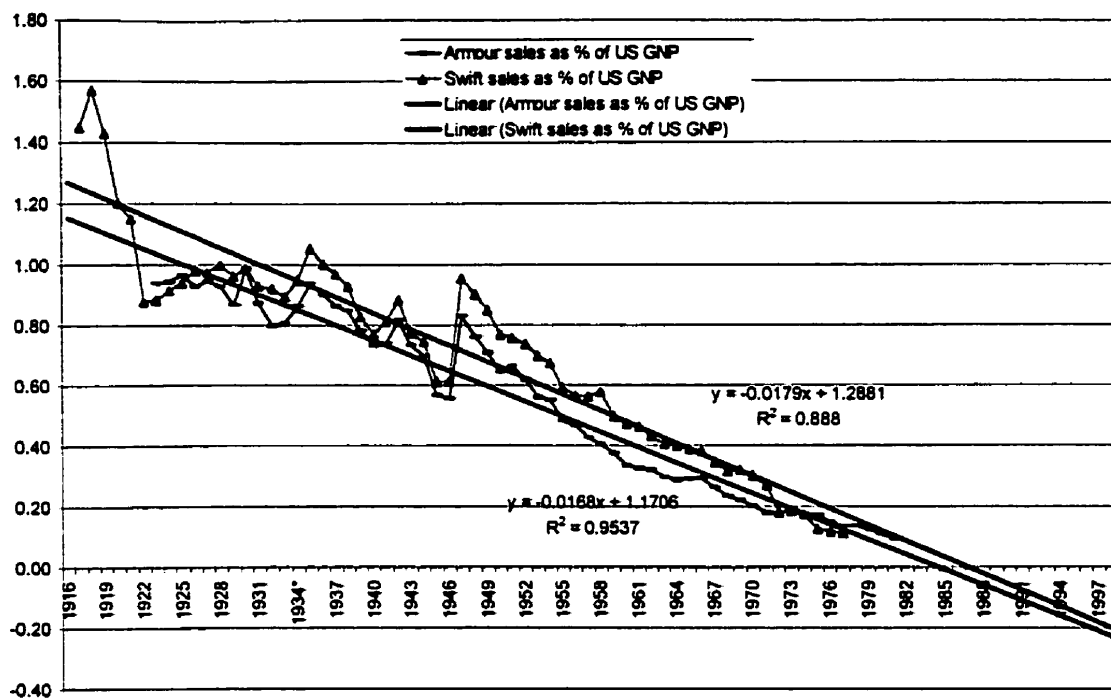


Figure 5.3

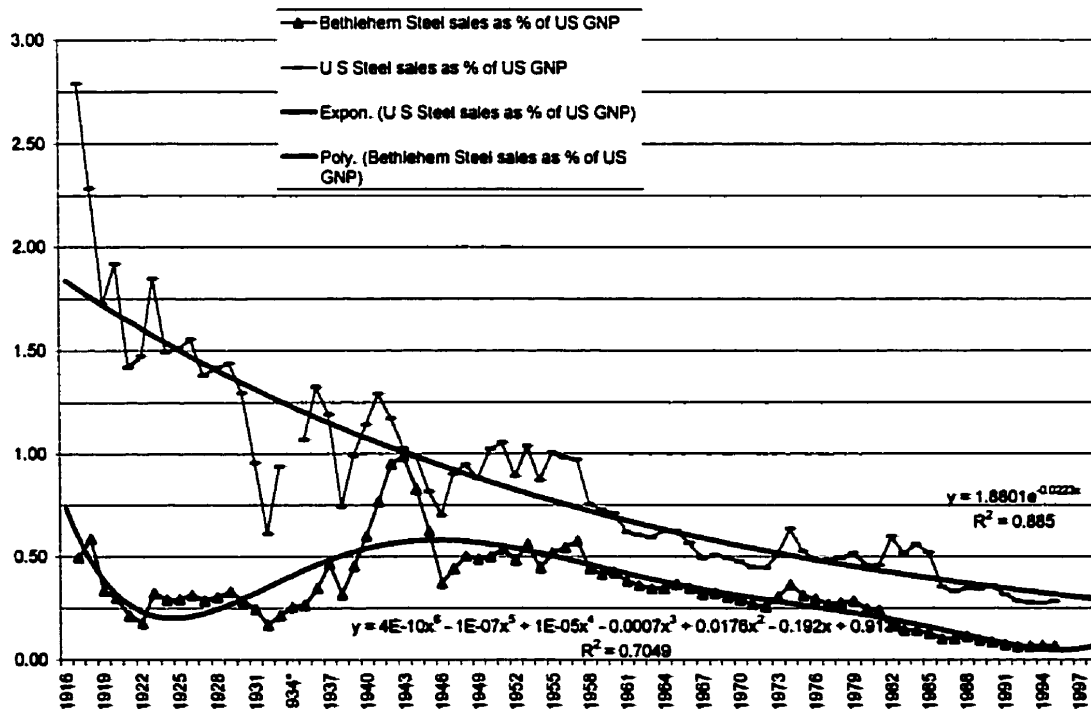


Figure 5.4

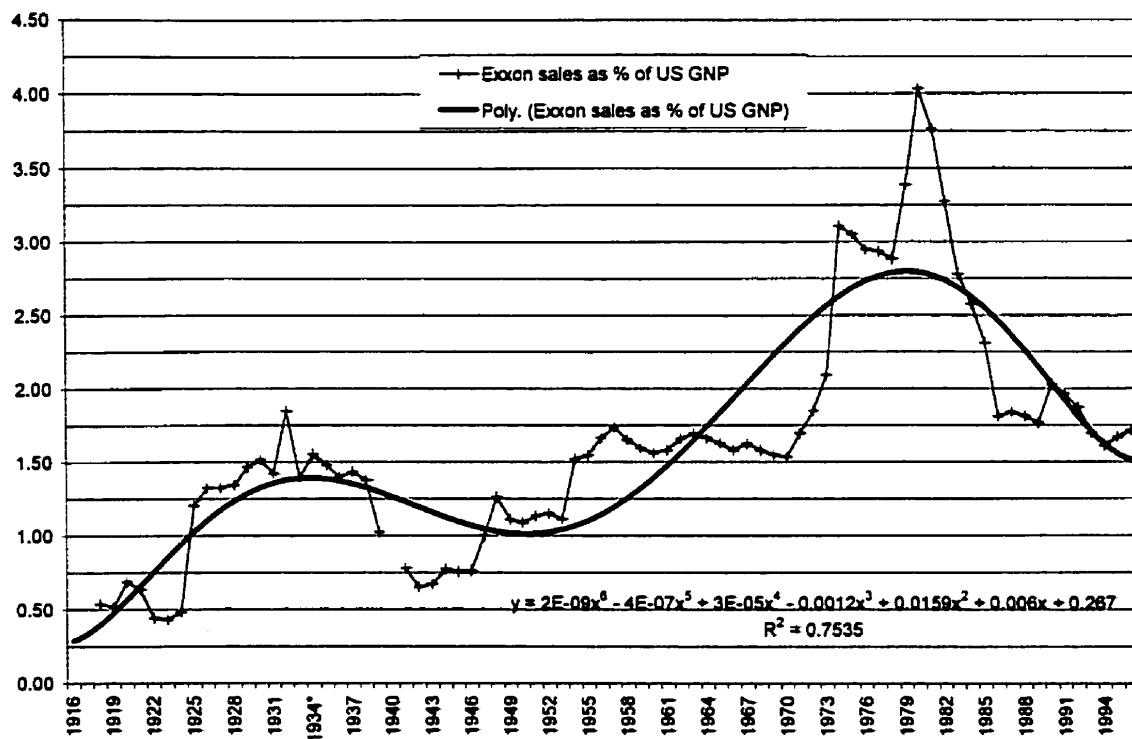


Figure 5.5

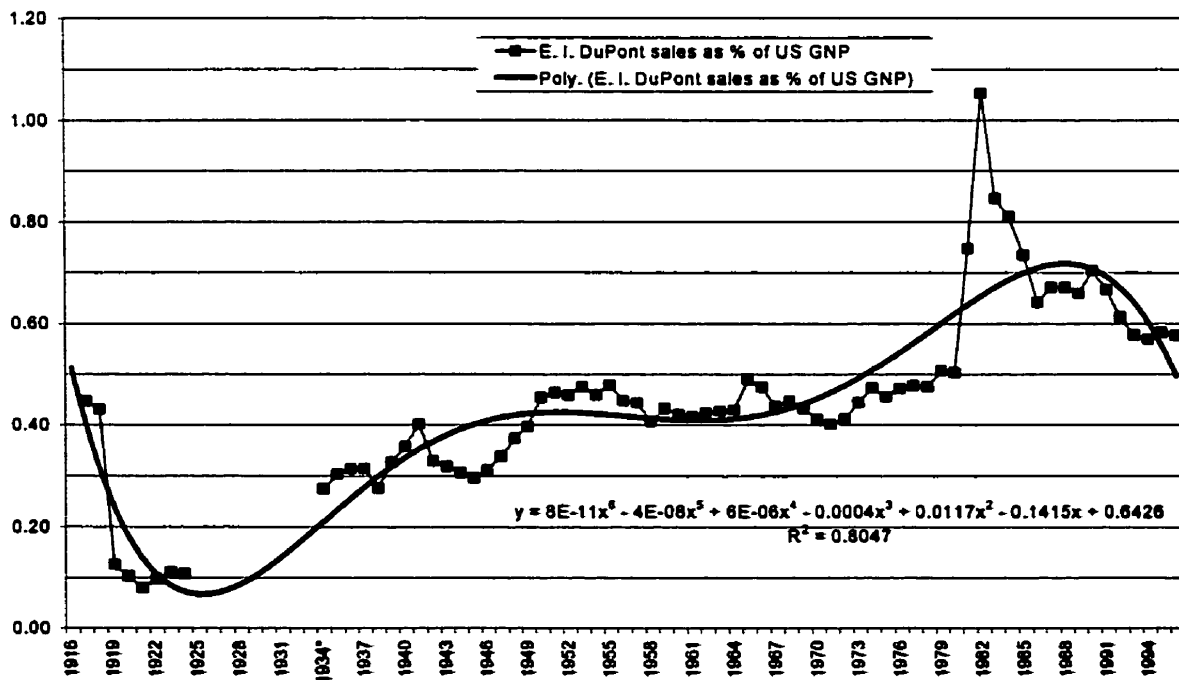


Figure 5.6

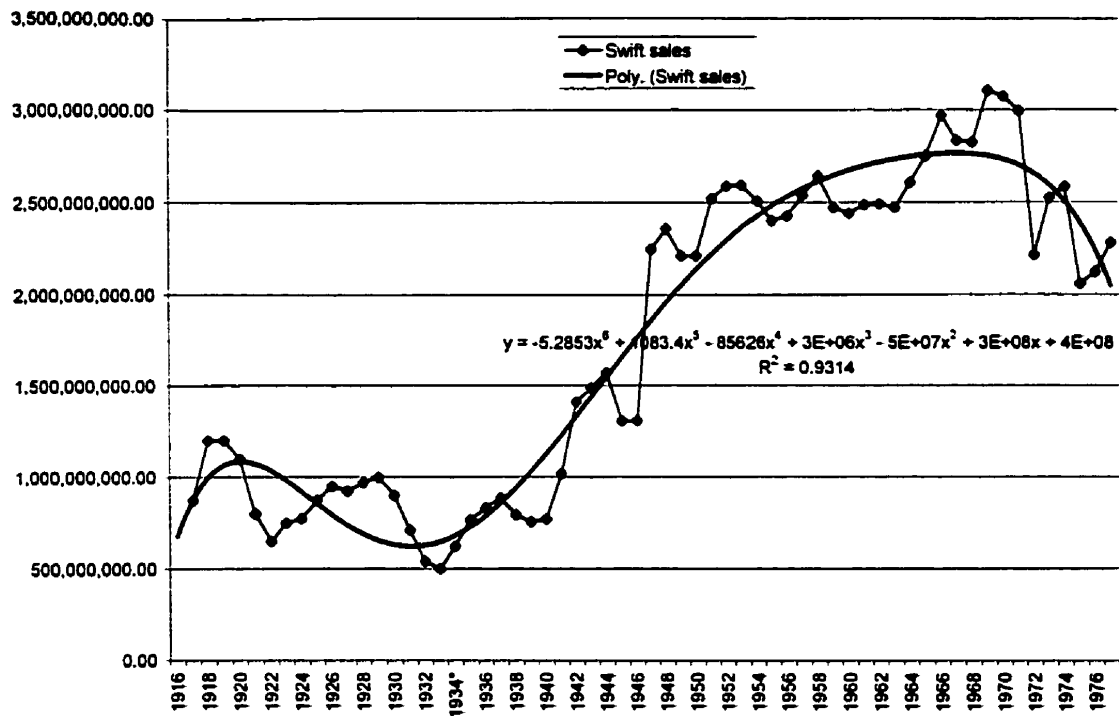


Figure 5.9

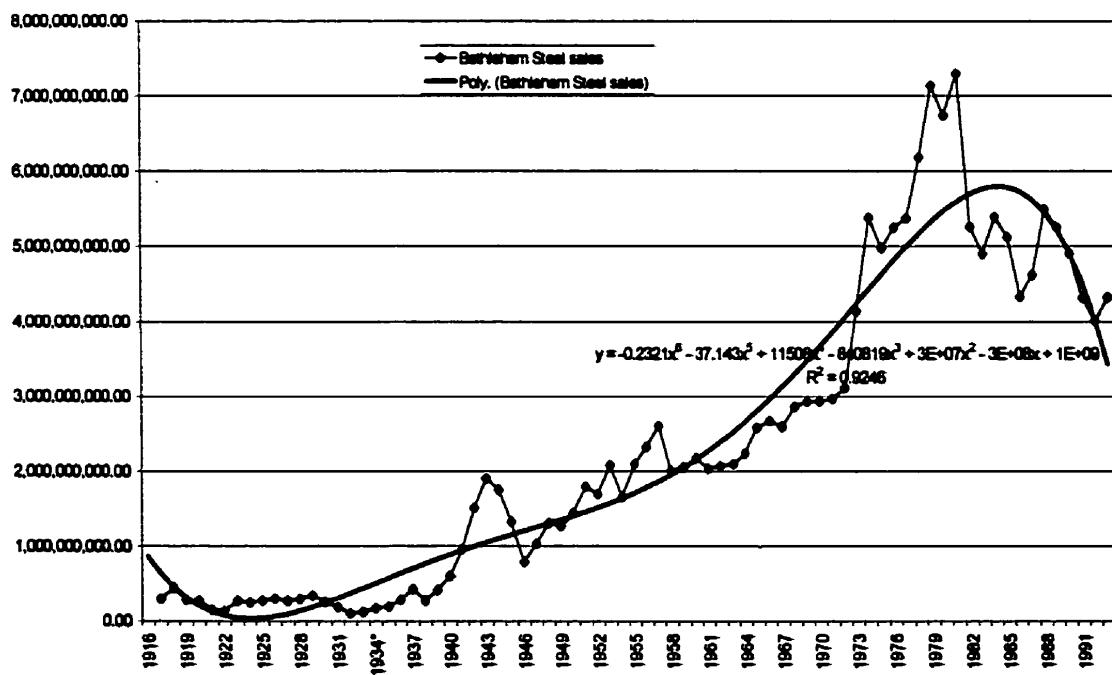


Figure 5.10

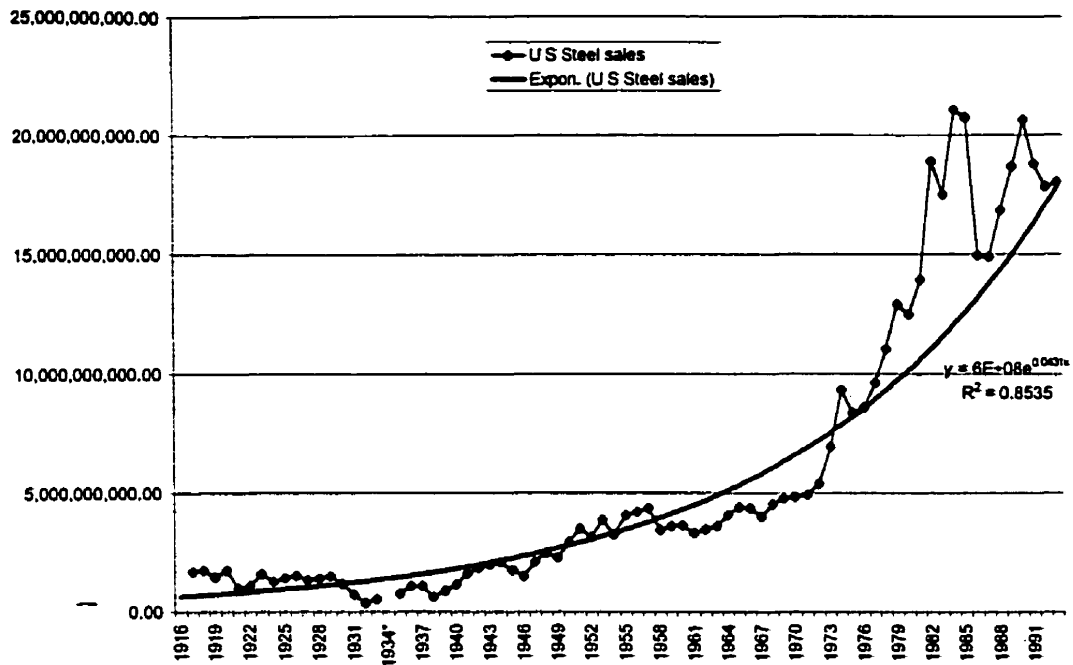


Figure 5.11

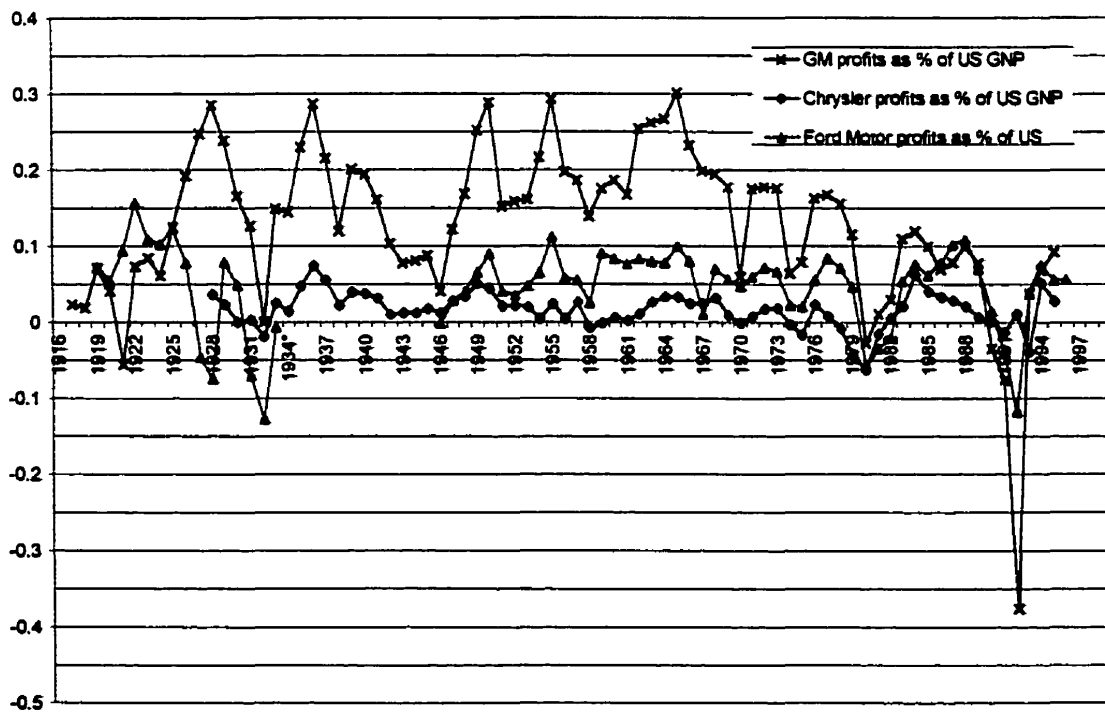


Figure 5.12

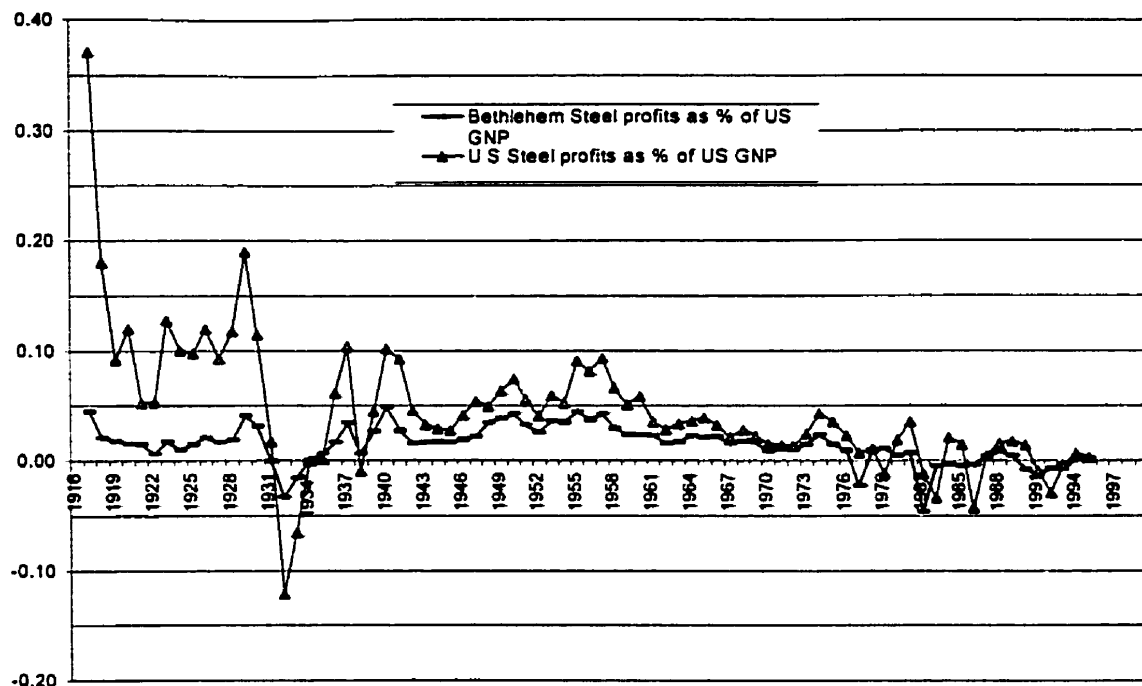


Figure 5.13

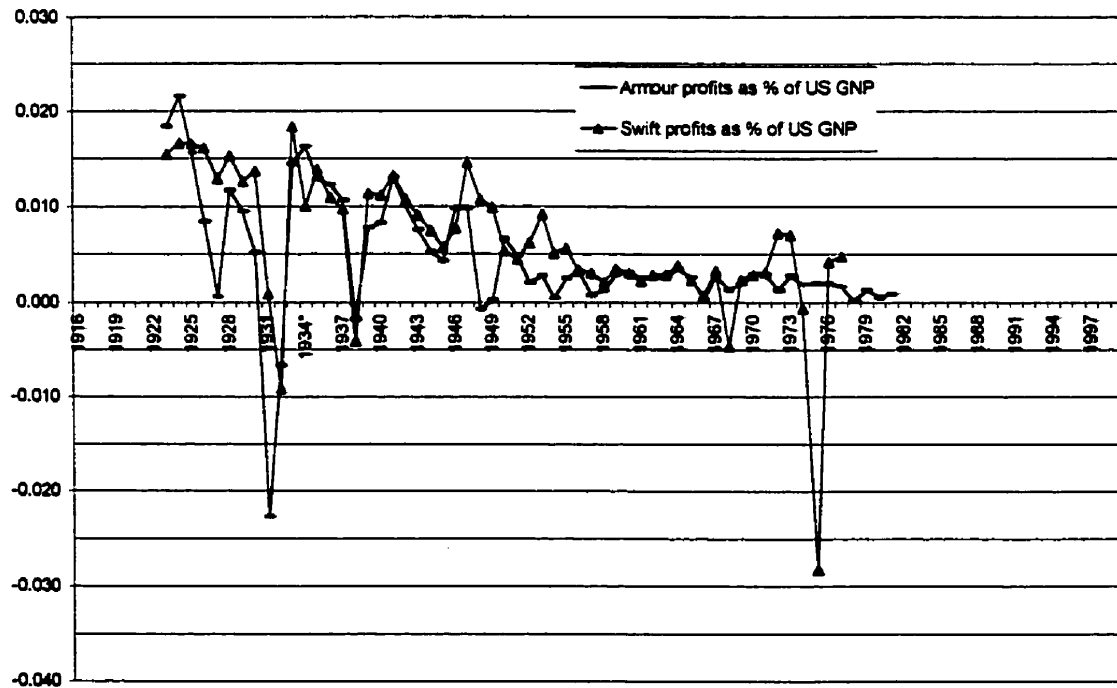


Figure 5.14

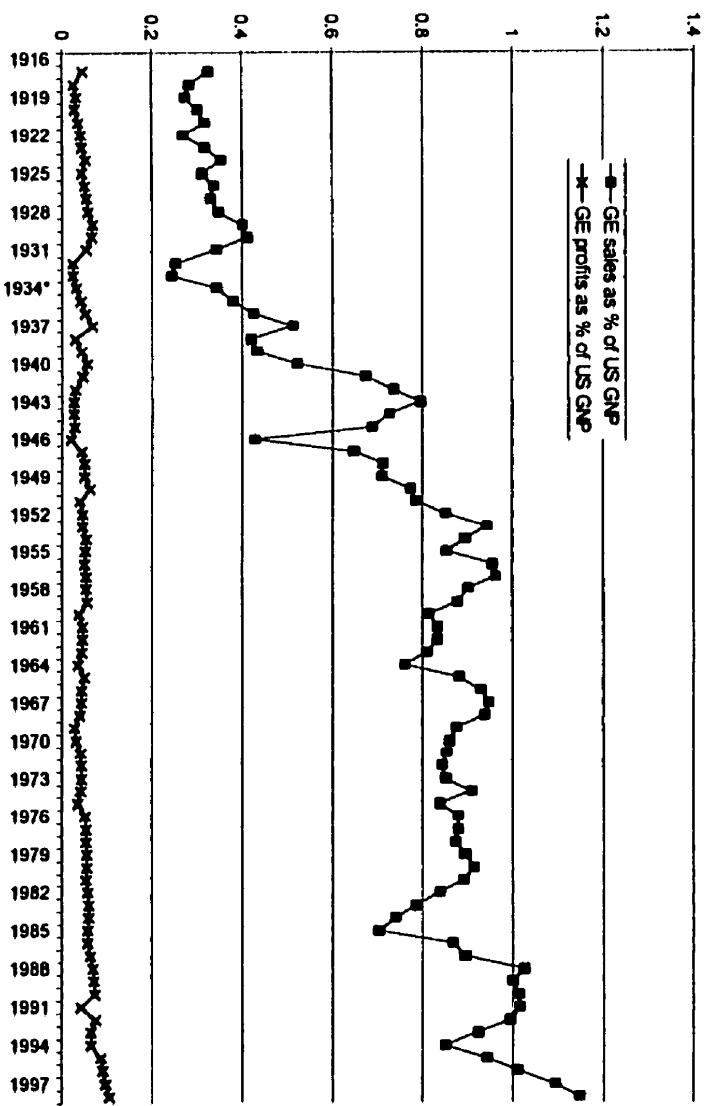


Figure 5.15

Understanding this intriguing rise and fall pattern of firms has challenged students of management for some time. Several authors have advanced contributions to the understanding of why some firms grow large and enjoy a continued successful existence, while others decay and cease to exist. Chandler (1977), for example, has advanced a number of mechanisms and processes associated with the continuing growth and continued existence of the firm. On the other hand, mainly concerned with explaining how organizations manage to survive, the resource dependence perspective (Pfeffer and Salancik, 1978) maintains that organizations survive to the extent that they develop competence in acquiring and maintaining the resources they depend on to operate. Another view, focusing on why some exceptional companies end up decaying (Miller, 1990), suggests that the very causes of success may become the causes of failure later on. As a matter of fact, a number of different lenses has been applied to the study of organizational growth, continued dominance and decline. Focusing on internal factors, external ones, or interactional processes, such as competition, all those different lenses have uncovered important aspects that affect the continued existence of the firm. In addition, more often than not, studies tend to concentrate on specific aspects of the firm's existence. Chandler, for example, was mainly concerned with the emergence and growth of the modern firm (Chandler, 1977), while Pfeffer and Salancik (1978) have focused on the survival of existing firms, and Miller (1990) has concentrated on the decline of once successful companies.

Rather than focusing on specific phases, this essay conducts a longitudinal examination of two long-lived companies, General Electric and Westinghouse, over a period of twelve decades, describing their emergence, growth trajectories and Westinghouse's eventual contraction and extinction. The study *portrays* their growth trajectories, *identifies* the occurrence and handling of growth-related dilemmas, *unveils* mechanisms governing continuing growth and continuing contraction processes. In so doing, the study expects to contribute to the understanding of *how and why some firms enjoy a continuing growth and a continued existence while others contract and eventually disappear.*

Three major periods have been identified:

- i. *Formation* (1880-1910) when the two companies emerge and grow within the emerging electrical industry becoming the two largest electrical manufacturing firms, GE being almost twice as large as WH. By the end of the period, there is a large number of smaller companies orbiting the GE-WH duopoly that dominates important lines of business such as apparatus and lamps;
- ii. *Structured* (1910- late 1950s) when the two companies undergo continuing growth within the duopolistic industry structure, which remains quite stable. By the end of the period, industry structure is challenged in a number of ways. Not only, does the duopolistic structure face antitrust suits, but also GE & WH's former competitive advantage based on developing early knowledge on science and technology is reduced because scientific knowledge is being produced on a large scale outside their research laboratories;
- iii. *Restructuring* (late 1950s on) when the two companies search for new paths within a more competitive environment. Despite major diversification efforts taken during the 1960s and 1970s, continuing growth does not occur in these two decades. Rather, both companies stumble and end up finding very different destinies. While GE's organizing strengths help it to regain its continuing growth path, WH's organizing weaknesses help it to move towards a continuing contraction path.

The analysis of GE and WH histories proceeded in two steps. Initially, I undertook a first-order analysis of each period by itself. Then, a second-order analysis of the whole twelve decades was done. In the first case, the unique characteristics of each period have inspired distinct research questions, while the second-order investigation took a panoramic view of both companies throughout their existences.

The *formation period* analysis has examined *why and how GE and WH grew into the largest firms in the electrical industry, GE being twice as big as WH*. Both *one-time growth* and *continuing growth* processes have been identified in the longitudinal analysis of both firms. Typical examples of one-time growth include the

mergers and acquisitions whenever these contribute to quickly increase the business and the organizational size of the firm – the firm's total sales and its number of employees, respectively – without necessarily nurturing favorable conditions for the continuing growth of the larger firm. Continuing growth has occurred in a number of different ways, according to the nature of the self-reinforcing mechanism in action. For example, at the interactional level, cooperation through the cross-licensing of patents between GE and WH has enabled continuing innovation in both firms in their early days. Although GE itself was the result of the merger of two of the three largest companies in the industry at that time, the merger provides but a partial explanation for GE's growth.

Several instances of continuing growth processes were found to play a major role in the expansion of the two firms. However, such a role could not be fulfilled unless the growth-related dilemmas were properly handled. The *growth dilemma* states that whenever some degree of standardization is required to foster industry growth capability, firms are likely to cooperate to bring forth a certain degree of standardization. However, by so doing, firm homogeneity increases, and firms are therefore likely to face higher competitive intensity later on. As a result, less opportunity will be there for the growth of individual firms. In fact, cooperation between GE and WH was found to occur in several instances, and technical competition between these two companies was in fact intense. However, special attention was devoted to neutralize sources of price-oriented competition so as to avoid compressing the firms' gains.

The *dominance dilemma*, on the other hand, states that while defensive-oriented expansion strategies help the firm to maintain its industry dominance, productive-oriented expansion strategies are required for the firm growth, and therefore, that the more domination-oriented the firm is, the less likely it is to keep growing. As a matter of fact, both firms sought to defend their positions through the patenting of their inventions. What is more, both have experienced the time-consuming effort to enforce their patent rights. However, by undertaking initiatives such as cross-licensing and R&D work, not only was defense of conquered position sustained, but new ventures were also initiated. In short, through the *hybrid*

approach to the dominance dilemma – undertaking strategies that have both defensive and productive properties – firm growth and industry domination managed to be reconciled. However, more often than not, it was up to GE to initiate a number of strategic actions for WH to share, comply with, and/or imitate, and for other smaller players to adapt to them. As a result, the industry was structured around the two largest companies, GE and WH, which underwent a quite synchronic growth path for a long time.

As for the structured period, the analysis therefore focused on *why and how GE and WH kept a synchronic growth path, along which both firms grew and GE kept its size leadership over WH*. Indeed, by virtue of its many strategic initiatives, GE came to play the role of *industry coordinator*. For one, the launching of its research laboratory in 1900 led GE to pioneer inventions and production processes in several technological fields. Moreover, GE was determined that the high-tech electrical manufacturing firms, particularly itself, should be properly rewarded for the high risks taken. As a result, GE obstinately sought to avoid price-based competition in the industry. In lamp manufacturing, for example, GE used the monopoly power embodied in its patents to keep industry production levels under control. In consequence, excessive production was prevented, price war pressure was avoided, and all players enjoyed quite handsome returns. In the apparatus business, for a number of reasons, price and market share also enjoyed a certain degree of stability.

GE's industry coordination placed WH in a privileged position, second only to GE. Smaller rivals were allowed to grow in synchrony with industry and market growth. Over the years, however, industry stability would be challenged in several ways. For instance, GE would face antitrust suits, and GE's agreements with WH and other manufacturers were put under scrutiny in the courts. Moreover, scientific and technological knowledge was spreading around the world at a fast pace, increasing, therefore, the number of players in the global industry. In addition, new knowledge areas emerged indicating new potentially promising high-tech avenues. All this signaled the upcoming transformation of the industry and its firms.

The restructuring period examination aimed, then, at understanding *why and*

how GE and WH ended up following two very different paths after so many years of synchrony. In face of major environmental transformations, for a couple of decades, both companies stumbled in their pursuit of a new direction. While GE succeeded at finding a new growing path, WH undertook the contraction path and eventually ceased to exist. Explanatory reasons for such distinct outcomes include:

- i. Nature of businesses – GE primarily diversified into new high-tech businesses. Besides high-tech, WH highly diversified into non high-tech businesses. Although several of these showed high growth prospects in the near future, most non high-tech businesses proved profitless in the end;
- ii. Decentralization process – while GE underwent a *strongly-coordinated decentralization*, WH decentralized in a *weakly-coordinated way*. As a result, GE became an ever larger integrated organization, while WH was heading towards a conglomerate form. The weakly-coordinated decentralization favored the emergence of a weakly-coordinated diversification, reinforcing the conglomerate form. Besides, the weak coordination of WH's many parts has also limited the firm's ability to make use of its size to leverage existing and new businesses. Moreover, in several instances, weak coordination contributed to the loss of prospective businesses;
- iii. Strategic traits – while, throughout its existence, GE developed a *systematic* approach to the handling of change, WH failed to so. From their inception, both companies had achieved success by undertaking a systematic, rather than piecemeal, approach to technological innovation. Thomas Edison, Elihu Thomson and George Westinghouse had provided vivid examples of systematic work in the pursuit of inventions. Over time, GE adopted such approach to a number of activities ranging from auditing to recruiting, to decentralizing, to labor management among others. Thomas Edison's systematic approach to his lighting system invention was adopted at GE in a number of distinct circumstances. The approach aimed at maximixing the chances of success and minimizing risks and losses. Being intent on replacing the existing gas illumination by an incandescent light system, Thomas Edison did a thorough study of the gas illumination industry - its technology, its marketing system, its consumers - seeking to understand all intervening actors, the bonds connecting each other, and the environment

in which the gas illumination industry operated. After scrutinizing behaviors, needs, strengths, weaknesses, Edison was ready to conceive a *replacing technology* that would at least neutralize, and preferably outdo, any feature of the existing technological system. This same approach was adopted later on in different contexts, such as, in the pursuit of the monopoly power that patents awarded their holders, and in the handling of labor negotiations. On the other hand, apart from the technological area, WH would not adopt the systematic approach in other activities. As a result, GE would tend to minimize risk and maximize chances of success, insofar as possible in an uncertain environment. On the other hand, as the second-best company in the industry, WH tended to aim at satisficing goals.

The second-order analysis took a panoramic view of the two companies over the twelve decades. We examined *which, if any, traits each company had had throughout its existence could possibly explain why and how GE and WH ended up having so different destinies*. As noted before, historical evidence suggests that GE from its early years onward exhibited a consistent behavior in the three areas: it had consistently pursued high-tech ventures, consistently developed strong coordinating capabilities, and consistently applied the systematic approach to a number of non-technological activities and contexts. As a result, more often than not, GE's behavior approached what Penrose (1980) called *entrepreneurial*. WH, on the other hand, started to diversify early on into non high-tech businesses, such as broadcasting, kept oscillating between tighter and looser coordination and control, and did not consistently apply the systematic approach outside technological development. Therefore, more often than not, WH's behavior was what has been named here *satisficing* (Simon, 1987) rather than entrepreneurial. In sum, by managing to transfer capabilities, such as the systematic approach, across organizational functions and businesses, GE progressively diffused to its members the concern and the methods for maximizing the chances of success and minimizing risks and losses in most projects and ventures GE undertook. At the same time, GE was building an integrated diversified organization that would increasingly make use of its gigantic size and scope to leverage existing and new businesses. WH, on the other hand, failed to spread a growth-oriented mentality/attitude throughout the organization. In

addition, more often than not WH underwent a fragmentation process, opening up the way for its self-destruction.

Five sections follow this introduction. In the first one, the analytical approach used to perform the study is explained; in the second, the research method used is described; in the third section, growth trajectories are drawn and first-order analysis is presented for each period; in the fourth, the organizational development of both companies is described and compared over the twelve decades; and in the fifth section, a panoramic look at their growth trajectories is taken and second-order analysis is advanced. Finally, a concluding section discusses the main ideas in the context of theory on the growth of the firm, advances the contributions and limitations of the study, as well as envisaged future research paths.

The two companies' narrative story presented in the third and fourth sections is not exhaustive. As Greenwood (1974) explained in his study of GE's managerial decentralization, "to aid in the understanding of such a complicated structure as this extremely large and diversified company, it is necessary to simplify the subject for research purposes and then to convey an analysis which, if factual, will retain the complex substance of the study" (p. xi).

In this essay, the narrative organizes factual data found in a variety of sources (refer to appendix 6.1) into two perspectives. The *business perspective* (third section) describes relevant events in the building and development of GE's and WH's businesses, while the *organization perspective* (fourth section) chronicles significant events pertaining to the building and development of GE's and WH's organizations. Arranging the narrative this way to cover the internal and external events facilitates describing and comparing the development of the two firms over twelve decades.

This section describes the main components of the analytical framework used to examine the growth trajectories of General Electric and Westinghouse:

- i. *growth trajectories description* – trajectories are drawn by means of a size indicator which allows for the representation of growth trajectories of firms throughout their existence;
- ii. *modes of change framework* – a framework of modes of change is introduced. Drawing on Bunge's philosophy (Bunge, 1979), the framework specifies a set of qualitatively different modes of change that may occur inside or around the organization, enabling the identification of different sources of change. The identification of sources of change may help increase the chances of success of conceived strategic moves, as well as reduce associated risks and losses;
- iii. *strategic dimensions of firm behavior* – some of Chandler's (1977) notions advanced in *The Visible Hand* inspire the search for growth-related strategic dimensions, such as continuing growth, expansion motives, self-perpetuation capability. In addition, the *growth dilemma* and the *dominance dilemma*, introduced in the first essay (chapter 3), are described. They help to identify the growth management profile of firms according to the different ways whereby firms handle such dilemmas.

Growth trajectories described

Drawing on the indicators proposed in the previous essay, several types of curve are drawn to describe growth trajectories, and performance curves. To clearly characterize the growth of the firm, this study uses an indicator of growth, which describes the trajectory a firm performs in the economy over time. By calculating total annual sales as a percentage of the American GNP, the suggested indicator expresses *the firm's share of the economy at a certain point in time*. Over long periods of time this indicator allows for the representation of the firm's trajectory in the economy throughout its existence. It is our understanding that this indicator provides a concise description of the evolution of the firm over long periods of observation enabling the identification of growth, decline and stationary periods.

Firm performance has also been portrayed longitudinally. Two indicators have been conceived: *relative net income (profit)*, an indicator of the overall firm performance, is calculated as *the firm's annual net income (profit) as a percentage of the US GNP*. Besides providing a concise account of the overall performance of a firm, the suggested indicator is specially meaningful in the study of the growth of the firm, since retained earnings constitute an important source of capital for implementing expansion strategies; and *relative employee productivity* (annual sales divided by the total number of employees), an indicator of organizational performance, is calculated as *the firm's annual employee productivity (annual sales divided by the total number of employees) as a percentage of the US GNP*. This indicator allows to represent how efficient has been the use of human resources over time.

The modes of change framework

Despite their descriptive capabilities, the suggested indicators fall short of explaining the growth trajectories of firms. In an effort to uncover the mechanisms of change in action throughout growth trajectories, this essay draws on the modes of change framework advanced in the second essay. Inspired by Bunge's philosophy (Bunge, 1979), this framework advances a comprehensive set of qualitatively distinct modes, which account for changes inside and around the firm. These modes are:

- i. *Quantitative mode* – more of the same kind of change, i.e., exploitation of existing paths;
- ii. *Qualitative (dialectical) mode* – conflicts and misfits giving rise to qualitative change, i.e., exploration of new paths;
- iii. *Goal-directed mode* – purposeful processes of change;
- iv. *Interactional mode* – same level interdependent processes of change;
- v. *Causal mode* – externally-triggered process of change;
- vi. *Structural mode* – multi-level interdependent process of change;
- vii. *Random mode* – random kind of change.

Examining the growth trajectories using the modes of change framework enables identification of elementary and complex units of growth dynamics, as well as the underlying mechanisms of change. For one, the identification of different modes of change associated with continuing growth processes allows us to identify different kinds of self-reinforcing mechanisms. In addition, the study of competitive and cooperative actions allows identification of different patterns of industry growth. Throughout their existences, GE and WH took a number of competitive and cooperative actions. Sometimes, cooperation was adopted to foster an industry segment growth. Such was the case in lamps and radio. In fact, the companies decided to share their patents, because otherwise growth in these fields would become extremely costly due to the inevitable patent infringement suits that each would file against the other.

Growth-related strategic dimensions

Chandler's *The Visible Hand* (Chandler, 1977) has inspired the identification of continuing growth mechanisms, of expansion motives, and of continued existence propensity. In addition, it has inspired the formulation of the two growth-related dilemmas, which were first advanced in chapter 3:

- (i) The *growth dilemma* states that the very strategies undertaken to foster growth are likely to constrain growth later on. It is associated with the development of growth capabilities in the industry so that, through cooperation, firms promote industry standardization, which increases the growth capability of the industry. However, such cooperation, and the resulting standardization, give rise to higher competition among rival firms constraining the growth of individual firms;
- (ii) The *dominance dilemma* states that in order to *achieve* dominance, growth-propelling (productive) strategies are required, whereas to *maintain* achieved dominance growth-constraining (defensive) strategies are called for. As a result, by deciding to defend its dominant position, the firm may be led to reduce its chances of experiencing further growth.

The handling of these dilemmas was compared in several circumstances. For example, in lamps, GE managed to circumvent the growth dilemma, according to which competition intensity is likely to increase as a result of cooperative efforts to foster industry growth. GE's initiatives to coordinate the emerging industry succeeded in establishing production quotas and maintaining stable prices. Therefore, lamp manufacturers grew at the pace of industry growth rather than at the expense of each other. In radio, on the other hand, RCA, a joint-venture of GE, WH and AT&T did not play the same organizing role GE had played in lamps, and therefore competition became very intense in the radio manufacturing industry.

RESEARCH METHOD

The study performs a longitudinal examination of the growth trajectories of General Electric and Westinghouse over a period of twelve decades. This section describes the data gathering process first, then the data preparation, and finally data analysis procedures.

Data gathering

The study uses various kinds of secondary data (refer to appendix 6.1). They provide historical information on GE and WH, on the constitution and development of certain industries they took part in, as well as on more general environmental developments. Two major kinds of data can be distinguished:

- i. Literature on specific themes and periods of time
Two business bibliography books (Daniells, 1957; Geahigan, 1988) have contributed to the identification of written material on the two companies. In addition, articles and book reviews in business history journals have also been helpful in the identification of relevant material. Finally, dissertation abstracts have also been a useful source of information.
- ii. Data from sources providing information on a regular basis

- . **Moody's industrial manual (from 1923 to 1997) - each annual edition includes a brief company history, its businesses, acquisitions and divestitures, debt and capital profile, and financial data;**
- . **Wall Street Journal Index (from 1955 to 1998) - each annual edition summarizes information published in the newspaper on each company or subject matter;**
- . **Fortune magazine (1930 to 1999) - was scanned in search of articles, reported news and advertisements of the two companies;**
- . **Business Week (1930 to 1947) - was scanned in search of articles, reported news and advertisements of the two companies;**
- . **Annual reports (1971 to 1999)**

In what concerns the American economy, Mitchell's (1998) International Historical Statistics provided data on US GNP. Appendix 6.1 lists the references used to investigate GE's and WH's trajectories.

Data preparation

Moody's and Annual reports of both companies have provided financial and organizational information, such as, sales, net income and number of employees. These data were used to calculate indicators and draw the corresponding trajectories. An effort was made to use the actual data for each year, i.e., adjustments for previous years to reflect acquisitions and divestitures have been disregarded. Microsoft's Excel spreadsheet was used to enter data, calculate indicators and draw curves.

Throughout the reading of the material, historical facts were identified and organized in a number of ways:

- (i) **Inside and around events list – a three-column list associating for each year two sorts of events: those taking place inside the American electrical manufacturing industry, and those around the industry;**
- (ii) **Events list by industry – events were associated with different industries;**

(iii) Moody's summarizing – for each year, from 1922 to 1995, financial, business, operational, labor-related, legislative, and organizational information on the two companies was recorded in a two-columns document (one column for each company).

Data analysis

Analysis has proceeded in the following directions:

- . As mentioned above some sources of data have provided information on a regular basis. These sources were scrutinized so as to enable the building of *visual maps* (Langley, 1999) comparing the two companies over time. One such map has represented top management tenure in both companies along the company's growth trajectories (refer to figure 6.12);
- . The growth trajectories curves have inspired the decomposition of the temporal processes of firm development into successive periods that do not have any particular theoretical significance a priori, i.e., periods dissociated from the notions of phases, cycles or stages in a process. According to Langley (1999), "the decomposition of data into successive adjacent periods enables the explicit examination of how actions of one period lead to changes in the context that will affect action in subsequent periods" (p. 703). In fact, visual inspection of GE's and WH's growth trajectory curves (figure 6.3) revealed that the rather synchronous pattern the two curves described up to the late 1950s changed into two distinct paths from then on. It showed that at first companies grew and contracted in concert, and that this ceased to occur later on. The adoption of this temporal bracketing strategy (Langley, 1999) has contributed to the understanding of the firms and industry evolution over time;
- . The reading of the gathered material has suggested a number of candidate themes worth investigating: leadership, planning and control, human resources and labor management, public relations management, innovation (resource and development, patents), legislation and suits, managerial practices. Themes underwent a template analysis (King, 1998) whereby events were classified according to the modes of change framework and elements of growth-related

dilemmas were identified. In addition, a GE x WH comparative list was organized into several themes, such as founding fathers' characteristics, managerial succession, organization.

Some sources were particularly useful in their report on certain themes:

Defense – Miller (1947), Woodbury (1948)

General information – Moody's and Fortune

Human Resources Management – Boulware (1969), Northrup (1964), Schatz (1983)

Industry – Bright (1949), Passer (1953), Reich (1992)

Innovation (R&D) – Birr (1957), Carlson (1991), Hawkins (1950), Liebhafsky (1978), Reich (1985), Simpson (1995), Wise (1985)

Leadership – Loth (1958), Lowe (1998), O'Boyle (1998), Prout (1921), Slater (1993, 1999), Tarbell (1932), Tichy & Sherman (1993), Usselman (1992), Vancil (1987)

Antitrust suits – Sultan (1974)

Managerial practices – Cordiner (1956), Fruhan (1979), GE (1953, 1954, 1955)

Planning & control – Greenwood (1974), Paxton et al. (1954), Solomons (1985);

. Alternate templates of theoretical perspectives (Langley, 1999) have been inspected in search of explanatory mechanisms in action throughout the firms' trajectories. Such theoretical perspectives, which are described in the next section, include: macro-economics-based explanations, Chandler's growth-related explanations (Chandler, 1977), Scranton's production-oriented view (Scranton, 1997), Collins & Porras' explanations centered around companies' visionary characteristics (Collins & Porras, 1994), and Pascale's corrective pendulum swings perspective (Pascale, 1990).

GENERAL ELECTRIC & WESTINGHOUSE GROWTH TRAJECTORIES ANALYZED

General Electric and Westinghouse pioneered in many technology-based businesses. They electrified cities, provided them with illumination, made thousands of consumer products, pioneered in electronics and telecommunications. They diversified both functionally and technologically. Besides inventing and

manufacturing, they branched out into marketing, distribution and finance. To develop increasingly complex products and systems, they have extended their knowledge into the electrical, mechanical, chemical and nuclear fields. In so doing, both companies experienced continuous growth reaching gigantic sizes. In fact, since the Fortune 500 list was first published, both companies had been listed among the 30 largest US companies.

In 1997, however, WH's businesses were split up and the 110 years old company ceased to exist. By then, WH had dropped to the 135th position in the 1996 Fortune 500 list. Using our proposed indicator – total sales as a percentage of the US GNP – the growth trajectories of both companies in their last 80 years are plotted in figures 6.1 and 6.2 below.

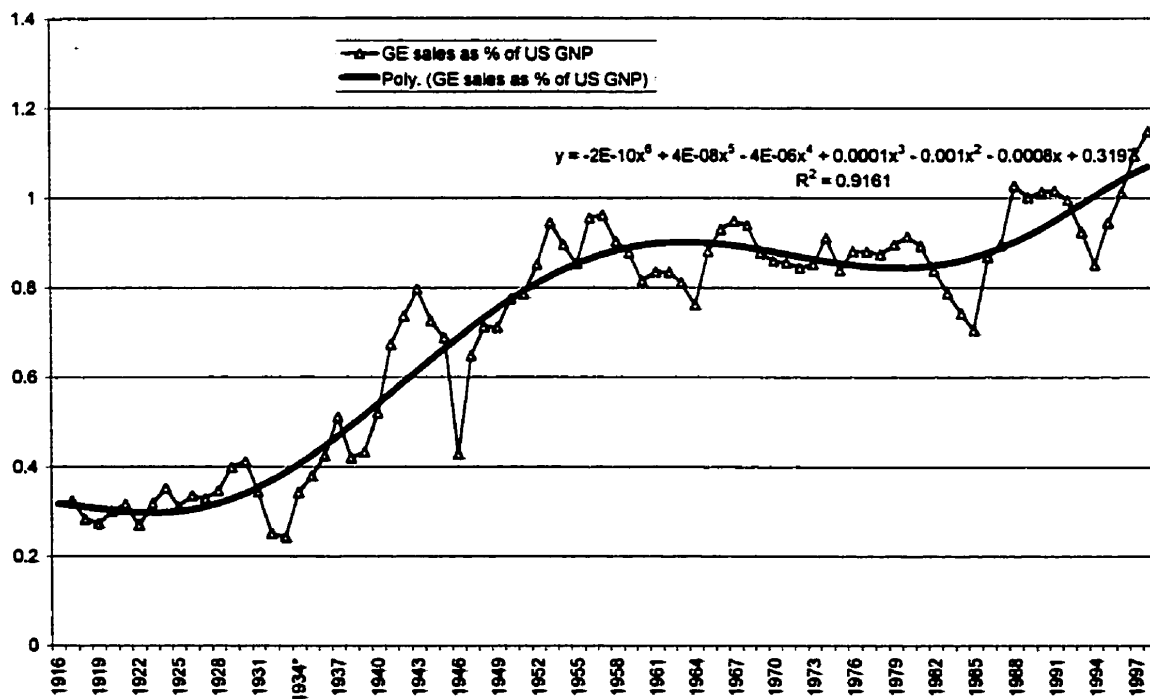


Figure 6.1 – GE Growth Trajectory

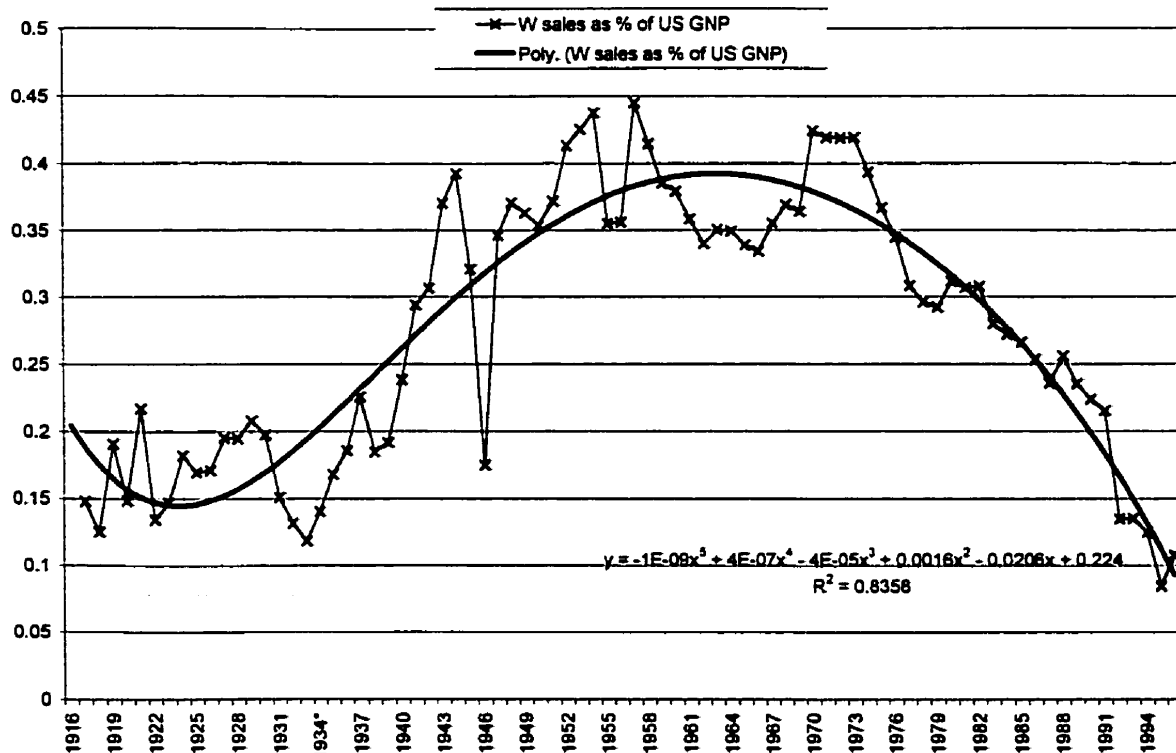


Figure 6.2 – WH Growth Trajectory

Essentially, GE has followed an upward path. Its share of the American economy has increased from 0.37% in 1917 to 1.14% in 1998. WH's trajectory, on the other hand, started to decline in the late 1950s. In 1917 its business size corresponded to 0.14% of the US GNP, increased to 0.44% in 1957 and contracted to 0.10% in 1996, its last full year of operation. Interestingly, despite having followed different destinies, for a number of decades the two companies performed a similar path. This can be better observed by plotting the two curves together (refer to Figure 6.3).

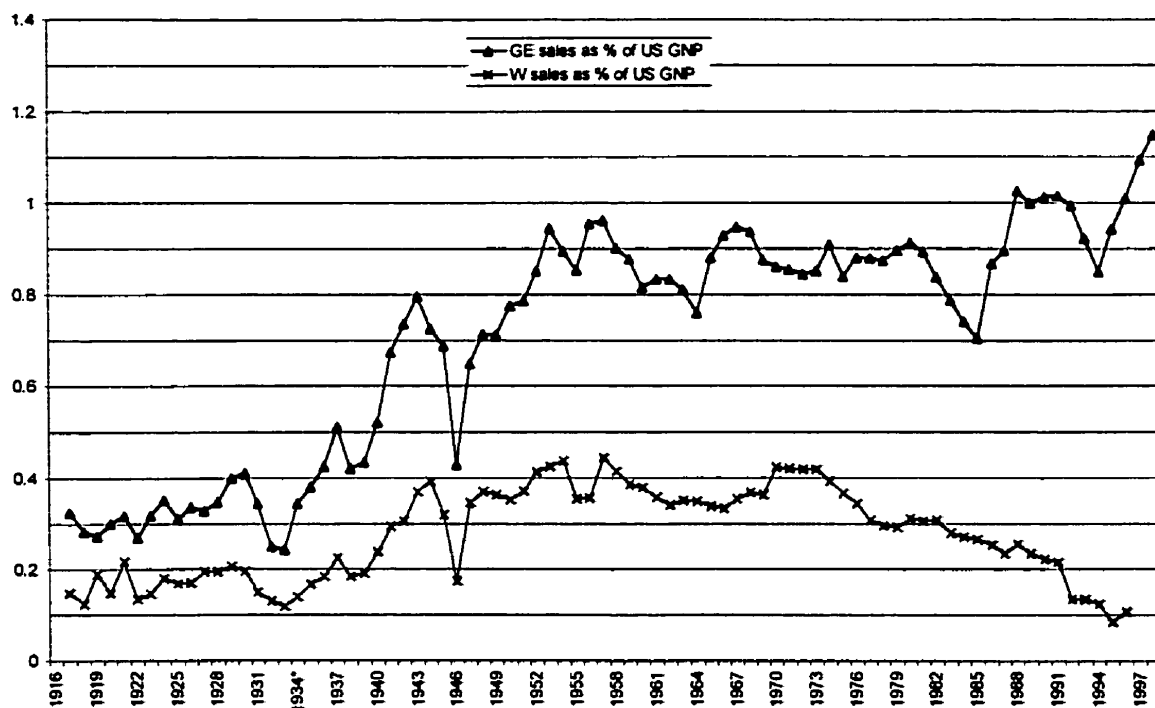


Figure 6.3 – GE, WH Growth Trajectories

Up to the 1960s GE and WH expanded and contracted concurrently. Both grew after WWI, contracted during the depression years, grew up to 1937, contracted in the 1938 economic slump, first grew and then contracted during WWII, expanded after WWII up to 1957, when both companies size attained a maximum. GE would only transcend its 1957 maximum three decades later, while WH would never achieve its 1957 maximum again. Interestingly, another company also performed a very similar path up to the 1950s. It was Allis-Chalmers (A-C), a heavy-engineering and farm-equipment firm that had grabbed a large share of the market for steam turbine and hydro-electric generators (Schatz, 1983). Though not as integrated as GE and WH, A-C was the largest competitor GE and WH faced in some of their main lines of business, such as apparatus. Figures 6.4 and 6.5 show the sales and profits trajectories of these three companies.

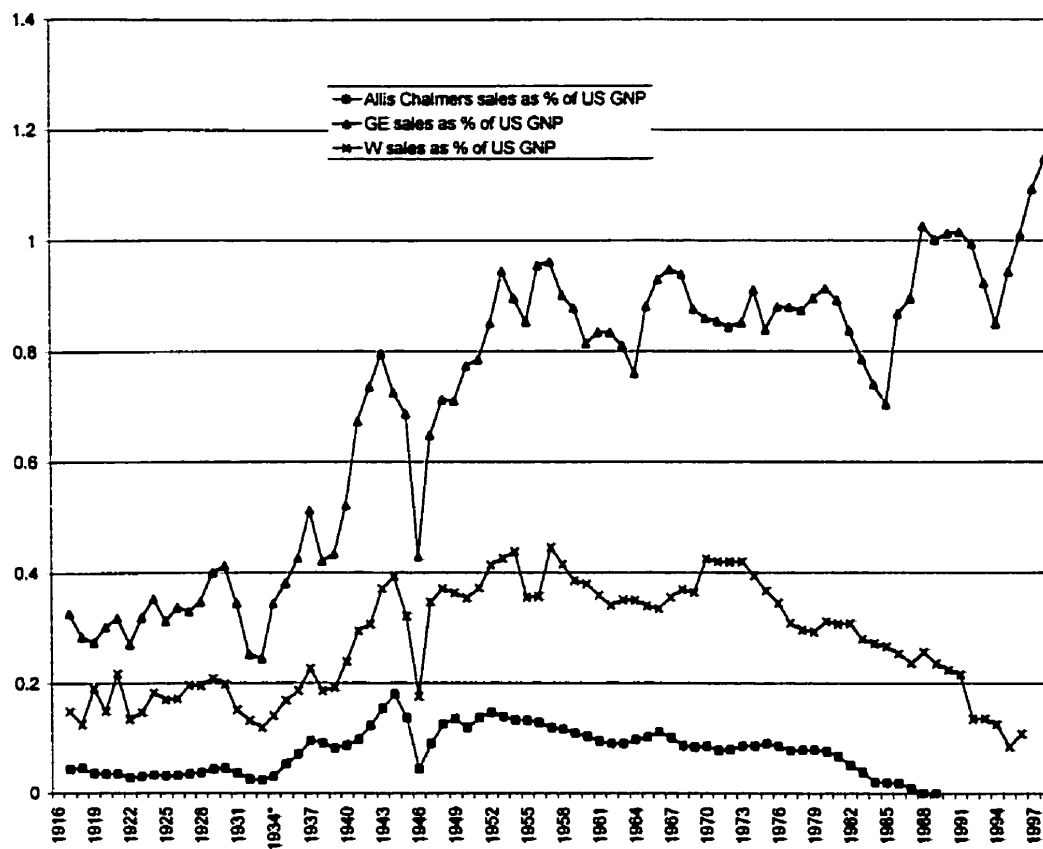


Figure 6.4 – GE, WH, Allis-Chalmers Growth Trajectories

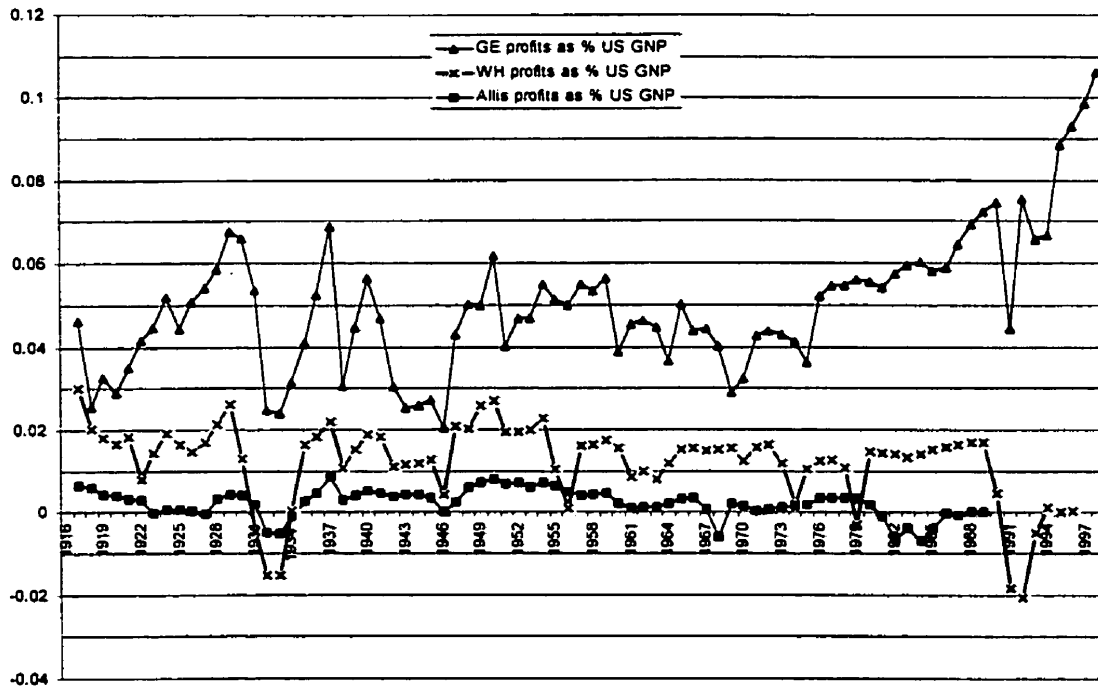


Figure 6.5 – GE, WH, Allis-Chalmers Profit Trajectories

Although WH and A-C exhibited less pronounced upward and downward variations than GE, up to the early 1950s, the three companies followed a quite homogeneous path in both curves. In fact, as Appendix 6.2 shows, throughout the 1922-1954 period, the three companies grew and contracted in concert.

The growth trajectories of GE and WH (figure 6.3) seem to indicate that for a period both companies have grown and occasionally contracted within a fairly stable industry structure, which underwent some sort of destabilization later on. Moreover, it also suggests that the effects on each firm of such a change were entirely different. Although both stumbled for a while, GE has grown above its 1957

maximum, while WH approached its 1957 maximum in the seventies only to start a declining path that ended up in its dissolution. Should the trend curves drawn in figures 6.1 and 6.2 be a proxy representation of the firms' life cycle curves, GE would have somehow adjusted itself to start a new cycle (Tichy, 1980), while WH did not manage to escape the declining phase of the life cycle.

What could possibly explain these trajectories? A macroeconomics-based explanation would center around the strong relationship the electrical industry holds with the general state of the economy. During expansion periods in the economy, utilities place orders and the electric power business expands; during recession, on the contrary, utilities find themselves with excess capacity and no new orders are placed. Boom and bust cycles in the economy would explain the GE's and WH's harmonious growth and contraction up to the late-fifties. It however fails to explain the different paths the companies have followed thereafter.

Chandler (1977) would explain their rise, growth and dominance as a result of a number of factors, including favorable economic conditions. Other necessary conditions include the development of effective coordination skills, the formation of a managerial hierarchy, the occurrence of self-reinforcing mechanisms of continuing growth, and the adoption of productive rather than defensive expansion strategies. The managers' aim to develop and maintain high productivity levels would be a main propeller of the self-reinforcing mechanism of continuing growth. In addition, administrative innovation has provided firms with effective ways to manage ever-growing organizations. For example, the assignment of different functions and responsibilities to top and middle management would enable the firms to simultaneously address long- and short-term issues, an essential condition for the continued existence of the firm. In sum, Chandler advances mechanisms, which lead to the development of capabilities. These, in turn, confer on the firm competitive advantage over rivals, contributing therefore to its expanding market share and possibly leading to industry dominance. Although decline has not been thoroughly examined within Chandler's framework, firm decline might be associated with failure in maintaining the necessary conditions for continuing growth and continued existence.

- ii. The ability to circumvent *either-or* issues turning them into *and* conditions. For example, GE managed to entertain both productive and defensive expansion motives, while WH did not. Moreover, WH sometimes undertook an empire-building orientation lead by neither productive nor defensive expansion motives;
- iii. Changing themselves as much as needed while preserving and protecting their core ideology; translating their ideologies into tangible mechanisms which indoctrinate people, impose tightness of fit and create a sense of belonging to something special. Initiatives like associating the GE monogram to its entire product line and GE management education centre at Crotonville illustrate GE's early efforts towards gathering people around an integrated organization. WH, however, never achieved a reasonable degree of unification of its several constitutive parts.

The authors' study undoubtedly provides useful insights, which help to understand and explain long-term success and failure of firms. However, scrutinizing and explaining the growth trajectories of any of the eighteen pairs of firms examined lay outside the purpose of Collins & Porras' work. As a result, in their study, GE's existence seems to be reduced to its first formation years and to Jack Welch's management era, while only the formation years of WH are mentioned.

Pascale (1990) would maintain that throughout its existence, GE succeeded in transforming itself, while WH did not. Aiming at understanding the anatomy of firm revitalization, Pascale (1990) performed longitudinal studies on a number of firms. GE's existence was examined throughout its several generations of top managers. Maintaining that "GE contains several stories in one" (p. 178), Pascale (1990) suggests the occurrence of corrective pendulum swings every time a new CEO took the helm at GE. According to him, such swings opened up the way for the firm transformation without crisis. In his book Pascale also stresses the importance of opposites: "Contention is an ingredient of organizational life. I have identified several dimensions of contention that arise in organizations. These correspond to the levers that managers commonly use to improve performance. When a number of these levers are used simultaneously and a constructive tension is achieved,

Indeed, our analysis of GE and WH trajectories suggests that *effective handling of change* is likely to constitute a necessary condition for the continuing growth and continued existence of the firm. Having developed better change handling skills, in many respects, GE developed into the industry coordinator, while WH and other smaller firms grouped under or around the protective umbrella GE built in the industry. As pressures internal and external to the electrical industry eliminated the protective mechanisms, industry players faced a new competitive landscape. As a result, both GE and WH stumbled in the 1960s and 1970s. However, while GE managed to redirect itself, to a certain extent back to its origins, WH did not succeed in developing change handling skills and entered a three-decades long declining path.

Our analysis also suggests that for reasons dating back to their foundations, GE ended up developing superior abilities to handle change inside and around itself, while WH failed to do so. The trajectory curves (figure 6.3) plot almost nine out of the twelve decades analyzed, leaving out the initial three decades for which complete data was not found. The plotted data suggests that, following the initial three decades, two main periods have occurred in the electrical industry. One, more structured period (1910s to 1950s), when companies expanded and contracted concurrently, and the other one afterwards, when industry restructuring took place. As a result, the growth trajectories of GE & WH are examined within three periods of the electrical industry existence: the formation period (1880-1910), the structured period (1910- late 1950s), the restructuring period (late 1950s on). Each period is first described and then analyzed.

Period I: the formation years (1880-1910)

The formation years described

From their inception, General Electric and Westinghouse were *high-tech* companies. Westinghouse Electric Company, a new venture George Westinghouse launched in 1886, had been formed to develop the alternating-current (ac) system of electrical distribution when the direct-current (dc) system was dominant and most well-known electrical engineers discounted alternating current (Passer, 1953). Likewise, General Electric Company was formed in 1892 by means of a combination of two pioneer, high-tech firms in the electrical industry: Edison General Electric (EGE) and Thomson-Houston (T-H).

EGE had pioneered a new incandescent lighting system Thomas Edison had conceived to replace gas lighting. Independently from EGE, T-H had built a reputation around improvement patents of existing systems. While both George Westinghouse and Thomas Edison were pioneer innovators who entered the electrical industry looking for new areas in which to use their talents profitably, T-H's Elihu Thomson was mainly an improvement innovator who excelled in improving other people's innovations.

When GE was incorporated in 1892, the three companies – EGE, T-H, WH – were the three largest firms in the electrical industry, occupying important positions in several lines of business. At that time, the electrical industry comprised lighting (arc carbon, and incandescent), power (dc electrical motors) and electric traction (street railways and elevated railways). As a result of EGE and T-H's merger at the end of the nineteenth century, a duopoly – GE & WH – took hold in many lines of equipment in the electrical industry. Eventually, only these two companies would develop a full line of products in what turned out to be an oligopolistic industry.

A number of factors determined the shape of the electrical industry structure. One such factor was evolving technology. In the 1870s electrical phenomena were ill-understood. On both sides of the Atlantic, electricity attracted the attention of

engineering-minded people who undertook independent efforts to construct dynamos and develop electrical lighting. Electrical technology underwent continuous change with the introduction of new products and services or new systems altogether, which eventually replaced existing ones: incandescent replaced arc carbon lamps, as well as ac replaced dc in electrical distribution.

Interestingly, electrical lighting systems were conceived as an alternative to, and eventually replaced, the gas illumination system that by 1875 had become customary. For different reasons, both Thomas Edison and George Westinghouse had thoroughly studied the gas illumination system. While Edison was mainly interested in advantageously replicating the gas illumination system for interior use, Westinghouse's attention was directed to electricity transmission, after he had succeeded in developing a high-pressure system of gas distribution that could be handled safely and economically. Neither of them, however, had been interested in arc lighting, the first illumination system developed.

In the late 1870s, a number of innovators were developing the arc lighting system for street and large-space illumination. Charles Brush was the pioneer-innovator in arc-lighting, having succeeded in developing a lighting system that produced a high-quality light at a lower cost in order to displace gas from large-space illumination. In 1879 Brush installed the first arc-lighting system and by the end of 1880, over 5,000 Brush arc lights and dynamos were in operation (Passer, 1953). Elihu Thomson was the improvement-innovator who together with E. Houston gave rise to the Thomson-Houston Electric Company (T-H). After a few years of work, by the end of 1881, Thomson felt he finally had built an arc-lighting system, which was technically superior to any other in the market. In the middle of 1882 a group of Lynn businessmen, including Charles A. Coffin, became interested in Thomson's system and T-H was founded in 1883. Coffin, the salesman and organizer, took charge of the company teaming up with Thomson, the ingenious inventor.

T-H flourished in the arc lighting business by developing valuable strengths to face a quite friendly environment. On the technological side, the awards received

in technical exhibitions, such as the London Inventions Exhibition in 1885, helped T-H to build a reputation that was important for selling the Thomson-Houston system both at home and abroad. In a few years, system design stabilized and T-H did not introduce any major technical improvements after 1883. Patents covering basic components were not issued to protect pioneer-innovators, because neither of the basic elements of the arc lighting system – the dynamo and the arc light – was patentable. However, over time, improvement patents became very important, and T-H was particularly strong having had an improvement patent on automatic regulator upheld in 1888. On the marketing side, the company built its own sales force, having decided early on to focus on the most promising market segment, central stations, rather than on isolated plants. In fact, by 1891, the latter accounted for no more than 10% of T-H's arc lighting business.

The wide market for arc lighting gave rise to a moderately competitive environment with low intra-industry competition. Yet, since arc lighting was a substitute technology for gas lighting, competition was higher with gas illumination companies. Before T-H's improvement patent was upheld in 1888, arc lighting technology was quite stable and the market so large that companies could grow rapidly and still not have to compete among themselves for business. Thereafter, T-H initiated a policy of buying out other manufacturers of arc lighting apparatus when the opportunity arose. Acquisitions were made to eliminate rivals, to secure the services of highly skilled technical personnel working for the acquired firms, to obtain key patents, and to enable T-H to expand its productive capacity. After all, it was much faster to buy existing facilities than to construct them. For example, when T-H acquired the Brush company, T-H's plant at Lynn was in operation twenty-four hours a day. T-H emerged as the dominant firm in arc lighting, having acquired most of the early arc-lighting manufacturers of any significance, except Weston that eventually became part of WH.

Arc lighting was used to illuminate wide-open spaces. Because it produced light by burning a substance primarily composed of carbon, it was restricted to uses where an open flame was permissible. In addition, the intensity of the bright light it produced could not be reduced. The substitute technology for interior gas

illumination was incandescent lighting. Thomas Edison was the pioneer-innovator in this field, while Elihu Thomson once more was an improvement-innovator.

When Edison approached the electrical industry in search of profitable areas of business, he focused his attention on incandescent lighting. According to Passer (1953), no evidence has been found to explain why he turned to the incandescent light in the fall of 1877. At that time, there were many inventors working on arc lights and incandescent lights. His choice might perhaps be explained as a marketing-oriented decision. The knowledge he did have that over 90% of the revenues of the gas companies came from home and office illumination, may have been decisive in his decision to concentrate on developing a system that could advantageously replace gas lighting in closed spaces. After his successful invention of an incandescent lamp late in 1879, Edison devoted himself to a careful and systematic study of gas illumination. Edison aimed at imitating the gas system as closely as possible, while differing from gas only in providing a superior and more desirable light. His approach put aside the arc lighting business path, which looked very promising, as well as every technical advance that had brought arc light to the commercial stage. In fact, to become as efficient as arc lamps were, the initially extremely inefficient incandescent lamp would require Edison to face various technological challenges and to invent a new system that bore no resemblance to the arc-lighting system.

Interestingly, both Elihu Thomson and the German Werner Siemens failed to anticipate a promising future for incandescent lighting. Both discarded incandescent lighting as business opportunities in the early 1880s. Edison had to face a number of technical challenges to design a competitive incandescent lighting system. In view of the low efficiency of the incandescent light, Edison had to design a new dynamo. To allow users to operate any light independently of the others, he wanted to use a parallel system instead of the series system used in arc lighting. In addition, introducing electric circuits into homes implied that voltages would have to be much lower than those in use with arc lighting. To carry out the invention of various components simultaneously, Edison organized his research laboratory in a way that enabled him to direct the work of his assistants on the problems that he

posed.

Besides his deep involvement in the technical aspects of the system, Edison was highly concerned with the economic factors. To him, the successful system was the one that could provide reliable and satisfactory lighting service for home at a price lower than gas. However, in-between inventing and marketing the system, there were manufacturing issues to be handled, which forced him to revisit his business philosophy. Edison saw himself in the inventing business, i.e., his inventions should generate patents valuable enough to provide him with resources to finance further inventing work. As a matter of fact, his entrance in the electrical field was being financed by previous inventions in other fields. Even before he had invented the incandescent lamp, he had formed the Edison Electric Light Company, which would own and license the use of the patents of electrical inventions he expected to conceive. However, given the complexity of the system he was to launch in the market, he was forced to create other companies to manufacture the incandescent lighting system components.

Patents were not very effective in protecting Edison's incandescent lighting system. For one, the complete technical details of the Edison system were published in a newspaper, the *New York Herald*, in December 21, 1879. According to Passer (1953), this happened "some time before Edison had intended it to appear. He was not then ready to market the lighting system, and would not be ready for several years. When Edison's solution to the incandescent-lighting problem was completely described in print, the other inventors working on the incandescent light were given the opportunity to work out their own systems while Edison was completing his" (p. 99).

Vigorous enforcement of Edison's patents rights could certainly have prevented usurpation of his inventions. Yet, Edison was extremely busy completing his system and directing the implementation of the first incandescent lighting systems and could not devote the required attention should Edison's company have initiated infringement suits against unlicensed use of Edison's patented inventions. Only in 1885 were the first patent suits initiated. Still, only one of these suits was

carried through – against the United States Electric Lighting Company – but the hearings did not start until 1889. Completion of the suit took two more years, and because the decision was appealed, it took an additional year for the Edison patent to be determined. Edison's company efforts to protect the business by threatening the other incandescent-lamp manufacturers and their customers were not very successful. In fact, most lamp manufacturers seriously questioned the validity of the Edison lamp patents to the extent that some manufacturers retaliated against Edison's suits by initiating suits against local Edison light companies (Edison's licensees).

After 1885 competition augmented further in the incandescent lighting market. George Westinghouse, who had started selling a dc incandescent lighting system in 1884 through his Union Switch and Signal Company, came up with his ac incandescent lighting system in the fall of 1886, marketed by the newly formed WH. In 1887, T-H began the production and sale of an ac incandescent lighting system. Shortly after, WH filed a suit against T-H for infringement of a transformer patent WH owned. The suit was dropped after T-H consented to a settlement whereby it recognized the validity of the patent and agreed to pay royalties per horsepower of rated capacity for each transformer sold. Later on, a supplementary agreement was reached setting minimum prices for the transformers, establishing penalty royalty rates for transformers sold in cities of less than 10,000 inhabitants, and specifying that WH was to supply T-H with certain types of ac equipment (Passer, 1953).

By 1891, EGE, T-H and WH were the three largest firms in the electrical manufacturing industry. Of the 3,000,000 incandescent lamps in use, nearly 1,300,000 were Edison, about 600,000 were T-H, and 500,000 were WH. WH was approximately equal to EGE and T-H in incandescent central station equipment in service, although it was much smaller than the other two in both sales, authorized capital and employment (refer to table 6.1).

	WH	EGE	T-H
Annual sales	\$5,000,000	\$10,900,000	\$10,300,000
Authorized capital stock	\$5,000,000	\$15,000,000	\$10,400,000
Employment	1,300	6,000	4,000
Number of central stations (incandescent)			
a.c.	350	none	500
d.c.	negligible	400	100
Central stations capacity in 16-candle-power lights			
a.c.	700,000	none	520,000
d.c.	negligible	750,000	82,000

*Table 6.1 – The Three Leading Firms in the Electrical Manufacturing Industry,
1891 (Source: Passer, 1953, p. 150)*

In addition to providing illumination, electricity was being explored as a means to produce mechanical power. Besides the three largest firms – EGE, T-H, WH – other concerns flourished in this field. By 1887, for example, there were fifteen manufacturers of small motors in the US who had produced about 10,000 such motors. Frank Sprague was a pioneer-innovator in the development of electrical motors, devices which transform electrical energy into mechanical energy. He started working for Thomas Edison in 1883, having resigned from Edison's employ in the spring of 1884 to devote all his time to motor work. In November 1884, he formed the Sprague Electric Railway and Motor Company. Primarily interested in research and development work, Sprague subcontracted Edison to manufacture the company's products. Up to 1887 these were almost entirely motors for industrial uses. In 1887, the increasing motor sales encouraged Sprague to establish his own manufacturing plant. While his motors were achieving increasing success in industry, Sprague was studying electric traction and secured his first railway contracts in the spring of 1887. To complete the Richmond railway project, Sprague had to handle a large number of technical problems whose solution contained the technical features that permitted

successful operation on a large scale and set the pattern for electric street-railway development. In fact, by the fall of 1889, eighteen months after the Richmond road began regular operation, Sprague and T-H had equipped 67 roads each, while 46 other roads had been equipped by other smaller manufacturers. After buying stock that the Sprague company had issued to support its growth, EGE absorbed Sprague in 1889.

T-H entered the field of electric motors in 1887, and early in 1888, its President, Coffin, stated that he considered the possibilities of electric lighting exhausted and that he consequently wanted to branch out into electric railway. To enter this new field, Coffin decided to acquire Van Depoele's firm, one of the companies already marketing an electric-railway system. Teaming up with Van Depoele, Elihu Thomson and a T-H engineer converted Van Depoele's small scale system into a large-scale one. By the spring of 1889, T-H had developed an electric railway system that could be used successfully on the largest streetcar lines of the US.

WH entered the electric traction field in 1890. Throughout the decade, a technical competition for designing railway motors took place between WH's engineers and those working for rival firms – initially those from EGE-Sprague and T-H, and later on those of GE (Reich, 1985). After GE's formation in 1892, the vigorous competition between the engineering staffs of WH and the newly formed GE produced radical improvements in railway motors. No evidence has been found that there was, at that time, any tacit agreement between GE and WH to set product prices and share the market. Being a very complex product, the railway motor had many components and features, which could be combined in several different ways. As a result, its design followed no rigid standard that could enable an easy comparison of competing products. Technical reputation of WH and GE engineering staffs propelled the improvement of the product stimulating price competition. Engineers believed that to be a real success, any ingenious design had to win in the market place. This required competitive prices, which were usually set on the assumption of heavy sales. In addition, the lifetime of new products should avoid the quality trap and the marketing dilemma (Passer, 1953). The frequent change in

design might lead rivals to build sales arguments associating frequent product design change with poor product quality. On the other hand, frequent launching of ever better new products might produce the marketing dilemma, whereby buyers postpone acquisition in order to reduce the risk of investing in outdated technology.

Besides illumination and electric dc motors for industrial use and railway traction, the alternating current system was being applied in electric power. Having started in 1888, it took WH six years to bring ac power to the commercial stage. By July 1893 WH was ready to supply ac power equipment on a regular commercial basis. In October 1893 WH won the generator contract for Niagara Falls, a victory over its major rival, GE, as well as over the ongoing disbelief in the ac system. In fact, the scepticism about the ac system was widespread. So much so that Lord Kelvin, a member of the International Niagara Commission, had advised the Niagara organizers to avoid the "gigantic mistake of alternating current" (Passer, 1953, p. 287). Although GE had entered the ac electric power later than the pioneer innovator WH, GE assigned its best engineers to the Niagara project, but it was WH who received the contract for the first three generators. GE was awarded contracts for the transformers, the transmission line to Buffalo, and the equipment for the substation there.

Competition in the ac business was remarkably intense. More than once, industrial espionage was an issue. In the course of the effort for winning the Niagara contract, WH made charges against GE. Some of WH's missing blueprints were found in GE's Lynn factory. Apparently, a janitor in the WH engineering department had stolen the plans from the company file. In September 1893 charges of conspiracy were brought against GE officials who admitted some of the espionage, but claimed that their only purpose was to learn of possible violations by WH of a certain injunction related to the manufacture of incandescent lamps. While price knowledge plays an important role in the preparation of bids for homogeneous competing products, in the context of heterogeneous, complex products, acquiring knowledge about rivals' product quality rather than their prices becomes of utmost importance. The Niagara Falls episode provides an example of such an attempt from GE to secure information concerning WH. Another attempt took place in the spring

of 1895, when WH charged that GE had paid a WH employee the amount of \$25 in exchange for information on WH's outputs in each line of business.

Having reduced the number of major players in the industry, the 1892 merger of EGE and T-H into GE contributed to somewhat decrease the competition intensity in the industry. As early as 1889, financiers who supported EGE started to plan a merger between EGE and T-H. Edison was opposed to the idea arguing that "if you make the coalition, my usefulness as an inventor is gone. My services wouldn't be worth a penny. I can invent only under powerful incentive. No competition, means no invention." (Passer, 1953, pp. 321-322) However, Edison held but a minority interest in EGE, and a number of other factors would dictate the carrying out of the merger. First, both EGE and T-H held strong patent positions in arc lighting, incandescent lamps and traction, having both firms significantly improved the quality of electrical products. Yet, neither could aim at producing top-quality goods without fear of infringing on each other's patents. Also, given that their manufacturing lines were complementary except in traction, out of a merger would come a very strong company covering the whole electrical field. Finally, EGE had the much needed capital resources T-H needed for expansion, and T-H's superior management team strongly appealed to EGE owners (Birr, 1957). In the newly formed GE, top management team included former executives from both companies, although the large majority came from T-H. Moreover, former T-H's president, Coffin, became the first GE president. Upon completion of the merger in April 1892, instead of three, the industry had two big companies, one (GE) being several times larger than the other (WH). Table 6.2 shows the three firms' strengths and weaknesses right before the merger.

Shortly after its foundation, GE faced the 1893 Financial Panic. Thereafter, and up to 1898, the electrical manufacturing industry faced depressed conditions. Besides the drastic shrinking in sales and profits, the utility securities that both EGE and T-H had accepted in part payment for equipment sold sharply declined in value. GE's assets had to be written off, having declined from \$50 million in 1893 to \$27 million in 1900. Such precarious conditions forced GE to adopt a conservative financial policy. GE's president, Coffin, once expressed his conservative philosophy to his comptroller: "Never take a profit until you have it, and always take a loss when there is any possibility of a future loss." (Fortune, January 1931, p. 98) Moreover, he subsequently used "the severe economic conditions of the mid-1890s to dictate terms to GE's often foundering competitors" (Reich, 1992, p. 309).

Notwithstanding this, GE had become the largest firm in the industry, and as bankruptcy threat was over, GE looked for further ways to stabilize relations within the industry. Relationship with suppliers is a case in point, and GE signed agreements aiming at more stable inter-firm relationships. For example, in 1895, GE signed agreements with Corning, Libbey, and the Phoenix Glass Co, agreeing to buy its entire supply of glass from the three companies and to divide its purchases in ratios of 2:2:1, respectively. No other lamp producer was to buy its bulbs and other lamp-glass requirements from those manufacturers more cheaply than GE, and in addition the lamp producer reserved the right to start its own glass production should it see fit (Bright, 1949).

Rivalry with WH remained strong. Apart from espionage, by 1895, WH and GE had filed hundreds of patent infringement suits against each other. The immense costs involved favored the signing of a patent agreement, which was to run for 15 years. The cross-licensing agreement between GE and WH in March 1896 brought to an end the hundreds of patent infringement suits that both companies had initiated against each other. The two companies exchanged licenses to all of their patents except those for electric lighting, due to specific clauses in GE's licenses to utility companies. Such clauses dated back to Edison's license granting period. When he started selling his systems he had guaranteed his licensees exclusive rights to use Edison's lamps.

According to the GE-WH agreement, the value of production was to be in a ratio of five (GE) to three (WH). Should either company exceed its share, it would pay the other a substantial royalty. Having reached this agreement, both companies started to sue smaller firms, forcing them either to license the patent pool or to sell their businesses to one of the two companies. Interestingly, most of the time, after one of them (for example, GE) initiated a suit against a third company, the latter would end up in the hands of the other company (WH, for example).

In August 1896, GE and 6 other companies organized the Incandescent Lamp Manufacturers Association (ILMA), which had for its purpose the fixing of lamp prices and the allotment of business and customers of each. Many other manufacturers joined ILMA later on. Agreements were made between ILMA members and WH, whereby WH agreed to maintain prices fixed and established by the association (Bright, 1949, p. 103-4). The following year ILMA fixed proportional output keyed to GE's sales and set prices based on GE's prices. GE was allotted 50% of the market, WH about 12%, and the remaining 35-40% went to all others. (Reich, 1992, p. 309)

As the nineteenth century came to an end, GE had accomplished many feats. It had become the largest company in the electrical industry, and together with WH, which was about half its size, they formed a duopoly fiercely competing with each other on technological innovations. Both companies had diversified in similar ways, and both held almost every line of product in the industry. Finally, GE had also established stability in the lamp manufacturing industry by means of the several agreements signed, which kept production volume and sales price under control.

However, during the 1890s, like most American electrical manufacturers, GE had been infected with complacency on technology improvement. At that time, many engineers would believe that most of the major improvements had been made by then (Reich, 1985). As a matter of fact, throughout the decade, GE had not made systematic efforts to improve incandescent lamps. It had spent small amounts on improving incandescent lamps (\$9,000, \$5,000, \$15,000 in 1894, 1895, 1896). Yet, little of this went to filament research, where breakthroughs would likely be made,

although GE did engage Edison's West Orange Laboratory to investigate new filament types (Reich, 1992, p. 311). Alarm sounded in 1898 when the Austrian von Welsbach developed a filament made from osmium that was 60% more efficient than GE's carbon filament and longer lasting as well (Reich, 1992, p. 311). Attempting to purchase threatening patents before they fell into unfriendly hands was a matter of GE's policy and throughout the 1900s GE systematically bought European patents. Among the patent applications and inventions acquired were Welsbach's (tungsten filament inventions), Bergmann's (all inventions and applications covering incandescent lamps and their methods of production), Just and Hanaman's (tungsten filament). But this defensive policy encompassed many risks.

To face the technological obsolescence threat, GE inaugurated its research laboratory in 1900. Although initially the Lab's primary purpose was to work on lamp development, by performing original research, the Research Lab was expected to discover new profitable fields for GE to exploit. So far, GE had tended to wait for outside developments in new fields that largely deviated from its established product lines (Reich, 1985). In fact, the eclectic scientific background its researchers had – chemistry, physics, mathematics – paired up with the open-minded approach to research its director Willis Whitney had, opened up the way for diversified research projects. Among the Research Lab first accomplishments were: metalized filament incandescent lamp, which came to be known as the GEM lamp (1905); ductile, pliable tungsten filament (1910); modern gas-filled lamp and neon lamps (1913). GEM consisted of an improved carbon filament, 50% more efficient than the standard carbon filament. The 1910 ductile-tungsten triumph gave GE a dominant position in the lamp industry (Liebhafsky, 1978). Although tungsten had been investigated from 1900 to 1908, no process had yet been conceived to turn it into a wire, which could be used commercially. Interestingly, GE's accomplishment had cost it about one-seventh as much as it spent in acquiring the American patent rights for the non-ductile tungsten filament (Bright, 1949). Yet, unwilling to abandon its carbon-filament lamp, for several years, GE would require that wholesalers and utilities accept shipments of carbon-filament lamps in order to get the GEM and tungsten filament lamps they wanted. (Reich, 1992).

During the 1890s, while GE was recovering from the 1893 Financial Panic and building a dominant position in the industry's well-established lines of business, WH was opening up new avenues of business and starting to expand abroad. WH's development path had differed from those of EGE and T-H, which had largely financed central stations. As a result, the 1893 Financial Panic did not affect WH as much as it afflicted GE. In 1896, George Westinghouse (GW) advanced in some detail his idea of a vast scheme of foreign companies (Prout, 1921). At that time, GW had established one electrical operation in England, and two other companies, in England and Germany, to operate in his first major accomplishment, the air brake business. The 1896 plan contemplated the formation of new companies in, Britain France, Belgium, Russia, and Austria (to include the Balkan States), while Norway, Sweden, and Switzerland "should probably be reserved for the Westinghouse Company (British) as part of its territory" (Prout, 1921, p. 263).

Despite a clear territorial demarcation as of each company's constitution, it might have eventually been advantageous for a company to sell or construct in the territory of a sister company. In such a case, a stipulated percentage fee should have been paid. In addition, patent rights, drawings, plans, specifications, and engineering and manufacturing information were to be exchanged. With the backing of the parent company, the European companies would be prepared to contract for complete installations of shops and city railways.

During WH's first decade, George Westinghouse (GW) expanded his empire of firms worldwide. Besides the vast and wide qualities as inventor, engineer, and businessman, GW possessed superior mental skills, which included unusual concentration and memory. According to Prout (1921), "In a certain eleven years, Westinghouse took out 134 patents, started six important companies which still exist, took the air brake through its one great crisis, and, most important of all, started the alternating current revolution in industrial history" (p. 306). In 1899 GW established British WH at Manchester, building a concern far larger than it would ever be needed for the next twenty years. During the first years of the new century GW organized companies in Russia, France, Belgium, Austria, Italy, and Canada.

In the 1907-1908 depression in the American economy, it was WH's turn to face major financial problems. Having grown his empire too fast and too large, the self-reliant GW took too many risks to implement his vision. The diversified empire GW had built around the world had been mainly financed with his own money. A few other investors held minor stakes in the business, and no powerful group of bankers had been protecting GW's companies. Quite on the contrary, GW had systematically refrained from bringing in financiers to his companies, because he would not give up control of his firms to any man or group of men. The 1907 Financial Panic in the American economy left WH in a poor situation, which called for the intervention of financiers. Although kept at the presidency, GW lost its power in the company and left it altogether in 1911. Internal coordination of the many pieces of the huge business and organizational systems GW had conceived had been mainly concentrated in his powerful mind. GW's removal from power left the company poorly articulated thereafter. In addition, the foreign subsidiaries GW had founded mostly in Europe were lost a few years after his departure. In fact, WWI and the Russian Revolution brought the destruction or sale of these plants. For the next fifty years WH's international activities would be restricted to manufacturing in Canada, licensing technology, and exporting through WH Electric International, the company's New York-based subsidiary.

The formation years analyzed

Our analysis seeks to uncover mechanisms that can *explain why and how GE and WH grew and became the two largest companies in the emergent electrical manufacturing industry, whereas GE grew twice as large as WH*. What possibly constitutes the most self-evident explanation, i.e., that GE was the result of the merger of two of the three largest companies in the industry, is deceptively simple. Not only does it fail to explain how the three companies – T-H, EGE, WH – grew into the three largest in the industry, but it also does not account for the major contraction the newly formed GE underwent shortly after its constitution to escape the bankruptcy threat. As table 6.1 shows, as of the merger, WH's sales were one-fourth the sum of EGE's and T-H's, its capital was one fifth, and its employment was one

eightieth. The fact that by 1910 GE was twice as big as WH indicates that not only GE contracted after the merger but also that WH grew considerably after GE formation. As a matter of fact, by 1900, WH's sales were \$12 million, while GE's were \$28.8 million. The understanding of GE's and WH's growth calls for a close examination of the growth mechanisms in operation throughout their evolution encompassing, therefore, the four firms concerned: T-H, EGE, the resultant GE, and WH.

Continuing growth, as opposed to one-time growth expansion, was the main process whereby these firms grew. The merger of T-H and EGE was undoubtedly a one-time growth expansion that provided GE with a superior competitive position in several lines of business. The complementary skills and the high reputations T-H and EGE had did play an important role in driving GE to a dominant position in the industry. However important in equipping GE with valuable, rare and hard to imitate resources (Barney, 1991), the merger by itself did not contain self-reinforcing elements capable of fostering continuing growth. Had not GE created its research laboratory, for example, GE might have faced very unfavorable conditions for growth, despite its huge size. After all, by then Thomas Edison was not anymore interested in the electrical industry meaning that the leading head in technology at the newly formed GE was Elihu Thomson, who excelled in perfecting other people's inventions. Although the merger gave GE market power to bargain better deals throughout the industry, it did not provide the company with inventive creativity to pioneer inventions. What is more, complacency, a quite typical behavior of large firms, took hold of the company's technical staff, who started to believe there was nothing else to discover in the electrical field.

A continuing growth process (Chandler, 1977) necessarily contains some sort of self-reinforcing mechanism that stimulates further growth. T-H underwent different kinds of continuing growth. In arc lighting, for example, T-H at first grew by replicating a quite simple technology (central stations systems), and then by acquiring rivals. As a substitute technology for gas illumination, arc lighting needed to be perceived as superior to the technology it intended to replace. As a result, arc lighting manufacturers such as T-H made strong efforts to demonstrate the superior

qualities of their systems and win over skeptical customers. However, as more arc lighting systems were successfully installed, skepticism tended to reduce. Therefore, the self-reinforcing mechanism worked at the diffusion level, whereby the more successful arc lighting systems there was, the larger the market for the substitute technology would become. Figure 6.6 illustrates this mechanism.

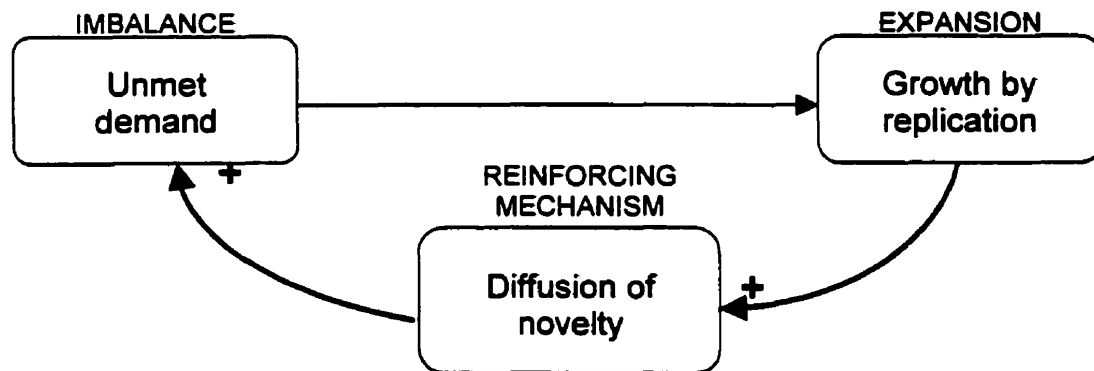


Figure 6.6 – T-H's continuing growth in arc lighting (initially)

Later on, as T-H developed improvement patents, built a reputation for quality, and put together its own marketing sales force, the former competitive parity that existed in that simple, non patentable technology ceased to exist. By building competitive advantage, T-H created an imbalance in the industry opening up opportunities for acquisitions of weaker rivals. By acquiring rivals, T-H's VRIO resources – *Valuable, Rare, Inimitable*, being the firm *Organized* to exploit their full competitive potential (Barney, 1997) – kept increasing: larger productive capacity and/or more key patents and/or more highly skilled personnel were added to T-H's assets. As a result, T-H's competitive advantage over rivals increased. The more the imbalance in the industry increased the better positioned T-H was to acquire remaining rivals (refer to figure 6.7). It is worth mentioning, however, that both types of continuing growth process faced limits above (or below) which growth ceased to exist: market size limited continuing growth in the first case, while in the second case, the number of competitors was the limiting factor.

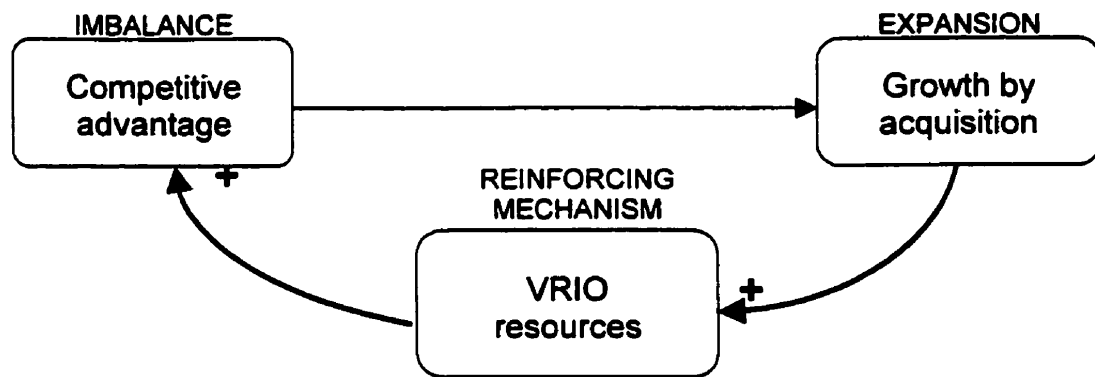


Figure 6.7 – T-H's continuing growth in arc lighting (later on)

Initially, T-H did not have to face the growth dilemma in the arc lighting business. Since rivals initially shared the same basic technology, cooperation occurred to sell potential customers the idea of the substitute technology. As there was plenty of space for all contenders in the market place, intra-industry competition was reduced. By the time it had increased, T-H had already built competitive advantages. T-H also escaped the dominance dilemma trap. Although the firm developed competitive advantages that gave it an increasingly dominant place in the arc lighting industry, and T-H did have patents upheld to defend its business, T-H did not restrict itself to defending its successful technology from other substitute technologies. On the contrary, T-H embraced new technologies as they seemed to succeed in the market place. By so doing, it entered the incandescent lighting technology, which would eventually replace arc lighting for open space illumination. The fact that arc lamps and incandescent lamps had complementary uses (open spaces illumination and indoor lighting, respectively) may have been a helping factor. Also, by not owning any major original idea such as Thomas Edison's incandescent light and George Westinghouse's alternate current, Elihu Thomson may have been intellectually and psychologically less constrained than pioneer inventors.

In many respects, EGE's growth in incandescent lighting was similar to T-H's growth in arc lighting. In both cases an external opportunity – the replacement of gas illumination technology – was grasped and pursued. Differently from arc lighting,

incandescent lighting did require plenty of innovative work to come to light. Thomas Edison's systematic work did not, however, provide EGE with the sought for competitive advantage. An event out of Edison's control – information leakage – ruined Edison's initial advantage and to a certain extent promoted the standardization of the system's main parts. Nevertheless, EGE managed to develop superior production processes that conferred its system a superior quality. Similarly to T-H, by replicating its system, EGE underwent continuing growth propelled by a self-reinforcing mechanism at the diffusion level. By virtue of information leakage, which diffused the main traits of the system, Edison faced the growth dilemma. By having involuntarily cooperated with potential rivals, EGE contributed to a faster diffusion of the new technology in the market, as well as to a higher degree of competition (refer to figure 6.8). In contrast to T-H, EGE did not engage in acquisition of rival companies. It was up to General Electric to do so later on.

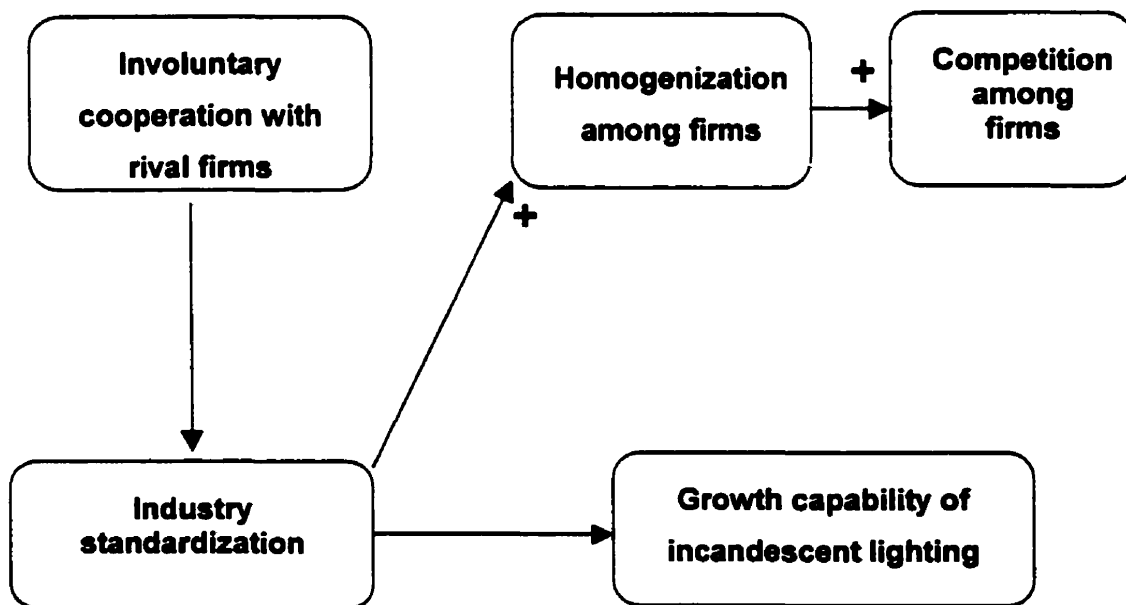


Figure 6.8 – Structure of the Growth Dilemma EGE faced

The growth dilemma was handled in a productive rather than defensive way: instead of pursuing patent infringers (defensive move), EGE focused on developing a superior lighting system (productive move). By so doing, EGE built competitive advantages over its rivals and lighting system competition was based on quality rather than on price. By developing competitive advantages, EGE achieved a dominant position in the industry and faced the dominance dilemma. In contrast to T-H, EGE refused to embark on the ac distribution system, which would eventually replace the dc system. As a result, by the time of its merger with T-H, EGE was a successful company, full of capital resources, but facing possible expansion limitation due to its technological dogmatism.

Similarly to T-H and EGE, WH grasped opportunities to apply new technology in the electrical field. In contrast to T-H and EGE, WH brought a radical change to the growing electrical industry. As a result, it faced skepticism both inside and around the industry, but at the same time it built a strong technological position in the industry. Like the other two companies, WH initially grew by replicating its central station systems. In contrast to EGE and T-H, patents did help WH to build and protect its initial competitive advantage in the ac technology. In fact, WH did force T-H to reach an agreement on WH's transformer patent. According to this agreement, T-H not only would pay royalties per horsepower of rated capacity sold, but would also agree to set minimum prices for transformers, and to buy certain types of ac equipment from WH. In addition, the diffusion mechanism contributed to reduce skepticism and increase the demand for the new transmission system. As a result, WH did not initially face a growth dilemma in its ac business. Yet, patent protection would prove short-lived.

Interestingly, patents held by the main players in the industry – EGE, T-H, WH – fomented inter-firm cooperation. By the mid-1890s, WH and the newly formed GE held each a large number of important patents. However, neither of them owned all the patents they needed. As a result, each company held hundreds of patent infringement suits against the other. Inter-firm cooperation was sought in order to eliminate the expensive and time-consuming legal procedures and allow the companies to grow their businesses. The cross-licensing agreement signed in 1896

was, therefore, the cooperative device that put an end to the deadlock situation in the industry (refer to figure 6.9).

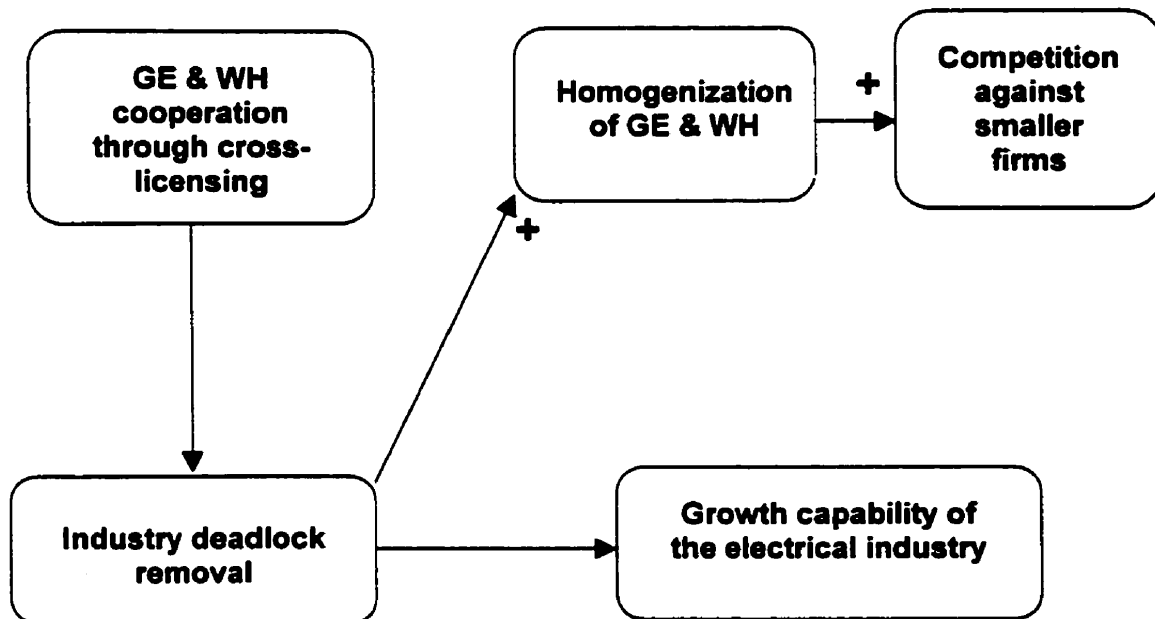


Figure 6.9 – Industry deadlock removal

The cross-licensing agreement produced two outcomes. First, it equalized GE and WH to a certain extent, and second, it gave them a competitive advantage over the other rivals in the industry. Over time, smaller rivals would be acquired by either of them (in a similar way to the mechanism portrayed in figure 6.7).

In sum, before GE formation, the three largest companies – EGE, T-H, WH – experienced continuing growth by replication (the diffusion mechanism). In addition, T-H and EGE also experienced continuing growth by acquiring rivals (the VRIO resources mechanism). After GE formation, WH and GE experienced continuing growth by acquiring rivals weakened by the cross-licensing agreement. T-H did not face the growth dilemma, while EGE involuntarily cooperated to enhance industry growth capability. After GE formation, WH and GE faced the growth dilemma, which was solved by creating two classes of firms in the industry. As for the

dominance dilemma, T-H escaped its trap by engaging in all types of technology in the electrical field, while EGE got trapped in it by sticking to the dc system. WH and GE circumvented the dominance threat by undertaking continuing innovation efforts.

Period II: the structured years (1910-late 1950s)

The structured years described

By 1911, the electrical industry structure comprised numerous small firms orbiting the GE-WH duopoly. However, as the new decade started, both companies would undergo important transformations. In 1911, George Westinghouse would leave WH, and his replacement would come from outside WH. In March 1911, the Department of Justice would file a suit against GE, WH and 37 other companies. According to Reich (1992, p. 314), "the Department of Justice brought equity proceedings under the Sherman Antitrust Act against GE and 38 other companies. The Department of Justice contended that relationships within the industry only purported to be competitive, but in fact amounted to close cooperation". The allegations maintained that GE controlled the lamp market through a variety of schemes. Moreover, they related to GE's relationship with National and other companies; to the use of process and improvement patents in the suppression of competition; to the preferential agreements with glass bulb and lamp-making machinery manufacturers; and to the distribution system that required wholesalers to accept a variety of lamp types while maintaining prices at levels chosen by GE.

As of 1911, National ran 18 subsidiaries that continued operations under each company's own name with coordination and technical services supplied from a central headquarters. GE's market share in lamps was 42% and National's was 38%. Besides, GE owned 75% of National's common stock and had an option to buy the remaining stock. As a result, between 1904 and 1910, GE had received about $\frac{3}{4}$ of the more than \$600,000 dividends paid by National (Bright, 1949). In 1910, GE had signed an agreement binding GE and National to buy 85% of their glass

requirements from Libbey and Corning (42.5% for each) and to make the balance themselves. Admitting the facts of the suit, but denying that they constituted violations of the law, GE argued that "the patents were inherently monopolistic and that its use was within the scope of the patent laws as well as in the spirit of the Constitution, all of which pre-empted the recent antitrust laws." GE agreed

- . to acquire the remainder of National's stock and make its ownership known;
- . to terminate special agreements with WH and with the glass bulb makers and lamp-making machinery suppliers;
- . to discontinue market-sharing arrangements with other manufacturers;
- . to stop setting the prices that wholesalers and retailers could charge for GE's lamps (Reich, 1992, p. 315).

Another, yet more auspicious, event took place in 1911. GE's Research Lab (GE RLAB) development of the ductile tungsten filament, which had been completed in 1910, was recognized in the courts, and GE was granted the ductile tungsten lamp patent. Later on, in 1912, the Just and Hanaman patent which GE had acquired in 1909 was granted and assigned to GE.

Following the October 1911 consent decree, which expressly stated that "patent licenses might specify any price, terms, and conditions of sale desired, although they could not fix resale prices" (Bright, 1949, p. 158), GE took a number of initiatives:

- . GE acquired Providence Gas Burner and became the only manufacturer of a full line of lamp bases in the US until 1923, when it sold to WH its trade secrets for the production of lamp bases. After that date, WH manufactured bases for its own use, while GE continued to supply other producers, both licensed and unlicensed. Unlicensed firms also satisfied some of their requirements through imports. Prior to 1927 the Providence Works allowed special discounts to GE lamp factories and to WH. In addition, GE was able to keep track of lamp output by the unlicensed firms through its sale of bases to them (Bright, 1949, p. 251)
- . GE acquired Fostoria Bulb & Bottle. GE produced bulbs for lamps until 1918, along with Corning Glass, Libbey Glass and 2 smaller glass plants. These later went out of business shortly after 1918, and GE and Corning were left in control of almost all

domestic production of glass parts for electric lamps (Bright, 1949, p. 252)

. GE: new licensing system was set up based primarily on the GEM and tungsten-filament patents (Bright, 1949, p. 236)

. (March, 1912) WH was granted a new A license to sell up to 15% of the combined net sales of patented lamps made by the two companies at a royalty of 2%; in 1919, it was reduced to 1%. The royalty rate rose to 10% on the value of sales exceeding the quota. WH was also bound to follow the prices, terms, and conditions of sale established by GE, although it was granted permission to use GE's "Mazda" trademark. WH was required to grant royalty-free licenses to GE under all its present and future incandescent-lamp patents for the duration of the license. GE did not grant a general license to WH under foreign lamp patents controlled by the licensor, although WH was licensed under the patents of certain countries. If WH had exported patented lamps to other countries, to which GE also could not export under its international agreements, it would have invited infringement actions under patents which WH had admitted in the A license were valid (Bright, 1949, p. 236)

. Agency plan of selling lamps: local dealers became agents under contract of GE. Stocks of lamps were not sold to them outright but taken on consignment, the company retaining ownership in the lamps while they were in the agents' hands, and relinquishing ownership only when the agent sold the lamps. Thus the sale by an agent to a consumer was a first sale rather than a resale (Bright, 1949, p. 237). In consequence, GE circumvented the prohibition to set prices to wholesalers and retailers. As the lamp owner, GE was entitled to set prices as it saw fit.

. GE took action against Laco-Phillips which was affiliated with Dutch Phillips and sold lamps made in Holland and exported to the US (Bright, 1949, p. 239), and won it in the courts (1916)

. Having had its patents sustained in court, GE decided to offer licenses under the Just and Hanaman patent to all firms that had been producing tungsten-filament lamps in 1915. These licenses established a quota system that permitted each licensee's business to grow in the same proportion as the incandescent lamp business of GE. Patent licenses were not offered to those producers who had initiated operations after the patent had been adjudicated. The new licenses granted to the smaller companies were called B licenses. They permitted each firm upon payment of a 3% royalty to make and sell a specified small quota of incandescent

lamps, based on the ratio between 1915 sales of tungsten-filament lamps by the company and by GE. Whereas WH could make both large and miniature lamps, almost all the lesser companies were licensed only for one or the other, and they were not licensed for export at all. They agreed to extend royalty-free licenses to GE under all patents or rights relevant to electric lamps owned or controlled by the licensee during the term of the principal license. Such licenses were to continue for the full life of each patent, however. The licensees were permitted to establish their own prices, terms, and conditions of sale, but they were not allowed to use the "Mazda" trademark (Bright, 1949, p. 240-41)

. As a matter of policy, GE would avoid to drive patent infringers out of business by competitive price reductions. Instead, GE would eliminate these independent lamp manufacturers by legal action and/or purchase (Bright, 1949, p. 243)

By developing the ductile-tungsten filament in 1910, GE RLAB had accomplished the basic mission that had motivated its creation: to defend GE's most profitable business, by putting GE in control of a superior technology. From then on, GE RLAB would work to help GE maintain a dominant position in the field. GE RLAB would work to assure GE's control of improvements to ductile-tungsten lamp technology, of any other filament materials that might compete with tungsten, and of lamp manufacturing methods that might bring down manufacturing costs. In fact, as late as 1939, when the basic tungsten patents had expired many years before, GE still retained 87% of the American lamp business due to its sustained competitive advantage.

The 1910 accomplishment, however, gave GE RLAB such respectability within the corporation that allowed for a few changes in the lab's policies. Research was diversified into other fields such as X-rays, vacuum tubes and radio. GE RLAB's director, Whitney, would add many new staff with varied scientific background. Whitney believed that chance favored the prepared mind. He had two management concerns: to provide researchers with an encouraging environment, while to also get researchers to work on those types of problems he believed suited most the company's commercial interests. In sum, in the course of its first two decades, GE RLAB had fulfilled its promises. It had actually defended GE's most profitable

business, lamps; had launched new ones in the fields of radio, appliances (electric toaster in 1905, refrigerator in 1917) and X-rays; and had gained the respect of scientific leaders around the world for its contribution to knowledge. (Wise, 1985, p. 248)

In 1912, WH was changing the top command composition. An outside executive, Guy E. Tripp, was chosen to replace George Westinghouse as Chairman of the Board. Meanwhile, Coffin was concerned about GE's future. The antitrust menace had been successfully handled, but Coffin perceived the wide influence of law issues on the firm's continued existence: patent disputes, trade controversies, domestic and international contracts, employees' rights. This same year, he brought in Owen D. Young, a lawyer who once had defeated GE in the courts, and who would eventually replace Coffin upon his retirement in 1922. Young put in order GE's law department and adopted a hybrid approach when defending the company in the courts. Whenever possible, Young would attempt to make his litigations not only a defense, but also a source of new and profitable activity for the company. For example, in 1916, Hoskins Co. sued GE for patent infringement. GE defended the case and lost it. Then, Young persuaded GE to take an interest in the Hoskins patent, and together, Hoskins and GE granted licenses to more than 100 rival companies.

WWI was to bring new challenges to US corporations. On the one side, the Army took away an increasingly large number of workers to fight in Europe. On the other side, military problems presented high-tech companies with an opportunity to show their problem-solving skills and expand into new fields. A case in point is GE's X-ray tubes. Research on X-ray tubes initiated at GE's Research Lab (GE RLAB) in the late 1900s, had enabled GE RLAB to manufacture X-rays on a small scale. Working on solving its several technical weaknesses, GE RLAB engineers came up with a new, more complex tube. Assessing its commercial prospects, GE RLAB engineers suggested the manufacturing of these new tubes to be discontinued. In their view, given their higher complexity, and consequently higher price, the market for them would be too small to warrant manufacture. GE management insisted that production should go on, notwithstanding. As a GE patent counsel clarified:

GE had no interest in invading foreign lamp markets: it already received income from foreign lamp sales through the equity positions; it wanted to maintain mutually beneficial relationships with would-be foreign competitors to keep them out of the American market, which regularly comprised half the lamp sales in the world. Lamp prices elsewhere were low as a result of competition (Reich, 1992, p. 313).

In 1919, not seeing much commercial future in the radio technology, GE was inclined to sell its radio patents to the British Marconi. However, Franklin Roosevelt, as Assistant Secretary to the Navy, wrote to Young asking GE not to sell its patents to any foreigner. GE decided then to enter the radio business. This same year, GE bought from British Marconi the latter's interest in American Marconi and organized Radio Corporation of America (RCA). RCA took plant, patents, personnel, goodwill, and other assets of the American Marconi, which was dissolved. Articles of incorporation provided that executives must be US citizens, that foreigners could not hold more than 20% of RCA stock, and that a representative of the Navy should attend board meetings (Fortune, Sep 1932, p. 48). By virtue of its patents in wireless transmission, AT&T was brought into RCA in 1920. By 1921 WH had rounded up many of the wireless patents not controlled by RCA, particularly the Armstrong regenerative circuit patent, which was a basic item in radio receivers. In 1921, WH was to join GE and AT&T, turning its patents into the RCA pool. It was agreed that the radio music boxes, now christened Radiolas, should be manufactured jointly by GE and WH in the proportion of 60% and 40% and should be bought by RCA at cost plus 20%. The patent pool was sufficiently extensive to make the legality of any independent radio set extremely dubious, yet, by Dec 1, 1923, it was estimated that the radio industry included 200 set makers and no less than 5 000 parts makers. All operated in complete disregard of RCA patent control and all, from the RCA standpoint, were flagrant patent infringers. Yet, almost from the first months of the radio boom they took from RCA a majority of the radio-box business. In the early days, RCA sold about 1 set out of every 3. In later times the proportion dropped to about 1 out of every 4. And in many radio seasons a single competitor (usually a different competitor in different years) outsold the RCA itself (Fortune, Sep 1932). In several respects, the radio-tube industry developed very differently from the lamp industry, leading "radiomen at Sylvania sound a little unhappy when they say that

RCA did not know how to exercise the same kind of leadership as did GE" (Fortune, May 1947):

- . Although RCA held most of the basic patents, it did not erect any protective tent over production volume or prices;
- . RCA granted licenses to all comers on a royalty basis only. No quota or price-maintenance provisions had been incorporated in the licenses;
- . RCA had initially followed a high-price policy, attracting new competitors;
- . When RCA tried to freeze out dozens of little tube companies which sprang up it was not successful. The insertion of a clause in its licenses to radio-set manufacturers requiring the set manufacturers to use only RCA tubes was contested in the courts and RCA lost the suit;
- . Radiolas were built in several GE and WH establishments, with neither in a position to give orders to the other. Mass production of obsolete sets went ponderously on for months before new models, slowly filtered through parent company and subsidiaries, finally arrived at the plant.

In 1922, Charles Coffin retired and was replaced by the pair Gerard Swope-Owen Young, whose educational backgrounds were engineering and law, respectively. This same year, three industry organizations – the Electric Power Club, the Associated Manufacturers of Electrical Supplies, and the Electrical Manufacturers Club – merged into a group that in 1926 would be called the National Electrical Manufacturers' Association (NEMA). To accomplish its purpose – "to advance the art of manufacturing adequate and reliable electrical equipment and to standardize apparatus" – NEMA intended to cooperate with the American Department of Commerce in constructive work, both in standardization and simplification. Each electrical manufacturer sent delegates to NEMA meetings to exchange market statistics and other information, as well as, to further the adoption of standardized product quality, dimensions and ratings. Such meetings fostered cooperation among competitors in several fronts. Intent on avoiding any appearance of illegal collusion, NEMA members stayed away from price discussions. However, discussions of standard cost-accounting systems and of average cost were held. According to one company attorney, clear effort was made "to establish a uniform system of accounting, which naturally results in uniform prices." (Sultan, 1974, p. 29)

Aware of the increasing antitrust enforcement, most companies were prudent in what concerned holding meetings with competitors. As a result, the practice of holding two types of meeting – an official one with minutes duly recorded and NEMA officials present and an informal one with discussions off the record – emerged.

In 1924, the government brought an antitrust suit against GE and WH. These companies were charged that the license agreement between them and their agency system of distributing lamps were illegal. In November 1926, the Supreme Court stated that GE owned patent rights that covered entirely the manufacturing of electric lights with tungsten filaments, and that secured to GE the monopoly of their making, using and vending. This decision in fact held that a license to produce a patented product may include a price-fixing clause. In June 1928, GE and WH agreed to sign a new "A-type" agreement dated as of January 1, 1927, and scheduled to run out in 1944. The new agreement licensed WH to make several other types of lamps covered by GE patents; increased WH's quota to 22.4421% of the aggregate net domestic sales of electric lamps by GE and WH, increased WH's quota 1% each year until 1930, when it would become fixed at 25.4421%; fixed the royalty at 1%; and included a penalty of 30% for exceeding the quota. In sum, WH's share of the industry was increased. On the other hand, GE managed to prevent uncontrolled competition.

Throughout the 1920's, GE helped Europeans to organize the international lamp cartel, and brought to market a revolutionary refrigerator technology. European lamp manufacturers faced a highly competitive situation that eroded profits. Although GE declined to join the international cartel, Young's intervention helped the European manufacturers to form a Swiss corporation to administer quotas, prices, exchange of technical information, and sharing of patent rights. As for the refrigerator, GE had not been a major player in the field dominated by General Motors' Frigidaire division. However, in 1929 GE came out with a new concept of a hermetically sealed refrigerator, the Top Monitor, which became the dominant design from then on. For four years, GE benefited from its competitive advantage increasing dramatically its market share and reaping large profits.

consequence, the informal meetings went underground.

In the 1930s, a number of events – antitrust suits, patents expiration, foreign competitors – started to menace the industry structure in place. An antitrust suit against RCA was initiated in 1930, which called into question the relations of GE and WH with RCA. A consent agreement was reached a few years later, whereby GE and WH would not anymore hold stock positions in RCA. In 1933, GE lamp patent ran out, but GE managed to grant new licenses to its licensees, in essentially the same form, scheduling licenses to run out in 1944. In the early 1930s cheaper Japanese lamps invaded the American market. To counter the increased lamp imports without reducing standard lamps prices, GE and its large-lamp licensees brought out a new line – Type D – of incandescent lamps. This model, designed to have fairly high efficiencies and short lives, would be priced cheaper than the products in their standard lines. An appeal was also made to the US Tariff Commission to raise duties on incandescent lamps. The Treasury Department ordered the imposition of dumping duties against Japanese lamps on the ground that they were likely to be sold at less than fair value and injure the domestic industry. In addition, Japanese lamps with markings similar to GE's had their admittance refused. As a result, Japanese lamps had their market share progressively reduced over the years.

In addition to antitrust suits, patent expiration and foreign competition, several companies that licensed GE patents started to take independent initiatives, signalling their search for autonomy. In 1937, for example, WH created an overall advertising department, initiating high-powered institutional advertising for the first time in its existence. A huge effort at the time, WH's advertising appropriation was \$4.3 million, nearing its \$5.5 million R&D budget. In 1938, Sylvania, a lamp producer, came out with its own fluorescent lamp shortly after GE & WH had announced their fluorescent line. Moreover, in the mid-1940s GE's lamp licenses expired and were not renewed.

On top of these events in the industry, the almost five years long Great Depression imposed severe damages to the American economy. The electrical

industry was seriously affected in most of its product lines. Sales declined abruptly and electric manufacturers profits were progressively squeezed. Notwithstanding these unfavorable conditions, GE managed to remain profitable throughout the Depression years. By keeping lamp prices unchanged, its efficiently run lamp business enabled GE to make profits while its competitors were losing money. As a matter of fact, in 1933, while GE lamps income was \$17.6 million, GE's other businesses had a total loss of \$11 million dollars.

Throughout the 1930s, the informal meetings among competitors evolved into an organized effort to influence market prices. As of 1937, "regular covert meetings to discuss prices were being held" (Sultan, 1974, p. 33) to train everybody to understand one common approach to figuring a book or list price for product lines of increasing complexity and diversity. Although during WWII the industry operated with government control over prices, those meetings continued for the purpose of supervising pricing. By the end of the war, an allocation system for sealed-bid business was in place for some lines of product, such as switchgear (Sultan, 1974).

In 1938 the American economy faced depression again, and once more, the electrical industry experienced sales and profits decline. Throughout the industry, productive resources were underused or idle. Facing a likely contraction in their productive resources, several GE plant managers looked for other uses of their manufacturing facilities. They initiated contact with the military, and having realized that their plants could be adapted to manufacture arms, they started to produce weapons even before WWII started.

Shortly after the war broke out in Europe, the American government approached large industrials, such as GE and WH, seeking their help in the war effort. Both companies agreed to cooperate, although GE approached this opportunity more aggressively than WH. Not surprisingly, by war end, WH had increased its floor space by 18%, while GE's floor space had augmented almost 40%.

During the war, the granting of new patents was suspended so as not to

impact the war effort. Cooperation among peacetime competitors was to take place in several instances, such as the handling of common supplies, and the transference of knowledge. Law suits were suspended for the duration of the war. A case in point is the 1941 Government's suit against GE contending that the last basic patent on incandescent lamps had expired in 1933, alleging therefore that the licensing system constituted an illegal restraint of trade. The war effort did engage the whole nation, and the relations between management and unions were not antagonistic.

WWII brought new opportunities for manufacturing expansion, technology advancement, and diversification into new fields: defense material, electronics, nuclear energy, and materials. Both companies would diversify into new technological fields. Moreover, as of 1944, WH International announced that in addition to its international licensing program, it was going into business as an importer.

As the war came to a close, Wilson and Reed returned to their top positions at GE. It became increasingly clear that the former industry structure was about to change. The stable duopoly of the large integrated electrical manufacturers, GE and WH, surrounded by numerous smaller companies offering limited lines of electrical products would be threatened from inside and out. Smaller firms in the industry would dare to undertake new technological challenges and the former state of controlled competition was to never be active again. Besides, new high-tech companies were to emerge, and foreign competitors were to start to grab increasing shares of the American electrical industry.

GE's planning studies indicated the likelihood of a consumer products boom in the post-war years. In consequence, at war end, GE underwent major conversion efforts and heavily invested in consumer appliances. In 1948 GE started to mention the need for "broadening the base", signalling that GE acknowledged a growing need for reducing product prices and increasing their volume. The scope of WH's conversion work was considerably smaller, since 80% of its war production consisted of normal industrial products such as turbines and generators. Industry players were busy repositioning their portfolio of businesses. GE directed strong efforts into

consumer products and defense contracts, while WH was slower at taking such initiatives, having initially stressed the familiar heavy apparatus business, which before the war had been more profitable than consumer appliances (Fortune, August 1958, p. 89).

During the post-war era American companies faced both opportunities and threats. For one, the 1946 depression brought unemployment and strikes. Still, industrial companies were offered numerous expansion opportunities in their traditional lines of business, as well as in many wartime technologies. GE & WH started to diversify into new areas such as nuclear, aircraft gas turbines, electronics, and radar. WH radio broadcasting operations expanded into television broadcasting, while GE electronics business expanded into computer manufacturing. In addition, in both companies, defense systems would gradually account for growing shares of the company's total business. Moreover, both companies changed their top management position in 1950. Gwilym A. Price, who had been brought to WH in 1943 to negotiate the termination of war contracts, replaced Robertson as WH's Chairman, while at GE Ralph J. Cordiner replaced Charles Wilson.

The structured years analyzed

Our analysis aims at examining *why and how GE & WH kept a synchronic path along which both firms grew and GE kept its size leadership over WH*. While in period I firms and industry grew from scratch, in period II they grew within an existent industry structure. As a result, the analysis done here differs from the one advanced for period I. Rather than focusing on continuing growth mechanisms – which were also in action not only in the new businesses the two companies entered, but also in the existent businesses they developed further throughout period II – this analysis explores possible explanations for the synchronic growth GE and WH experienced during the whole period.

Two main features characterize this period, and in both, GE played a major role. First, the industry structure stabilizes and second, the benign circle of power

inspires business diversification. As a result, the two integrated electrical companies evolved their portfolios of businesses in very similar ways. In fact, throughout this period, GE and WH competed in virtually every line of business except radio broadcasting, elevators and escalators (where GE did not compete).

The American electrical manufacturing industry structure evolved into an *umbrella structure*. By coordinating industry players, actively promoting innovation, and neutralizing external sources of change, GE systematically crafted a protective cover for electrical manufacturing firms. As the industry coordinator, GE occupied centerstage, and reserved a privileged position for WH, while most other industry players orbited these two companies. During this period, the most important business segments were lamps, apparatus, and appliances. While lamps profits were proportionally the highest and most regular in the industry, apparatus accounted for the bulk of sales, which heavily depended on the state of the economy, and appliances were the most promising segment. Most importantly, the umbrella structure provided all players with handsome returns.

Umbrella shaping started at GE's foundation. To reap the potential benefits of Edison's lamp patents GE initiated a number of coordinating actions in the industry: supplier agreements (glass bulb, lamp-making machinery), cross-licensing agreements with WH, market sharing agreements, incandescent lamp manufacturing association (ILMA) creation, independent lamp manufacturers financing (National), participation in foreign electrical companies' capital, price fixing. GE lamp business strategy aimed at two major goals: to maximize margins and to avoid price-based competition.

Margin maximization calls for value perception increase and manufacturing costs reduction. Product (GEM, tungsten, Mazda lamps) and process (lamp manufacturing) innovation developed at GE's research laboratory enabled GE to achieve both. Research work increased the product quality of existing lamps, as well as inventing new lamps for new uses, contributing therefore to sustain and even increase perceived value levels. Manufacturing processes were also improved in the lab so as to enable GE to benefit from scale economies. However, in the event of

price war, product margin is likely to reduce considerably.

To neutralize potential sources of downward price pressure, GE sought to keep under control both volume production and product price in the industry. Its licensees were allocated quotas expressed in terms of GE's own production. As a result, the whole industry would harmoniously increase or eventually reduce production, avoiding the formation of undesirable inventory, which might exert strong pressures on product price. In addition, through its commercial practices, which evolved from retail price fixing to consignment schemes, GE would set industry prices.

GE's strategy in the lamp business was extremely successful. Lamp profit margins were the highest among electrical products, not only contributing significantly to GE's total profits, but also protecting the firm from losses during the depression years (in 1933, for example, the \$17.6 million lamps income neutralized the \$11 million losses in all other GE's businesses). To accomplish its goals, GE effectively handled different modes of change. Internally oriented actions were undertaken to foster both *qualitative* (new products, new processes) and *quantitative* (mass production) types of change. In sum, GE sought to explore promising new business avenues, as well as to fully exploit existing businesses. At the interactional level, *cooperation* (GE-WH patents cross-licensing) was sought to enable continuing innovation and industry growth, while *competition* was maintained at the technological level and practically suppressed at the market level. *Structural* change (Dutch Phillips in the 1910s, Japanese entry during depression) in the market share of existing firms was halted and reverted by means of competitive actions and protective legislation. Finally, *random* change (technological innovation) was managed so as to increase GE's chances of success: besides taking R&D initiatives deliberately seeking to pioneer innovation, GE neutralized WH's chances to gain a competitive advantage by means of the cross-sharing of present and future patents. Moreover, participation in European firms capital and licensing agreements neutralized the threat of being outpaced in lamp-related technology. Figure 6.10 synthesizes GE's change handling in the lamp business, where the goal-directed mode provided the guidelines concerning pursued goals.

Orientation	Goals	Change handling initiatives
Internal	Maximize: (Perceived Value – Cost)	<i>Qualitative</i> : innovative products <i>Quantitative</i> : innovative production processes
External	Neutralize: external sources of change	<i>Competitive</i> : controlled at the market level (volume & price) <i>Cooperative</i> : patents cross-licensing <i>Structural</i> : fiercely fight new entrants <i>Random</i> : minority participation in foreign firms

Figure 6.10 – GE change handling in the lamp industry

By its very nature, *causal* change (economic, political, social, etc) remained beyond control. Under favorable external conditions, the whole industry would grow synchronically, while contraction would result in the event of unfavorable conditions. Lamp manufacturing, therefore resembled, Porter's (Porter, 1988) five star industry, since return was maximized due to successful neutralization of the pressures forcing down industry profitability. *Suppliers and buyers* were neutralized by means of agreements and consignment schemes; *new entrants* were neutralized by recourse to legal suits, governmental legislation or new products specially designed to compete with foreign products; *rivalry* was neutralized through volume production and price control. Being itself a substitute technology to gas lighting, electrical lighting did not face the pressure of *substitute products*.

GE's initiatives did bring stability and profits for all industry players. However, profits were unequally distributed among participants. GE held the largest market share, continually launched new and better products and kept improving its manufacturing process. As a result, both its margin and total profits were far greater

than its competitors'. WH held the second largest market share and actively participated in the innovation initiatives (Mazda lamps, for example). Over time, it successfully negotiated increases in its production quota as well as royalty payment reduction. WH, therefore, occupied a privileged, second-best position in the lamp manufacturing industry.

The electrical apparatus industry structure also took an umbrella form. Cross-licensing between GE and WH and the complex nature of the custom manufactured products contributed to limit the number of integrated manufacturers in the industry. As a matter of fact, GE and WH dominated the apparatus segment, holding the two largest shares of the market, while facing a number of smaller, specialized rivals. Allis Chalmers was the most important rival. GE's relationship with foreign electrical manufacturing companies protected the American market from foreign competitors. Besides, the organization of industry firms around NEMA, government's NRA (National Recovery Act), government's control over prices during WWII, and the informal underground meetings to fix prices, organize sealed-bids, and establish market shares contributed to reduce price-based competition and to foster market share stability. In addition, utilities companies were not qualified to integrate backward into apparatus manufacturing. As a matter of fact, their dependence on apparatus manufacturers was extremely high. As a way to counterbalance manufacturers power, specially the GE-WH duopoly, utilities would stimulate competition between manufacturers and, whenever possible, distribute an order among competing firms. Interestingly, it was in the best interest of most players – utilities, government (as a customer and ruler), the companies (GE and WH) – that both GE and WH be in good shape.

The benign circle of power concept inspired diversification into appliances. However, the appliances segment structure did not develop into an umbrella type. The first mass produced appliance, radio, whose market launching was even more successful than lamps, did not reward its patents owners as lamps did. Two main factors seem to explain the pioneers' failure to reap their patents benefits: lack of vision and low technological complexity. Contrary to lamps, whose market already existed and was expected to keep growing for a long time, radio was a totally new

product for which no infrastructure – broadcasting stations – had been developed. In view of this situation, the pioneer companies, GE, WH and their joint-venture, RCA, expected but a small volume of sales for military uses. As a result, product price was set high and issued licenses did not stipulate any kind of production volume constraint. Contrary to apparatus, radio technology did not involve complex manufacturing technology. Imitation, therefore, could easily flourish. And so it did, as the market boomed demanding a product whose price promised very generous returns when mass produced. In sum, the pioneer's initial competitive advantage could not be sustained for long. Likewise, other appliances, such as GE's Top Monitor refrigerator, did not reward their inventors for long, since industry rivalry was intense. Given that appliances accounted for but a portion of the whole electrical manufacturing industry, the umbrella structure in lamps and apparatus provided a protective cover to most electrical manufacturers, enabling them to grow in line with the general state of the economy.

Finally, by undertaking this "umbrella strategy", GE simultaneously built defenses for the whole industry and underwent productive expansion. In sum, GE took what can be called a *hybrid approach* to expansion, i.e., expansion stimulated by both defensive and productive motives. By so doing, GE circumvented the dominance dilemma. By undertaking productive expansion, WH also circumvented the dominance dilemma, although its expansion was not consistently stimulated by defensive motives.

Period III: the restructuring years (late 1950s on)

The restructuring years described

By the late 1950s, both companies had heavily diversified into appliances manufacturing to complement their apparatus and lamps businesses. The electrical industry, however, was under close scrutiny of the Justice Department. In fact, GE, WH and 27 other electrical manufacturers were facing the courts. Forty-five of their executives were charged with conspiring "to fix prices, rig bids, and divide markets

on electrical equipment valued at \$1.7 million annually" (Fortune, April 1961, p. 133). The trial came to an end in 1961, revealing that GE had been involved in 19 conspiracies, concerning products, which accounted for more than 10% of GE's total sales. GE received total fines in excess of \$400,000, and WH \$370,000. Fifteen GE executives were sentenced. Three GE executives, and two from WH were sent to jail for thirty days.

In addition to the electrical products, by the late 1950s, they had diversified into a number of technologically connected fields. A case in point is electronics. Early starters in radio manufacturing, GE and WH occupied important positions in the electronics industry, which had become concentrated over time. GE together with RCA produced nearly 25% of all electronic goods. In receiving tubes, GE, Sylvania and RCA produced over 70% of those made in the US. WH was one of the other five significant tube makers. However, electronics was undergoing a major transformation. Vacuum tubes still dominated the market, but they were gradually losing ground to semiconductors. Also, new firms were threatening the leading firms in the field.

New promising high tech-oriented businesses had emerged by the end of WWII. The cold war and military conflicts around the world turned the American government into a demanding customer of high tech products. GE, and later on WH, devoted increasing attention to this market, so much so that by 1958 defense products accounted for 24% of GE's sales having remained an important source of revenues for GE up until the 1970s. In the early 1960s, WH defense products accounted for around 20% of its revenues, having developed expertise and reputation in several technologies such as radar systems and underwater weapon systems. As of 1994, government contracts still accounted for 26% of WH's sales.

Nuclear energy was another promising field into which GE jumped as early as 1946, being followed by WH two years later. Proposing two different types of technology, the two companies engaged in a fierce competition for world leadership in nuclear power stations. By 1976, WH led in nuclear power over its nearest rival, GE, in both sales and profitability.

Research laboratories in each company produced innovations in several fields. WH, for instance, developed new products and processes in water purification, air pollution monitors and control, high-power gas lasers, to name a few. GE had, among other things, managed to manufacture man-made diamonds, to produce artificial rain, and to develop some types of plastics that could replace metals and glass in certain applications. In the late 1950s and early 1960s, GE launched a number of "growth ventures", including computers, commercial jet engines, new chemicals and plastics.

During the 1960s WH re-examined its international strategy. As WWI came to an end, WH had lost most of its investment in its 12 foreign subsidiaries. From then on, the company mainly exported its products or licensed technology. The Canadian subsidiary was the only manufacturing operation it still owned abroad. Donald C. Burnham, Price's successor, conceived an expansion strategy to internationalize and transform the domestic WH into a multinational firm. WH would buy several companies in Italy, Belgium and France, and merge them into a single operation that would "start life with \$1 billion sales." (Fortune, January 14, 1980, p. 49) In 1969, however, this strategy was deeply weakened, as French President de Gaulle vetoed the acquisition of a keystone French company. Intent on expanding WH domestically, as well as, internationally, Burnham changed the overall strategy, adopting a piecemeal approach. By breaking WH into 4 companies, Burnham gave each of the four presidents enough autonomy to search for growth opportunities. By giving WH's 125 division managers responsibility for both foreign and domestic business and by establishing an operational goal of 10% growth in sales per year and a 15% return on investment for each division, Burnham impelled division managers not only to create new lines of business, but also to find customers and companies to acquire abroad.

Growth efforts at both the domestic and international levels brought a considerable increase in the quantity and diversity of businesses in WH's portfolio. New businesses included water-desalination plants, low-cost housing, land development, water-quality control, car rentals, motels, health care, soft-drink

bottling, chain of resort inns, mail-order, Swiss watches. By 1976, WH's foreign business accounted for 31% of total sales, a volume 3 times as large as the 1971 foreign sales volume. What is more, from 1969 to 1973, WH's total sales grew, while GE's were declining (refer to figure 6.3). As a result, for the first time in the history of these two companies, financial analysts were inclined to recommend WH's stock rather than GE's.

Indeed, the two decades following GE's outstanding 1957 sales performance, were problematic. GE was increasingly losing ground in electronics. Its dominant position in the profitable tubes segment turned its initial advantage in the field into a weakness, bringing about unproductive hesitation and delayed action. In the computer business, GE belatedly entered the field in 1957, initially targeting special-purpose computer segments – banking, utility billing, and credit accounting. In 1960, GE decided to become a general-purpose computer manufacturer like IBM, aiming at reaching a 10 to 15% market share. As of 1969, IBM's market share was 69%, while GE was fifth in the industry with a 4% market share. After 12 years of losses amounting to \$209 million dollars, in 1969, GE's computer business had produced a modest profit for the first time - \$4.7 million dollars. GE decided to take advantage of this favorable situation to sell its business. GE moved ahead of other rivals and managed to negotiate exit from its computer business at very advantageous conditions, given the circumstances. In the nuclear field, as early as 1955 GE had built at a loss the world's first commercial-size nuclear power plant. The \$15 to 20 million losses were looked upon as an R&D expense, given that the actual building of the plant enabled GE to resolve thousands of engineering issues that could not have been solved at the drafting table. Notwithstanding the project's technological success, similar plants could not be sold at a profit throughout the next 8 years. Then, GE came out with the turnkey plant concept, in which GE "not only supplied the reactor, but took full responsibility for building the entire plant – bricks, mortar, and all – at a fixed price" (Fortune, 1970). Between 1963 and 1966, the concept was very successful at getting GE nuclear power plant contracts. However, miscalculation of costs, which inflated as much as 20% a year as of Vietnam War, left GE in a poor position. GE, which wrote off engineering and development costs as they were incurred, estimated that its nuclear business would not be profitable

until the late 1960s. As a result, in 1966 GE quit making turnkey bids, and WH followed suit. By 1970 GE had lost over \$200 million in the nuclear venture.

As for GE's core businesses, the booming economy in the late 1960s caught GE short of capacity in lamps and appliances. The rapid capital expansion it undertook to restore capacity depressed the company's earnings even further. Some of its old businesses, such as small electric motors and lamps, continued to be highly profitable, providing in some cases a return on investment as high as 40%. However, foreign competitors increasingly invaded the American market in consumer electronics, turbines and appliances. New fields, such as commercial aircraft turbines and engineering plastics, were promising but not yet substantially profitable. Some costly acquisitions in entertainment, modular housing, personal services and education did not prosper. On top of GE's misfortunes in business, GE's approach to labor relations – Boulwarism – was defeated in the courts in the late 1960s. Introduced at the end of the 1940s, Boulwarism was a new collective bargaining approach that concentrated all bargaining initiatives at GE, leaving unions in a quite secondary position. The collapse of Boulwarism brought to an end the stability GE had enjoyed in its labor relations for two decades.

Ironically, WH's superiority over GE occurred just as, apart from their core businesses, their business portfolios bore little resemblance to each other. While most GE businesses still turned around a unifying technology (refer to Appendix 6.3), WH had diversified to such an extent that its businesses had been through successive groupings under broad, imprecise labels (refer to Appendix 6.4). Moreover, WH's apparent ascendancy over GE was short-lived. In July 1974, facing a severe cash crisis, WH was forced to line up \$500 million of revolving medium-term credits with a group of 15 banks. Like GE, as its most expensive products costs skyrocketed, WH had to honor its fixed-priced contracts despite a double-digit inflation. However, there was much more. For one, big markets failed to materialize in ventures such as electric cars, vessels for exploring the ocean depth down to 20,000 feet, and unmanned rubber-tired transit system for medium-sized cities. Besides, WH had to discontinue or sell off money-losing businesses such as major appliances, auto rental, and desalination. Though disappointing, these failures did

Similarities	Differences
<ul style="list-style-type: none"> Both companies were involved in the electrical conspiracy Both companies lost cash cow businesses after the dismantling of the umbrella structure Both were unprepared to manage volume production after the umbrella dismantling and were caught short of capacity in lamps and appliances Both entered several minor unprofitable ventures in high-tech and in non high-tech businesses Both faced an unfavorable environment: increasing foreign competition, labor strikes, high inflation Both lost ground in electronics Both engaged in the defense business, which accounted for 20-25% of their sales Both entered the nuclear field Both R&D labs developed several innovations Both companies decided to re-establish their foreign operations after WWII 	<ul style="list-style-type: none"> WH took a piecemeal expansion approach both domestically and internationally, while GE did not WH took major non high-tech initiatives: land development, auto rental, home building, mail order, while GE did not GE took major high-tech initiatives in addition to the defense field: computers, aircraft turbines, plastics, while WH's high-tech initiatives were mainly in the defense field WH did not hedge against uranium prices hike, while GE did

*Table 6.3 – Similarities and Differences between GE and WH
(late 1950s – mid-1970s)*

Thereafter, with one noteworthy exception – their financial subsidiaries – GE and WH would take ever more distinct paths. In fact, both GE Credit and WH Credit would experience enormous profitable growth during the 1980s, which led each to occupy prominent positions in its company's portfolio. Interestingly, both subsidiaries would face scandals later on. Apart from this similarity, the companies diverged in several respects: while GE was fine tuning its business portfolio in search of growth ventures, WH underwent continuous divestment and contraction; while GE acquired Utah International, a mining company with coal, oil and gas, uranium, iron ore, copper operations in several countries, WH was facing bankruptcy threat due to its

price fixed uranium delivery commitments; while GE's inflation studies would provide its corporate strategy with major directions, WH's strategic planning process would address portfolio planning on a micro-basis.

Shortly after Jones took office at GE, the oil crisis disturbed the world's economy. In fact, throughout the 1970s, inflation escalated and most large firms followed the widespread business portfolio view. This view prescribed the building of balanced counter-cyclical portfolios of diversified businesses. A case in point was WH, which had been diversifying its portfolio since the late 1960s. Yet, a large number of these acquisitions proved unprofitable and divestment started in the early 1970s and continued throughout Kirby's tenure. Like many other poorly screened acquisitions, the French elevator company that had been acquired to improve WH's competitive position in the European elevator business, was sold in 1974. Throughout 1975, the home-building subsidiary, named Urban Systems Development Corp., was discontinued and all the segments of the mail-order business terminated or sold off. WH lost more than \$120 million in these three businesses.

In 1976, GE acquired Utah International. Having diversified into the natural resources area, GE added a totally new field to its previous five businesses – consumer, industrial components and systems, industrial power equipment, aerospace, and international. A 1 billion dollar business in 1976, Utah “contributed 6% of General Electric's total sales in 1976 and 17% of total earnings” (GE 1976 Annual Report, p. 6). At the time of its acquisition, Utah had achieved “its twelfth straight year of record earnings” (GE 1976 Annual Report, p. 6). Commenting on Utah's acquisition, Jones stated that “the favorable impact of Utah International on our 1976 results underscores the short-term benefits of this merger. But the greater importance is long-term” (GE 1976 Annual Report, p. 5). Utah was a “growth opportunity identified through strategic planning”, whose potential for profitable growth was expected to “exceed those of our historic product lines” (GE 1976 Annual Report, p. 5).

Intent on raising GE's earnings, GE's studies indicated that, in an inflationary economy, unless real costs were known, prices would mistakenly be set low, reducing therefore the company's profits. GE's studies on this matter suggested the need to "raise the balance-sheet values of inventories and fixed assets from historical to current cost, and then use these values to set the inventory and depreciation costs that flow through the income statement" (Fortune, May 4, 1981, p. 121-122). In 1979, GE launched COIN, a management-education program to "Effectively COping with INflation". In two years, around 3,000 GE managers had been trained, as well as representatives of about 50 other large companies. GE shared its insights with corporate visitors, believing that to the extent that all of American industry knew its real costs, pricing would be more realistic, and all firms would benefit.

The insights the studies on inflation had provided were incorporated into GE's corporate policy. For instance, since services businesses were lean in inventories and fixed assets, not only they would not require large inflation adjustments, but all competitors in a service industry would be more likely to understand their real costs. Pricing would consequently allow for real profits in the industry. As a result, expansion into services would be a sound strategy in inflationary times. Another insight concerned the effects of inflation adjustments, which were believed to be much bigger on low-margin businesses than on high-margin ones. Expansion into high-tech ventures would therefore fit well an inflationary economy. In fact, upon formulation of these strategies, GE emphasized expansion into services, for example, computer programming, and into high-tech, such as, manufacturing of advanced integrated circuits.

While GE was fine-tuning performance measurements to account for inflation effects, the uranium issue was unquestionably WH's greatest concern. Having found only in 1975 that the fulfilment of its uranium delivery commitments might cause its bankruptcy, WH declared that "it was legally excused from the fuel contracts because of the drastically changed market conditions" (Fortune, August 1976, p. 154). As of December 1979, settling the utilities suits had cost in excess of \$1 billion before taxes, and a provision of \$405 million was made for estimated future costs.

In 1983 WH won \$85 million from uranium producers against whom it had filed suit. As of 1992, the nuclear contracts had cost WH in excess of \$1.3 billion. Throughout Kirby's tenure, WH performance improved to the point of having the medium-term revolving credits cancelled. Some old-time businesses such as circuit breakers and related control equipment were so profitable that officials felt "almost embarrassed to talk about it" (Fortune, August, 1976, p. 156). Notwithstanding this, the on-going utilities suits created a sort of dilemma to WH's management. Should they acknowledge the firm's recovery and its better earnings prospects, they might worsen the settlement conditions the company was negotiating. All in all, despite a few investments made during Kirby's tenure, the outstanding bill of previous strategic errors led WH towards a continuing contraction path (refer to figure 6.2). GE, on the other hand, had avoided liability in its long-term, fixed-price uranium supply contracts because it had contracted for enough uranium among suppliers to cover its much more limited commitments, a precaution WH had not taken.

In 1981, Welch took over from Jones a slightly larger GE, while in 1983 Douglas D. Dunforth replaced Kirby at a considerably smaller WH. In line with GE's corporate expansion strategies that emerged from inflation studies, Welch took over in 1981 intent on renewing and growing the company's businesses. He conceptualized the company's portfolio as those businesses falling into three circles – core, services, high-tech – and those falling outside the circles – mobile communications, housewares, TV and audio, consumer electronics. These latter were divestiture candidates. For four years, Welch carried out deliberate contraction to foster continuing growth. GE's portfolio of about 100, sometimes marginal, businesses was reduced to 14 major ones, occupying first or second positions in their industries. Well over 100,000 jobs were eliminated in this process. Several businesses were sold, such as central air-conditioning (1982), houseware small appliances (1984), semiconductors (1988). Most of Utah International was also sold in 1984. Having faced cyclically depressed prices for its products, Utah had not turned out to be the growth business anticipated at its acquisition.

In 1985, the first major acquisition was made. RCA, the first joint venture between GE and WH, was brought back into GE to strengthen GE's aerospace and

defense business. Interestingly, GE exited the aerospace and defense business in 1992-93 by selling it out to Martin Marietta. In 1986, GE acquired Kidder Peabody to reinforce GE's financial subsidiary. In 1987, GE traded its consumer electronics business for Thomson's medical equipment business, and the nuclear business was restructured, so as to focus its activities on refueling and servicing installed boiled-water reactors.

At WH, Kirby's successor, Douglas D. Dunforth continued the reshaping of WH's portfolio. He "moved factories offshore, bought back stock, took a couple of restructuring hits, and channeled capital away from sluggish businesses and into fast-moving ones. Light bulbs, cable television, and many others were cut away. Between 1985 and 1987 WH made 70 divestitures but held sales steady – and improved profits – through internal growth and 55 acquisitions" (Fortune, July 3, 1989, p. 93). Upon Dunforth's retirement in 1987, the 62 years old Marous replaced him up until 1990, when Lego took over. Marous and Lego continued the restructuring of WH's portfolio. Internally developed VABASTRAM (for *VA*lue-*BA*sed *STR*ategic Management) was the planning tool that, according to Lego was "the most sophisticated strategic planning process of any company in the United States" and that helped WH "to portfolio-plan on a micro-basis" (Fortune, July 3, 1989, p. 93). According to WH's management, this tool helped to perform a shareholder-value test on acquisitions, which were required to complement existing lines of business. In addition, WH was heavily applying productivity and quality enhancement techniques to improve all the companies businesses.

Meanwhile, the finance subsidiary of both companies – WH Credit and GE Credit, later on renamed GE Capital – experienced remarkable profitable growth. Due to its astonishing performance throughout the 1980s, WH's subsidiary had been widely praised inside and around WH. As of 1987, WH Credit profits accounted for 16% of WH's total profits. It was the financial subsidiary that generated growth to support the unrelenting search for the perfect, counter-cyclical portfolio that led Dunforth and Marous to sell about 70 businesses and buy over 50 throughout the 1980s. GE Capital (GEC) was formed in the 1930s as a captive finance subsidiary to bankroll GE's washing machines and other household appliances. Over time, it

made a number of acquisitions and launched a number of internal ventures in the financial services. By 1997, its businesses included among others specialty insurance, store-sponsored credit cards, commercial loans, residential mortgage, computer services, equipment leasing – airplanes, railcars, cars, trucks, satellites. Notwithstanding these accomplishments, both subsidiaries would undergo major problems in the 1990s.

GE Capital's acquisition of Kidder Peabody turned into a fiasco reducing GEC's 1994 earnings by \$1.2 billion. This acquisition turned into a nightmare because of an inside trader who involved the firm in his crimes. Not only did the American government force GE to oust Kidder Peabody's management, but the firm also suffered a huge loss of talented people thereafter. WH's financial subsidiary problems popped up just a few months after Lego took over the chairmanship. In 1990, the subsidiary had to look for \$665 million in revolving credit, and in 1991, WH was forced to make a \$1.68 billion provision against earnings. Out of a \$10 billion portfolio, WH had to write-down \$2.7 billion. Growth had been pursued so intensively, that "nearly every deal that went to a loan committee got approved" (Fortune, November 4, 1991, p. 94). When accounts started to fall delinquent, renegotiation resulted in reduced interest payments in return for equity in the financed projects.

At the end of January 1993, Lego was forced into retirement, stepping down two years ahead of schedule. WH's eroding stock price undermined his credibility with shareholders, leading WH's board to oust him. Up until a new CEO was brought in, one of WH's executive vice presidents, Gary M. Clark, became the acting CEO. Five months later, in June 1993, an external manager, Michael H. Jordan, was brought in. At that point, WH Broadcasting was not only the most profitable but also the most promising business in WH's portfolio. During Jordan's first two years, WH's stock price stayed at the same low level it was when he took office. Aiming at fortifying WH Broadcasting, whose 1995 earnings were \$203 million on sales of \$870 million, Jordan purchased for a big premium CBS television network. From then on, Jordan restructured WH's portfolio repositioning WH as a media business. Industrial businesses were to be spun off. As a result, in 1997, after more than

almost three decades of restructuring experiments, WH's several businesses were split up or sold out and the company ceased to exist.

Interestingly, despite the large amount of activity in reshaping GE's portfolio in the last two decades of the 20th century, out of the 12 businesses reported in 1997 GE's annual report, only one – broadcasting – was new to GE (refer to Appendix 6.5). In fact, broadcasting, which had been included in GE's portfolio as a divestiture candidate, ended up showing a superb profitability and was kept, while the businesses that had motivated RCA's acquisition – aerospace and defense – ended up being divested in the course of time. Ironically, in Welch's highly praised "New GE" (Slater, 1993) all but one business was "old", having initiated in the late 19th or early 20th century.

The restructuring years analyzed

By the late 1950s, the carefully built umbrella structure had been demolished. The conspiracy scandal revealed the last desperate attempt industry participants made to play by the old rules. From then on, competition would include price among its variables, as well as, new domestic and foreign firms fighting for changeable market share. In addition, GE and WH faced the challenge of running ever larger organizations, of negotiating with ever more organized and demanding unions, and of venturing into multitudinous new markets and businesses. To a certain extent, a new game was about to start.

Two underlying reasons seem to help explain *why and how GE and WH ended up following two very different paths after so many years of synchrony*. Although both GE and WH were unprepared to face the numerous environmental changes that brought the umbrella breakdown, WH ended up taking neither a productive nor a defensive approach to expansion – instead, an empire building growth. In addition, WH was less diligent towards risk management.

With the umbrella breakdown, uncertainty increased considerably. Most of GE's change handling tactics aiming at neutralizing external sources of change (figure 6.10) were discontinued or became fruitless. License agreements specifying production quotas were not renewed inhibiting GE's coordination of production volume in the industry. Patents cross-licensing was not practiced anymore. Moreover, smaller rivals such as Sylvania undertook research efforts on their own. It was harder to justify import tariffs increase to deter foreign entrants, which by the way would initiate producing equipment in the United States. Buyers, such as utility companies, started to put their bargaining power into action, as would also do labor. Finally, scientific and technological knowledge had spread around the world. As a result, it became ever more difficult to neutralize the threat of being outpaced by technological breakthroughs. In sum, the five star industry gradually lost its stars and had its handsome returns significantly reduced.

In many respects, the two companies responded to the new circumstances in much the same way (table 6.3). As a result, they occasionally made similar, sometimes huge, mistakes. To face this environmental overhaul, both companies hedged against economic downturns by building a diversified portfolio of businesses. Their first steps towards diversification were quite alike: appliances, new high-tech fields, defense. Both succeeded in some ventures, such as radar (WH) and aircraft turbines (GE), and failed in others, such as water desalination (WH) and computers (GE). Both also entered several new, though unprofitable, minor ventures. Besides, they both engaged in the defense business, which came to account for significant portions of their annual sales, but eventually faced a slowdown in this area due to reduced governmental budgets. In addition, they both occupied prominent positions in the newborn nuclear field, which did not however develop into the high growth, profitable venture it had been expected to become. Both lost ground in fields they had pioneered, such as electronics, both having showed they were unprepared to manage post-umbrella production – both were alternately caught short of capacity to meet demand or stockpiled with unsold manufactured products. Finally, both companies experienced outstanding growth and performance in their financial subsidiaries, which ended up caught in huge scandals.

Yet, the two firms also differed in several ways. For one, while GE's major initiatives outside the defense field were mainly in the high-tech, WH's major initiatives were mainly non high-tech. In fact, WH entered the auto rental, home building, mail order businesses, while GE entered computers, aircraft turbines, plastics. In addition, WH's piecemeal expansion approach was characteristically empire building-oriented (Penrose, 1980), i.e., neither productive nor defensive motives played a consistent role in the acquisitions screening. Growth was mainly pursued to accomplish financial rather than strategic goals. On the other hand, by emphasizing high-tech ventures, more often than not GE would grow into directions where it could make more productive use of its existing resources and technological skills, i.e., in fields where it believed to initially have some competitive advantage.

Another significant difference between the two companies concerned their approach to risk. While WH often left itself exposed, GE usually hedged risk – an important exception was the Kidder Peabody episode. Disregard for risk lead WH to make expensive commitments in fields as varied as home building, mail-order and nuclear. GE's consideration of risk prevented it from unnecessary commitments in fields such as nuclear power, as well as, enabling it to make timely exit from unprofitable fields, such as the computer business. WH's losses were proportionally far greater than GE's. As a result, poor risk management eroded WH's wealth and used up managerial time that could otherwise have been allocated to foster productive growth. In fact, as depicted in figure 3, from the mid-1970s on, WH underwent a continuing contraction process. Fostered by the gap between WH's available resources and its commitments, the contraction process was reinforced by an increasingly unproductive use of remaining resources. Figure 6.11 illustrates the continuing contraction process.

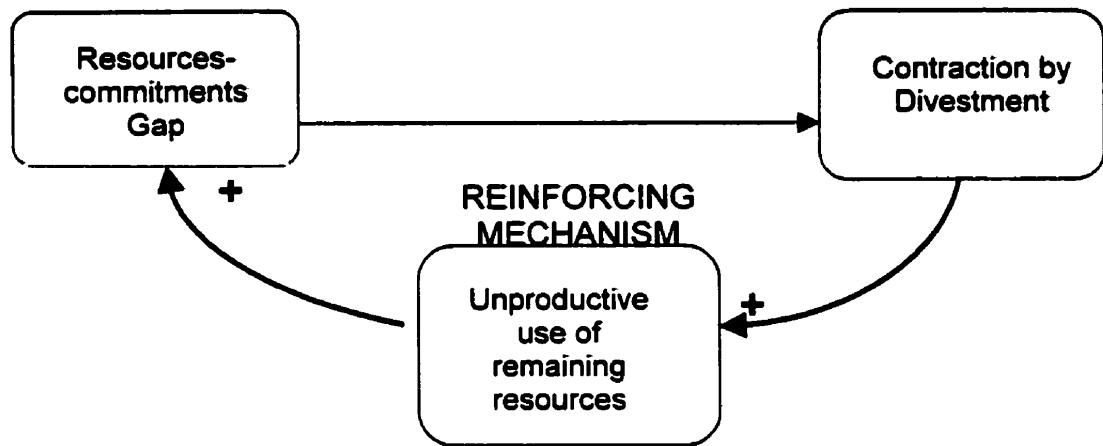


Figure 6.11 – WH's continuing contraction (mid-1970s on)

In addition, GE once more applied a systematic change handling approach in order to neutralize external sources of change and enhance the success chances of its business and corporate strategies. Its inflation studies and the derived growth strategies illustrate this approach. By sharing its inflation studies insights with other large corporations, GE was replicating its strategic behavior as industry coordinator. In sum, its strategic vision reach went far beyond its own borders.

This section described and analyzed the growth trajectories of GE and WH, having advanced explanatory mechanisms for their growth over the twelve decades of their existence. Moreover, it was shown that while the two companies to a large extent followed similar paths in the first two periods, they differed considerably in the third. While the former industry coordinator managed to regroup and retrieve a continuing growth path, the second-best in the industry succumbed to the major environmental shift following WWII. Aiming at shedding additional light into why these two initially so similar companies ended up having so different destinies, the next section describes and discusses organizational aspects of the two companies throughout the several managerial dynasties that took the helm at each company.

GENERAL ELECTRIC's AND WESTINGHOUSE's ORGANIZATIONAL DEVELOPMENT

The previous section described and analyzed the growth trajectories of GE and WH, having identified three distinct periods throughout the electrical industry existence. The structuring of the industry occurred during the first three decades. Then, for almost five decades, the industry operated within the formed structure. Thereafter, industry structure was dismantled and the companies underwent major business and organizational changes.

This section focuses on internal events at each company over the twelve decades. It first identifies the several managerial dynasties in charge of each company, reporting relevant episodes in each firm's organizational development. Then, it performs a comparative analysis of their organizational development, which *seeks to identify distinguishing organizational traits each company developed over its existence.*

Managerial Dynasties at GE and WH

Figure 6.12 shows the successive dynasties of top executives at GE and WH over the twelve decades. Drawing on figure 6.3, which presents the growth trajectories of both firms, figure 6.12 adds each company's timeline delimiting the time period of each dynasty's tenure. For example, Price managed WH from 1950 to 1964 and Jones was GE's CEO from 1972 to 1981. In addition, vertical lines associate each dynasty's starting and ending years with each company's growth trajectory. As a result, the growth trajectory segment comprised between two vertical lines helps visualize the firm's growth path throughout each dynasty period. Appendix 6.6 chronicles top management tenure at each company

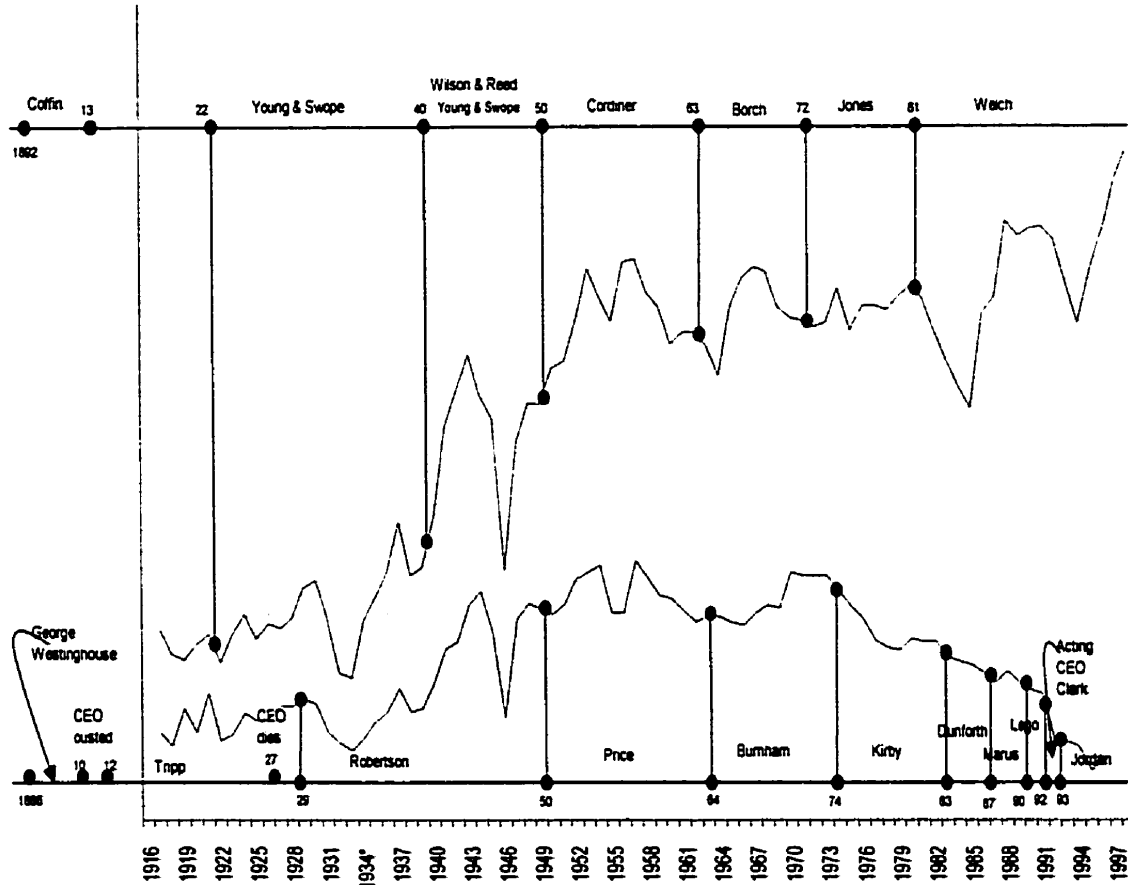


Figure 6.12 – Managerial dynasties at GE & WH

According to Usselman (1992), George Westinghouse (GW) “was an engineer, not a wizard... with lots of initiative, with nerve to attempt difficult things, and money enough to see them through to success or failure” (pp. 267-268). GW “had a constant part in executive conduct as well as planning and administration – perhaps a part too close for the best results” (p. 269). He “routinely toured the floors of his plants – checking the progress of work, chatting with master mechanics, and nodding to apprentices. As he personally made many of the key decisions, his firms lacked a managerial hierarchy. Westinghouse would emphasize engineering and manufacturing over marketing, finance, and organization building. Thus, just as WH

had been created as a company separated from Air Brake and Union Switch and Signal, when WH initiated gas and steam turbine production in 1895, he chartered the separate Westinghouse Machine Company, rather than adding a division to WH. GW sited each of these enormous plants in adjacent towns east of Pittsburgh, readily placed for his direct oversight" (Scranton, 1997, pp. 226-227). GW's personality traits "overshadowed everyone in the Westinghouse company even as late as 1929" (Fortune, 1938, p. 49).

GW was known as a thirty-day man, for whom the profits of a new idea or new enterprise would begin to appear in about thirty days (Usselman, 1992). He was "extremely quick to see a situation and judge the possible merits of a device" (p. 276). WH had progressively adopted a number of initiatives GE had pioneered years before. For example, the centralization of "finance, billing, and control over major policy decisions while providing considerable autonomy to the manufacturing divisions" (Scranton, 1997, p. 232), and the introduction of training programs for skilled workers and engineers. Although WH had failed to develop strong coordination skills at the corporate level to integrate its several subsidiaries, by 1912 "WH's management had taken on the professional style long in place at GE" (Scranton, 1997, p. 239).

In 1912, WH's directors brought in an external manager, Guy E. Tripp, as Chairman of the Board. Tripp was to replace George Westinghouse, who had progressively lost control of his company after the 1907 Financial Panic. Under Tripp's direction, WH apparently underwent a centralization process, which did not however produce integration. Tripps' sudden death in 1927 caught WH unprepared to replace him. In fact, it took almost two years for WH's board to choose a new Chairman. It was Andrew W. Robertson, a lawyer who was head of a Pittsburgh utility holding company. As Robertson stepped in, he noticed that WH "could not always tell its manufacturing extremities ... the correct thing to do. Nor could it be counted on properly to interpret the stimuli it received from these extremities. WH engineers would perfect something ... and WH sales promoters would often miss the train to market with the product. The company was slow in styling; its goods were trustworthy but incorrigibly humdrum ... Males in the lagging consumers'-goods

département manufactured ranges for females – and were surprised to find they couldn't sell them for the simple reason that cooking on the receding heat of an interrupted electrical circuit was beyond the experience of housewives who were used to the steady flame of oil or gas" (Fortune, Feb 1938, p. 55). Robertson understood that these were symptoms of a central administrative heaviness. As a result, he "began to decentralize the organization, placing the engineering and manufacturing autonomy and the responsibility for profits with the various plant division" (Fortune, Feb 1938, p. 55, 57). The range of products WH manufactured progressively encompassed most classes of electrical products, plus a non electrical line of bottle stoppers, sugar bowls, spoons, poker-chip racks, and Mickey Mouse dishes for children.

In 1922 Charles Coffin retired. Finding GE's President, Edwin W. Rice, unsuitable to replace him as Chairman, Coffin persuaded Rice to simultaneously retire. Owen Young replaced Coffin as Chairman of the Board, Gerard Swope became GE's President, and Rice and Coffin were given honorary titles of Chairman and President, respectively. It was up to Young to take care of the major policies of the company, while Swope ran the business.

Coffin had wished for quite some time to place Young at the chairmanship. In addition, Swope had had such an exceptional performance running International General Electric (IGE) that Coffin thought him suited for the presidency. Coffin made up his mind when Swope and Young returned from a several months long trip they had taken together to Europe. During the trip the two executives proved they not only respected each other but also realized that they shared a common ground on which to base team work. It was up to Young to take care of the major policies of the company and to take the lead in representing GE before its stockholders and the public, while Swope would be the executive head of the company and run the business.

Coffin had run GE with a firm hand for nearly thirty years. Although he had exchanged the presidency of GE for the chairmanship, Coffin had remained the executive head. Swope was to follow suit. Swope's meticulous, centralized style has

been called "Prussian" (Fortune, May 1947, p. 166). As early as 1901, while working for Western Electric, he pioneered market research: "He analyzed his business to find out exactly what he sold, to whom and where he sold it ... He kept account of his proportion of the total market and broke down his costs, translating his statistics into charts – an innovation – and hurling his energies at the weaknesses revealed" (Loth, 1958, p. 45). His methodical application of the engineering principles he had learned at the MIT helped him to lift out of the losses the offices he was in charge of during his stay at Western Electric.

Coffin's conservative policy was not discontinued. Quite on the contrary, it was sustained and shown to reach a broader scope. Instead of generating unproductive risk aversion, it was explicitly associated with decision-making speed. As a matter of fact, the 1926 Annual report stated that "the value of a plant cannot be determined by first cost nor by appraisal on the basis of reproduction cost less normal depreciation. It is for these reasons that your Company has followed the policy of providing a general plant reserve in excess of normal depreciation rates, so as to enable it to take promptly out of service buildings or equipment which, although not worn out physically, are inefficient and uneconomical".

When working on any issue, Swope would come up with a broad overview, perform a detailed analysis, and quantify whatever might help him identify whether the goals were being achieved. He described supervision "as measuring by as many yardsticks as possible the extent to which his goals were being achieved. Most of his standards were expressed in mathematical terms. He liked figures" (Loth, 1958, p. 125). In order to be able to assess GE's performance, he believed he needed to be in touch with the field, having acquired a reputation for "poking that nose into every corner of GE operations" (Loth, 1958, p. 137).

By working out yardsticks, Swope noticed that "certain of GE's assets were out of balance and had been for years. For example, physical plant and the number of workers were about the same in 1939 as they had been in 1922 ... This meant that far back in the World War I era, managers at factory level had got too much plant approved by top executives too far away from the factory floor" (Fortune,

December 1955, p. 112). Applying the %US GNP operator to productivity (total sales per employee), the longitudinally comparable productivity indicator has been plotted in figure 6.13 below. It shows a considerable increase throughout Swope and Young's tenure, followed by a sharp decline during WWII.

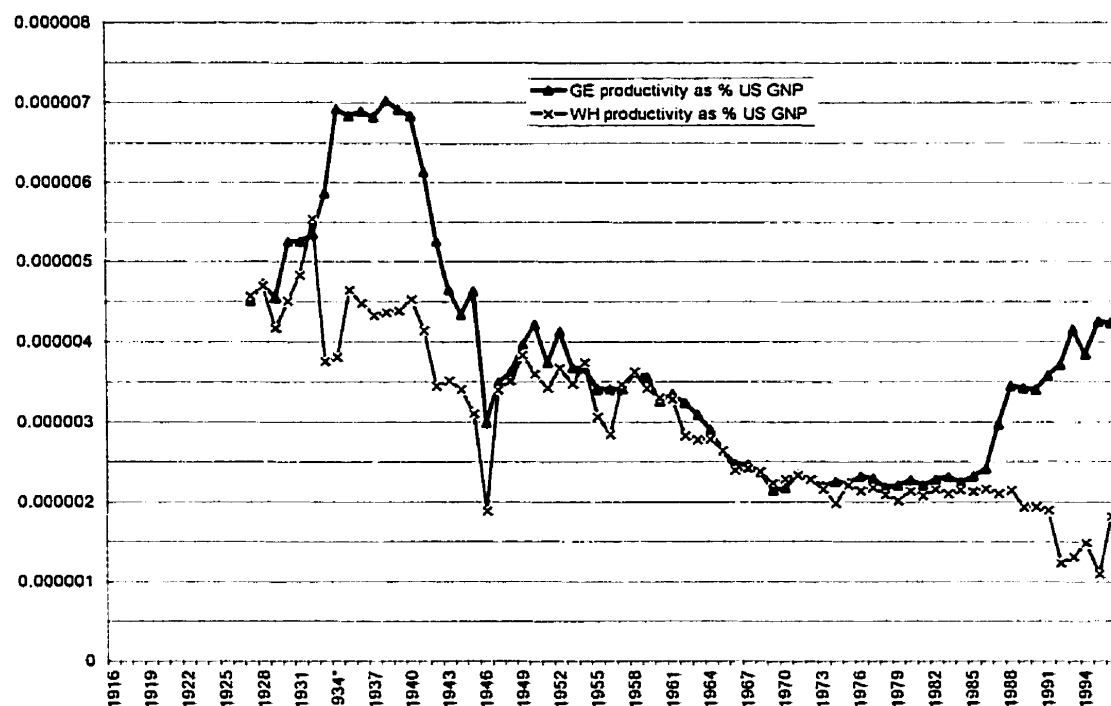


Figure 6.13 – GE & WH Employee Productivity

As Swope became president, his analysis of GE showed a number of weaknesses: "GE owed too much money; its accounting procedures were insufficiently precise; it had too many plants making too few products; there was too little understanding of the whole company; too much emphasis upon a man's own department, with engineers and salesmen considering each other separate races of people, not knowing or caring what the other fellow was doing; and management had neglected the training of younger men and the security of older ones" (Loth, 1958).

Swope's goals for GE included putting GE's monogram on everything electrical going into the American home, growing the company as fast as the industry and lasting as long as Du Pont, and giving better training and security for the men in the industry. His business philosophy prioritized firms obligations in the following order: first to the public, by providing more things for more people at lower cost; then to employees, simply because it was good business, since highly productive workers were well paid and secure; then to the industry itself, because only through common agreement could items be standardized, fire protection could be coordinated and so on; and finally to stockholders, who wanted a fair, regular and uniform return. In view of his analysis, goals and philosophy his actions would emphasize *integration* of the company, and *coordination* both inside and around GE.

Throughout the 1920's GE undertook a liberal approach to labor management. Swope and Young introduced a number of personnel practices and plans, including life insurance, a pension fund, and service bonus. Their first profit-sharing plan proved unsuccessful. A few years after its introduction, when the results of the plan were studied, GE management found out that only 2,000 out of the 14,000 men still retained their GE stock. Other plans were introduced later on aiming at fixing the mistakes identified, guaranteeing that GE employees kept their stocks for long periods of time.

Seeking to integrate GE's several units, Swope called a conference of managers of the various operating departments to establish an advertising policy. Although GE already had an advertising manager, such a policy had never been implemented, and each executive handled his own advertising independently of the others, and often quite contradictory to them. Then, he turned his attention to the lamp department, which made a great many different brands, none of them identified with GE by name. He reduced the number of lamp factories, concentrating lamp manufacturing in larger, formerly idle plants. In addition, by 1923, changes in design and machinery had trebled lamp production. He also renewed the Advisory Committee role, which now became a forum for managerial exchange and discussion of ideas concerning policy and a channel through which his authority reached into the essential operations of every department (Loth, 1958). Swope,

however, reserved to himself the final decision in the inevitable disputes.

Swope was aware that for GE to fully take advantage of the extremely favorable conditions the electrical industry enjoyed, GE had to develop relations with its stakeholders on "a businesslike basis", or the firm would face endless difficulties (Loth, 1958). The public relations program Young and Swope launched targeted stockholders, employees and the public. Shortly after they took office, they inaugurated a system of quarterly reports to shareholders signed by both executives, and gradually expanded the amount of information in the annual report. As for employees, Swope appeared at their meetings and welcomed questions, taking "pride in having ready answers" (Loth, 1958). Swope "put unionization in the same category of managerial problems as increasing costs of an essential raw material or the rise of an efficient competitor in a national market which never had had domestic production of its own. It was a condition, not a theory, and could not be argued or fought or bought out of existence" (Loth, 1958, p. 169). Believing that "industry could do a better job [at coordination] than the state" (Loth, 1958), Swope took a number of initiatives to improve intra-industry coordination. In 1926, he headed the formation of the National Electrical Manufacturers' Association (NEMA). Shortly after, he stimulated the formation of a nation-wide union of electrical workers.

Swope was also aware of possible dangerous effects of increasing size on efficiency. Increasing size called for delegation of responsibility and authority. "Once a year at promotion time he perused the records on everybody in the company who made \$10,000 a year or more" (Loth, 1958, p. 123), a task that he undertook to keep informed of the abilities and work of employees and to be able to better allocate them in the future. On several occasions he exhorted the virtues of entrepreneurship: "If we could fill this body of executives and leading men with the spirit of adventure to try even unheard-of-things, the company would either make progress or go broke, and the older of us would try our best to keep it from going broke" (Loth, 1958, p. 173).

Swope introduced a new managerial style in several ways. In contrast to Coffin and Rice, Swope paid visits to GE's plants which gave him a "certain

popularity with factory workers who never before had the slightest contact with the president of the company" (Loth, 1958, p. 115). In addition, awareness of stakeholders was increased, and both integration and coordination of GE's facilities was reinforced. During his tenure, GE grew and diversified. His *benign circle of electric power* concept inspired a major diversification into electric appliances. As a matter of fact, appliances came to account for 30 percent of GE's total business. It however took time for the company to realize the importance and organizational needs of what had been launched as a side business. As a result, the functional structure, which required engineering, production, and sales top managers to devote attention to both apparatus and appliances lines, progressively brought inefficiency and slowness as GE's businesses grew.

In 1937, Charles E. Wilson who had been with GE for almost forty years, since he was 13 years old, was called to fill a newly created post of Executive Vice-President, and was put in charge of the appliances business. Wilson had impressed Swope as early as 1928. Swope lead a discussion on the most desirable managerial structure: "horizontal", i.e., functional, or "vertical", i.e., divisional. Despite the fact that Swope was one of the most horizontal-oriented managers, Wilson openly and vehemently attacked the horizontal structure. From then on, Swope would assign increasing responsibilities to Wilson, who ended up replacing him in 1940.

As GE vice-president, Wilson set up in 1938 a *post-war planning committee*, which was composed of one or two key men from each of GE's main departments. The committee's assignment was "to give GE a thoroughgoing self-scrutiny" (Fortune, May 1947, p. 168). Their analysis indicated that in order for GE to successfully keep growing, the organization had to undergo decentralization, and its businesses should diversify. When Wilson took over the presidency in 1940, GE was deep involved in the war effort, having already started a large diversification into many high-tech demanding defense products.

Shortly after the war broke out in Europe, the American government started to demand the American industry to cooperate in the war effort. Both GE and WH were approached to take defense orders. According to Woodbury's account

(Woodbury, 1948), Westinghouse at first decided to refuse munitions orders, seen as "irregular" work outside the standard WH line of manufacture. The committee that suggested this policy had been organized by WH's Chairman, Andrew Robertson, and was composed of plant managers. Having concluded that munitions orders could not be produced in the company's existing plants, the committee found new plants and tools investments unjustified. In at least three other occasions, Robertson was approached to manufacture munitions, but the Pittsburgh plant manager decided against taking such orders. The WH policy regarding this matter would then hold that WH should reserve its skills and equipment for the huge demands that were bound to come in its own field – turbines, generators, transformers, switchgear, meters, electronic equipment, lamps – and let others make munitions (Woodbury, p. 11).

By June 1940, WH had organized the Emergency Products Division to handle products other than the ones the company had already standardized. Its policy would be to never accept work that another and more logical manufacturer could do as well. The division's program for WH war projects comprehended a small number of major projects; the choice of projects that best suited WH's experience; and where new buildings were required, they would be located and designed to fit a long-range expansion program for WH's regular peacetime products. Despite its initial intent, WH ended up not only taking military orders outside its lines of products but also designing and manufacturing entirely new devices to cope with military battlefield needs - for example, radar, and jet engines. Special war products, however, did not account for more than 20 percent of WH's production during the war.

GE, on the other hand, had initiated to take orders even before WWII had broken out. By the spring of 1940, GE war orders were becoming increasingly more important and GE had just changed its top management. GE's new President, Charles Wilson, appointed a four-man Defense Advisory Committee to integrate and expedite all GE's war orders. The group, later on called War Projects Committee, was supposed to help the company conversion into a mass-producer of special products. This required GE to accelerate the acquisition of more factories, more

men, more supplies, more and different research and development, as well as, the change of consumers goods facilities to war products. Also, GE's cost-conscious attitude had to adapt to the ever higher war time pressures. Production bottlenecks were solved by the fast acquisition of out of use factories, by standardizing the design and the production process of complex apparatus, and by dividing the production load among subcontractors, and even among competitors (Miller, 1947). At certain points, people were hired at the rate of 1,000 a week. As a result, by the end of WWII, GE had duplicated the total number of plants (from 34 to 68) increasing its floor space from 29 million square feet to 41 million square feet. Having favored a different strategy, WH undertook the operation of Ordnance Plants, having therefore had its floor space increased from 14 million square feet to 16,5 million square feet only.

By the end of 1941, the conversion of GE's manufacturing facilities to produce war products was well advanced. The company then started to plan for the postwar world, tentatively figuring out the conversion work that would be needed, in view of an optimistic postwar scenario, according to which the American population income would reach 100 billion dollars.

When Wilson took over in 1940, he introduced delegation of authority to a certain extent. He assigned powerful business portfolios to a large number of divisional vice-presidents and assistants, dividing in this way authority among more executives, but refraining from delegating decision authority to lower managerial levels. As this decentralization process was under way, GE's President and Chairman, Charles Wilson and Philip Reed, respectively, resigned. By the end of 1942, both were called to Washington to work for the War Production Board. Gerard Swope and Owen Young were brought back from their retirement and ran the company during this two years long emergency, while Wilson and Reed served in Washington. Given Swope's interim role, he did not undertake any reorganizing *action*, but he freed up his assistant Ralph J. Cordiner to think about the future.

Cordiner's career trajectory was quite unusual. When Wilson moved to Washington, he persuaded Cordiner, by then an ex-GE executive, to follow him as

Vice Chairman of the War Production Board. Cordiner was an old GE engineer turned merchandiser. While at GE, Cordiner had pointed out to Swope the need for GE to dedicate as much effort in appliances as the independent companies did, if GE wanted to succeed in the appliances business. Swope apparently agreed with him, but took no concrete measures to change the situation, and Cordiner left GE in 1939 to take over the presidency of Schick. Upon his return from Washington in 1943, he moved back to GE as assistant to Swope. After three years of thinking and joint work with Swope and Wilson on major policy issues, Cordiner had identified *diversity*, rather than size, as GE's main problem. GE restructuring had to foster decision-making flexibility at the operating level, while insuring long-term planning to headquarters. Cordiner devised the fragmentation of the company into operating departments independent of central authority on operating matters.

The 1946 postwar depression brought unemployment, and strikes. The stability GE had enjoyed in labor matters for almost three decades was disturbed. GE had traditionally pioneered benefit and pay programs. By 1922 several of these programs had already been inaugurated. Swope and Young extended them and introduced new ones. After 1933, unionization of GE's employees started, having caused no convulsion as had been the case in other companies and industries. Soon after the relationship of GE and the United Electrical, Radio and Machine Workers (UE) had been established the WWII defense period began. During the war, UE demands grew, but wage increases were circumscribed by the War Labor Board regulations, which turned down most union demands. During the war, UE began a policy of making identical demands upon all electrical manufacturers. By war end, UE demanded from GE, WH, and the electrical division of General Motors (GM) an increase per day that the three companies rejected. In January 1946 strikes started affecting all three companies. After one-month strike GM came to an agreement. GE's strike lasted two months and WH's four, having ended up as of the acceptance of the conditions GM had negotiated.

Following the 1946 strike, GE started a systematic study of its labor relations. The study was still unfinished when the 1947 negotiations took place. Once again, GE followed GM's agreement conditions. Yet, from then on and for the next twenty

years, GE would completely change the balance of power in its relation with unions. Shortly after the 1946 strike, Wilson selected Lemuel Boulware to head up a new employee-relations function meant to re-examine the policies and program of the company. Boulware was a pioneer in marketing having been an early advocate of the use of market research and surveys to determine what customers wanted before products were engineered and manufactured. He had been brought to GE after the war and put in charge of the affiliated companies, none of which joined the 1946 strike against GE.

"Boulware and his group set out to re-examine the entire framework of personnel and employee relations at GE" (Northrup, 1964 p. 26). This included employees, unions, GE's several layers of management, the communities where GE operated its facilities, government, stockholders and the public at large. Their study revealed that what employees expected was precisely what GE had been trying to do. GE had however seriously failed in providing full information not only to its employees, but also to all other stakeholders. Convinced that GE had been "doing right voluntarily" for a long time, Boulware diagnosed GE's failure in employee relations mainly as a failure in marketing. "What seemed to be needed, therefore, was to apply the tools of marketing to employee relations – market research, product planning, market development, and merchandising. ... [GE] set out to take the initiative in employee relations by putting out a good product, altering that product only on the basis of factual information, and merchandising the product on all fronts in order to obtain the earliest and most effective sale thereof" (Northrup, 1964, pp. 28-29).

The Boulware collective bargaining concept encompassed the following actions:

- . Careful research and a full exchange of views with the union bargaining agent before an offer was made;
- . GE would put what it believed proper on the table and change it only on the basis of what could be considered new information;
- . Ample publication to all stakeholders fully informing about company plans, programs, and proposals.

This approach, therefore, denied unions the possibility of proclaiming a political victory over the company.

During 1948 and 1949, Cordiner's plan was tested in GE's affiliated companies – Hotpoint, Trumbul, and others – which had kept decentralized management since their acquisition by GE. Wilson intended to implement the plan in 1951 before his scheduled retirement at the end of that same year. Yet, the Korean war started in 1950. Experienced in managing war efforts, the American government re-established its war effort organization and called Wilson back to Washington. As a result, Wilson's retirement and his replacement by Cordiner was anticipated in almost two years. Shortly after Cordiner became president, he launched the decentralization process.

Cordiner had to face challenges everywhere. For one, the booming American economy pointed out profitable avenues of growth in the upcoming years. But at the same time, the Korean war increasingly called for more technological research and defense-oriented products. As a result, GE faced personnel shortage to simultaneously handle the technologically challenging war issues and the booming market for electrical products and electrical energy in the United States. Retired engineers and salesmen were called back to help GE reconcile these two strong pressures on business growth. By allocating experienced, retired people to GE's traditional lines of business, the younger talents were assigned the innovation-challenging defense projects. Besides this, Cordiner faced management's high resistance to the new order. In the course of the first two years, about 2,000 men were shifted or hired. For GE veterans, this meant geographical, authority and status change. In addition, Cordiner identified a number of challenges to GE's managers. These were: the development of men; leadership by persuasion rather than command; the achievement of teamwork, integration, and balance; the measurement of results; proper use of all types of compensation; criteria for determining the scope of a business at Department and Division levels, and for the Company as a whole (Cordiner, 1956, p. 71).

Cordiner took a number of initiatives to handle the wide variety of challenges.

Recruiting methods were increasingly systematized to cope with Cordiner's 1953 estimates that, in the following ten years, GE would need to fill 1,525 executive slots (Fortune, October 1953). Moreover, he inaugurated Crotonville, a managerial training center, which among other things would help in the formation of "the well-rounded man". In this concept, the well-rounded man does not think up ideas himself, but mediates other people's ideas. In the words of a personnel director, "the decision should be made by the group and agreement reached after discussion and consultation prior to action" (Fortune, October 1953, p. 268). Individual brilliance was undesirable. As a management trainee stated, "All the basic creative work in engineering has already been done", justifying the assertion that "I would sacrifice brilliance to human understanding every time" (Fortune, October 1953, p. 268).

In 1952, Cordiner established a Measurements Project to devise common measurements at three levels: operational, functional and managerial work. Performance evaluation was sought from each and every unit. For example, as of 1957, when most research-minded companies had their laboratory budgets increasing about 10 per cent a year, GE had its Research Director devoted to the elaboration of evaluation methods of R&D activities. A method to allocate effort on basic research had been devised. GE's research administrators "keep a running survey of all the important scientific journals and count the number of papers devoted to each field. If research seems to be lagging in some field that GE is interested in, they will step up their research effort there. Having found, for example, relatively few recent papers on incandescence, GE plans to continue doing about half of all the research that is done in this field. High-energy nuclear physics, in contrast, is currently one of the most popular scientific subjects; so here GE will simply try to keep abreast of what is being published" (Fortune, October, 1957, p. 217). Measurement also played a major role in the management of costs and productivity. Value analysis, devised in the early 1950s, stipulated that after engineers had designed a product, a group of trained men who had nothing to do with the original design would go over each component looking for less expensive ways to accomplish the same functions.

In 1950, as Cordiner was becoming GE's president, WH's Chairman,

Robertson, retired. Gwilym Price, replaced Robertson. As of 1940, Robertson was considering his retirement and had his attention attracted to a lawyer-banker. In the course of a three years period at the bank's presidency, Price had pushed his bank from sixth position in the Pittsburgh area to a strong third. Robertson hired Price in 1943 to plan the termination of WH's war contracts (over \$3 billion). In 1946, Price replaced Robertson at WH's presidency, while Robertson kept the chairmanship. In 1950, Price replaced Robertson entirely.

According to Fortune (December, 1952, p. 121), Price inherited a hodgepodge of:

"semi-autonomous manufacturing divisions producing disparate products and serving divergent markets. Divisions making steam turbines, locomotive equipment, soft-drink coolers, elevators, vacuum cleaners, transformers, aerosol bombs, aviation gas turbines, radar equipment, toasters, and a host of other products operated quite independently of each other and with little regard for broad company welfare. Within the manufacturing division, moreover, there was some queer product groupings such as TV sets and industrial electronic equipment, motors and consumer appliances. There was a copper mill, an iron foundry, and the largest phenolic-plastic plant in the country. There were also three wholly-owned subsidiaries: WH Electric International Co with 200 distributors in sixty-five countries; WH Electric Supply Co with ninety-five branch offices and warehouses in the US; and WH Radio Stations Inc, which operated six commercial broadcasting stations".

The company needed to regain some integration.

Price once declared that when he joined WH, "the most difficult thing for me to understand was its sales structure" (Fortune, December 1952). By then, WH had a vice-president in charge of sales and another one looking after all the manufacturing divisions. Each and every disagreement that arose between manufacturing divisions and sales force had to be resolved by the president. Moreover, manufacturing divisions enjoyed such autonomy that complex bids gave rise to several rounds of negotiations within WH. Whenever a sale involved more than one manufacturing division, as in a bid on a utility power plant in which the

transformer, generator, and switchgear divisions might all participate, the process within WH for deciding on price, delivery dates and so on, took three to five weeks, before a bid could be submitted. Such sales accounted for more than half of all WH apparatus sales, which normally were more than twice as profitable as consumer goods.

Price waited until the sales vice-president retired in 1948. Then, he hired a consultant firm a friend of his from US Steel had indicated. Mark W. Cresap, who was a partner at this firm, submitted reorganization recommendations, which were implemented shortly after. Price withdrew Cresap from his own firm, and in 1951 Cresap was named vice-president and assistant to the president of WH. Cresap recommended the adoption of a line-staff management organization with operational decentralization and top-management policy control. As a result, the manufacturing divisions were grouped into four broad market classifications – apparatus, consumer products, defense and general industrial products. A group vice-president responsible for engineering, manufacturing, and sales was placed in charge of each of these four groups. Functional executives served in a staff capacity and had no authority over the line organization. Together, the four group vice-presidents and the ten principal staff officers served on a new management committee, the top policy-making body below the director level.

As of 1958, a former WH executive, who had left WH in the early 1957 synthesized his view of WH's organizational efforts: "There are cycles in WH management, from tight head quarters control to loose control. When I left, they were in a very tight period. Now it is time for a swing the other way" (Fortune, August 1958, p. 89).

Price hoped to build "not the biggest but the best company in the field" (Fortune, December 1952, p. 186). By "best", he meant the most profitable. Interestingly, WH was then emphasizing the least profitable business in WH, i.e. consumer products. Moreover, the lamp division was losing money because of its poor management of volume production, now free from the former market share allocations associated with GE's licenses. Managing production volume of lamps

in the absence of production quotas proved challenging. In 1951, the big lamp division had to slash lamp production to 60 percent of the sales rate, because the company had built inventories and WH sales unaccountably dropped some ten percent. Price however maintained that profitability was a long-range concept.

For two decades, GE's labor relations policies kept unchanged, steady and predictable. They were discontinued in the late 1960s when the courts ruled them out/deemed them inappropriate. WH, on the other hand, failed to conceive any consistent policy in this matter. In the ten years after WWII end, WH had had four industrial-relations directors, having entertained alternately soft and hard labor relations. Unlike most companies, WH did not succeed in tightening work standards inflated at the insistence of the military services during WWII. In late 1953, WH hired Donald C. Burnham from GM as manufacturing vice-president staff. Burnham was asked to improve assembly line efficiency by applying automation techniques. Time studies started, and as a result, in 1954 and 1955, WH faced more than forty walkouts and a six-week strike. Shortly after these disturbances were over, GE signed a five-year contract with the unions, leading WH's president, Price, to aim for a similar agreement that would guarantee predictable wages for a long period. Union representatives, however, were intent on avoiding another contract on similar terms. Contract duration and time studies issues became deadlocked and WH's workers initiated an almost six months long strike. In 1957, WH decentralized its labor relations. Line management would assume responsibility for labor relations, while corporate industrial relations would play a mere advisory role, except in the event of company-wide bargaining.

As mentioned earlier, in the late 1950s and early 1960s, the electrical conspiracy scandal came to light, incriminating forty-five executives in the electrical manufacturing industry. Despite a general instruction issued in 1946 admonishing GE managers "about their obligation to obey antitrust laws" (Sultan, 1974, p. 34), GE managers were implicated in the conspiracy scandal. By the end of WWII, GE was determined to clarify top management's position with respect to the company's compliance to antitrust laws, having therefore issued the general instruction and requiring GE's managers to sign a statement indicating compliance. Twice

thereafter, in 1948 and in 1950, the instruction was reissued with supplements. In addition, a policy directive clearly stated that "no personnel having pricing or marketing responsibility could henceforth attend NEMA (National Electrical Manufacturers Association) meetings" (Sultan, 1974, p. 34).

Through such efforts, Wilson and later on Cordiner were signalling a major change in a long-established tradition in the electrical industry of holding conclaves among competitors to discuss prices, so as to keep price competition under control. Multiple pressures – foreign competition, unstable economic conditions, top management's emphasis on bottom-line results – as well as the understanding that top management really wanted the meetings to continue, led most managers to disregard top management directives. After all, the intricate system that permeated all the companies involved had not been dismantled, and not taking part in it was believed to constitute a competitive disadvantage.

In fact, the system withstood Cordiner's organizational revolution initiated as he took office in 1950. His five years long work on a reorganization plan meant to revitalize GE aimed at decentralizing authority, which was concentrated in the president's office, at fighting security, complacency, and mediocrity, at rewarding based on performance. Cordiner split GE into 27 autonomous divisions comprising 110 small companies. These would be run as if they were individual firms, "the local boss setting his own budget, even making capital expenditures up to \$200,000" (Fortune, April 1961, p. 135). The mechanism for developing the desired entrepreneurial climate was an organized planning system made up of entrepreneurial/strategic, administrative and operational plans (Vaghefi & Huellmantel, 1998). Moreover, Cordiner's new philosophy of decentralized management specifically forbade meeting with competitors on prices, bids, or market shares.

Throughout the change process, over 2,000 managers were shifted or hired. Those reassigned to divisions that traditionally held price conversations with competitors were to be pressured for compliance with the traditional behavior. Top-down and bottom-up pressures were likely to be exerted. In some cases, after

signing their compliance with GE's general instruction, some managers felt uneasy and refused to pursue further contacts with competitors. Replacements for these positions were sought throughout GE's ranks. Candidates were offered promotion and clarified about the reasons for the opening position. Upon acceptance of the new job, they engaged in colluding with rivals. Bottom-up pressure for collusion occurred when executives landed in a business where people believed that only by pursuing collusion were they to reach ever increasing yearly goals: more profits as a percentage of net sales and larger percentage of available business.

As discussed before, the trial came to an end in 1961. Both GE and WH received fines and had executives sent to jail. In contrast to WH, which believed that corporate punishment would not do any good, GE did punish those involved. Initial punishment, which comprised demotion, transfer, pay cuts, was eventually followed by forced resignation.

Having fought on several fronts, Cordiner had succeeded in but a few ones. By restructuring the whole company, the quite autonomous Works (manufacturing units) had had their power reduced, thereby decreasing GE's fragmentation threat. To prevent the development of new power imbalances and give management flexibility in the allocation of managerial personnel, Cordiner conceived the idea of interchangeable professional managers. This concept endorsed uniformity in pay, in goals, and in skills. By so doing, Cordiner failed to foster entrepreneurship, one of his proclaimed goals. By setting uniform goals set for all units – 7% return on sales and 20% return on investment – he surely aimed at rewarding people based on performance, therefore fighting reward based on length of service. However, this led people to avoid risks and entrepreneurship. Finally, by seeking to standardize as a way to counterbalance diversity, his early diagnostic on GE's source of problems, Cordiner stimulated a process of regression to the mean, discarding promising outliers.

Upon Cordiner's early retirement, the Board chose Fred J. Borch to succeed him in 1963. Borch would face a business portfolio in need of renewal, and an organization in need of reassurance. In fact, Cordiner's ideas on the well-rounded

man and interchangeable professional managers did not stimulate initiative and entrepreneurship. Borch, by contrast, would allow for new ventures initiatives. A case in point is Jack Welch's career development. John F. Welch, who joined GE in the early 1960s, started the plastics business from scratch working with a single assistant. Welch was assessed in line with his outstanding business achievements. Therefore, the blowing up of a pilot plant in 1966 while testing a new manufacturing process brought neither punishment nor business slow down.

Apart from this distinction, Borch carried forward Cordiner's organizational revolution. The notion of strategic business units was put forward and implemented and a comprehensive system for business planning was established. Also, employee education was emphasized. GE's 1971 Annual Report stated that "company-conducted educational programs are a GE tradition and are essential to assuring the competence of the current and future work force. In 1971 the range of GE courses extended from entry-level training to courses in advanced management. Over 5,000 employees completed professional and managerial courses" (p. 24). In addition, GE instituted a new "Educational Incentive Awards program", whereby the General Electric Foundation would grant \$326,000 to seven universities "proposing imaginative changes in curriculum, community involvement and other programs relating to such contemporary problems as minority education and environmental studies" (p. 24). During Borch's final year, he sponsored two long-range initiatives. First, a new company-wide program was launched "to rally all of our people behind the goal of making GE products and services the "Best Buy" for customers. Progress toward this goal will require and, we are confident, will receive extra effort by each component and every employee to improve our quality, service and value, while also seeking to make our operations more productive, cost-conscious and still more competitive" (1971 Annual Report, p. 4). Second, he approved the building of a new headquarters facility in Fairfield, Connecticut, meant to "house the Company's senior management and supporting staffs. The present GE headquarters facility in Manhattan will continue to be fully occupied by the Company to serve as headquarters for the International Group and to consolidate other components now using quarters at various New York City locations" (1971 Annual Report, p. 24).

Price's succession at WH took place one year after Cordiner's. In 1964, Donald Burnham replaced Price. An ex-GM manufacturing engineer, Burnham had been with WH for 11 years when he became WH's CEO. During his tenure, as reported in Annual Reports, WH's proclaimed mission was "solving the problems of people". In fact, the diversified portfolio of businesses built in this period actually fit the broad scope of the stated mission. Burnham's major 1969 reorganization had loosened the reins, enabling a decentralized diversification that took WH far away from its core businesses. Burnham broke up WH into four "companies", granting their presidents enormous autonomy, which more often than not went separate ways. Interestingly, it was up to Burnham to integrate the four pieces.

WH's Annual Reports described both 1971 and 1972 as "the most successful year in WH history". In July 1972, Burnham announced a "step-down-at-60" program", whereby senior officers would retire at the age of 60. According to WH's 1972 Annual Report, the program "assures that the top seven positions in the Company will be filled by competent young executives, and releases the talents and experience of the former top executives for programs of long-range significance to society and to Westinghouse" (p. 3). Following the two "most successful years", 1973 had significant, unexpected losses. Due to the loose controls that came with Burnham's 1969 reorganization, several divisions and subsidiaries had been functioning without significant surveillance from headquarters. As a result, losses took management by surprise. WH's 1973 Annual Report stated that "because these loss operations have had such a disproportionate effect on our overall results, we have instituted a tighter, centralized management system to prevent such areas of weakness from developing into major problems in the future. The division manager is still in charge of his operation, but our new, more sensitive system will help detect and solve problems more rapidly and effectively" (p. 1).

In 1972, Reginald Jones replaced Borch at GE. He not only carried forward Borch's business portfolio rationalization, but he would also develop further the main policies in place. A case in point is Crotonville. The Management Development Institute Cordiner had inaugurated in 1956 was intensively used to homogenize managers' skills, knowledge and values. One of GE's accomplishments mentioned

in its 1974 Annual Report was a new executive workshop, "Managing in an Inflationary Economy". Long-established procedures were kept and developed further. For example, Swope's yearly reviews of personnel records at promotion time came to encompass the identification of talented and promotable managers, the planning and development of such executives, and contingency plans for succession. Jones introduced a new committee structure of GE's Board. Five new committees were formed in mid-1972 aiming at "insuring optimum utilization of Directors' time and abilities in reviewing matters of greatest importance to General Electric (1972 GE Annual Report, p. 6). The five committees were: operations, public issues, management development and compensation, audit and finance, technology and science. In addition, Jones would increase corporate scrutinizing and controls aiming at ensuring effective strategic planning and resource allocation.

In 1974, the 56 years old Robert E. Kirby would replace Burnham at WH. Kirby, who had joined WH in 1946, was the first fully home-grown WH executive to become the company's CEO. He established a prudent management style, delimiting limits of authority and having auditors check operations to make sure guidelines were being observed. In acquisitions, for example, he discontinued the former procedure that had three-page proposals hurriedly handed to the vice-chairman for approval. Moreover, no unit was allowed to initiate negotiation until the proposed acquisition got tentative approval from the Major Projects Review Committee. Shortly after he took office, the uranium issue came to light, initially as a concern and later on as a major problematic issue. Reviewing WH's performance in 1975, Kirby stated in the 1975 Annual Report that "apart from our concern over uranium ... the year 1975 was one of accomplishment for Westinghouse" (p. 1). In the Annual Report's Financial Section, a potential severe financial impact was conjectured, while also stating that "in light of many uncertainties, probable or potential loss cannot reasonably be estimated" (p. 34). In 1977, in his letter to stockholders, Kirby would declare that "resolving the uranium problem remains one of our primary objectives" (WH's 1977 Annual Report, p. 3). The uranium affair had also taken WH's management by surprise. In early 1973, WH's president in charge of nuclear businesses had told security analysts "we have firm commitments [for uranium] that match our requirements throughout the term of all our contracts"

(Fortune, August 1976, p. 154). Unawareness of the firm's commitments was a result of Burnham's reorganization. In fact, fuel obligations had been taken on in a piecemeal, uncoordinated way, leaving top management unaware of the extent of such obligations.

Reestablishing a strong top coordination was one of the most important changes Kirby introduced. A Management Committee formed by Kirby and the companies' presidents was established to make key decisions. As Fortune reported in August 1976, "Company presidents, who formerly were preoccupied with their own parochial interests – and who even feuded over products and markets – now find themselves "looking over all of Westinghouse" at these meetings and helping to deal with problems in their sister companies" (p. 156). This committee dealt with every major issue, such as capital budgeting, long-range planning, key appointments, as well as, the latest developments in uranium.

In July 1978, Kirby appointed Douglas D. Danforth WH's chief operating officer. Danforth had joined WH as a general manager of the Mexican subsidiary in 1955 and had later overseen WH's Canadian operations. After his appointment as chief operating officer, Danforth travelled abroad extensively. According to him, "our own people were telling me we could do better. We were turning down projects because the job needed six of our business units and only three were interested" (Fortune, January 14, 1980, p. 50). Customers also complained. As Fortune reports, "not long ago, a company salesman called on a Saudi business man. After the preliminaries, the Saudi reached into his desk drawer and drew out the business cards of twenty-four other Westinghouse salesmen. Spreading the out in his desk, the Saudi exasperatedly inquired: 'Who speaks for Westinghouse?' " (Fortune, January 14, 1980, p. 50) Kirby and Danforth assigned John C. Marous to do a study on WH's international operations. Marous, who had joined WH at the age of 24, had been for thirty years with the company. A ninety-day deadline was set and Marous assembled a team that would provide a fresh look on the company's international operations. The findings astounded team members (Fortune, January 14, 1980, pp. 50 to 52):

the company did not know precisely how much money it made abroad;

business units never separated their domestic and export business. As a result, they were able to allocate overhead as they saw fit, sometimes piling it all on their domestic sales to avoid the appearance of a loss abroad; the few units whose products had a competitive edge in world markets, notably in the nuclear- and defense-equipment fields, had developed an international orientation and operating method. But most of the business units enjoyed no such edge and readily fell back on the big, unified, steadily expanding domestic market. If an easy foreign sale or obvious acquisition appeared, they snapped it up. Otherwise, the world looked too complex, fragmented, and competitive to be worth the effort; each unit had its full complement of support services – legal, accounting, financial – in each country. This led to such ludicrous situations as one subsidiary sitting with surplus cash, while another in the same country was borrowing at exorbitant rates.

In the late 1970s and early 1980s, aiming at recovering lost ground and meeting the increasing challenge of the Japanese, WH concluded it had to increase productivity much faster than the 2-3% American industry used to achieve. In the words of a WH executive: "Our operating margins didn't look as good as we hoped for the future and we agonized a lot over this. The significant and delightful development came when we freed ourselves from trying to solve the problem by changing the mix forgetting the volume or raising prices. We said, realistically, these things are not fully, and sometimes not at all, under our control. Maybe we had better concentrate on things we can influence. We are going to have more with less – fewer people, less money, less time, less space, fewer resources in general – and I think that's probably a pretty good definition of productivity" (Fortune, June 15, 1981, p. 74). As a result, "Westinghouse invested a record \$446 million in capital improvements in 1980, an increase of 41% over 1979. A substantial portion of this investment was made as part of our corporate-wide quality and productivity effort. This effort includes modernizing existing facilities, building new plants, introducing advanced manufacturing processes and focusing on human motivational factors" (WH 1980 Annual Report, p. 1). In 1979, WH established the Westinghouse Productivity and Quality Center. In addition, WH engaged in participative

management seeking for inspiration in Ouchi's Theory Z (Ouchi, 1981) and his consulting services. In fact, Ouchi became chairman of an outside committee of three consulting academics. As of 1981, more than 600 quality circles had been formed, "with three being added every day" (Fortune, June 15, 1981, p. 84). Notwithstanding these proclaimed productivity enhancing efforts, WH's overall productivity remained virtually unchanged (refer to figure 6.13).

Unlike Burnham, Kirby stepped down at 65 in 1983. His succession happened in a quite unusual way: Dunforth, then 61 years old was to replace Kirby up to 1987, when Marous, then 62 years old, replaced him. Because of Marous age, as of Dunforth's succession, WH named the 57 years old Paul E. Lego president and chief operating officer and announced that he would replace Marous by the end of 1990. Kirby's policies were basically continued over the Dunforth-Marous-Lego period. Then in 1991, WH Credit led WH to \$1.6 billion quarterly loss. Once more, WH had failed to keep business deals under close scrutiny. WH Credit collapsed in 1992 after billions of dollars in loan losses. Lego left WH shortly after. In the words of a securities analyst, "the crisis at Westinghouse began as a hangnail and turned into gangrene" (Fortune, November 4, 1991, p. 99). Only this time the amputation procedures in use for the last 3 decades did not succeed in keeping WH alive and WH split apart a few years later.

Kirby's contemporary, Reginald Jones, passed the baton to Jack Welch in 1981. In contrast to Jones, a finance man who had climbed GE's hierarchy as an auditor, Welch had been a business manager. He developed the plastics business, positioning GE's Lexan thermoplastic as a replacement for glass. Unlike most GE managers, the entrepreneurial and performance-deliverer Welch did not rotate through new jobs during the first 17 years of his career. As he took office, he viewed bureaucracy as evil making people look inward. He once told a group of GE's top managers, "this internal focus has wasted out energy, frustrated us" (Fortune, March 27, 1989, p. 46). Welch would fight the bureaucracy Jones had set up. Feeling that "you never get all the information you'd like" (Fortune, March 27, 1989, p. 42), Jones had added more complex financial reporting to the point of having GE's computers spit seven daily reports, each 12 feet high.

Much like Swope, Jones picked up a successor that in many respects differed from himself. While Jones had emphasized control, Welch preached entrepreneurship. Rather than an organizational change, Welch saw the need for a cultural change. Much like Swope, he would aim at communicating directly with employees. He would meet subordinates face to face as often as possible, showing up at GE's management training institute to present his ideas and debate them with the managers there. He would discuss issues ranging from corporate strategy to attitude and best practices – being number one or number two, boundarylessness, work-out, six sigma, becoming the most competitive firm in the world.

Described as a revolutionary by many, Welch however confessed he was "afraid of breaking it", as he had been handed "one of the treasures of American enterprise" (Fortune, November 22, 1999, p. 186). On several occasions, he would stress

- . *cohesiveness*, "successfully implementing a strategy to become the world's most competitive enterprise demands a special culture – one that's strongly cohesive" (1984 GE Annual Report, p. 5)

- . *integration*, as when referring to new ventures, "At GE today, they're run by entrepreneurs with their own boards – but with all the technological and financial resources that come with being part of a larger company" (1985 GE Annual Report, p. 3). Or when he commented on GE's corporate strategy, "Are we a conglomerate? No, not that there's anything wrong with being a conglomerate. We simply aren't one. We're not a collection of stand-alone enterprises, and this label misses the very essence of what makes this Company work so well. We know what we are: ***an integrated, diversified company***" (1989 GE Annual Report, p. 3)

- . *boundarylessness*, as when explaining what the boundaryless vision meant, "in a boundaryless company, suppliers aren't 'outsiders'... Customers are seen for what they are – the lifeblood of a company... internal functions begin to blur. Engineering doesn't design a product and then 'hand it off' to manufacturing. They form a team, along with marketing and sales, finance and the rest" (1990 GE Annual Report, p. 2). Also, "GE's diversity creates a

huge laboratory of innovation and ideas that reside in each of the businesses, and mining them is both our challenge and an awesome opportunity. Boundaryless behavior is what integrates us and turns this opportunity into reality, creating the real value of a multibusiness company – the big competitive advantage we call Integrated Diversity. Boundary-busting does something else for us. It makes us faster... 'We versus them' is increasingly coming to mean GE versus the competition" (1991 GE Annual Report, p. 3, 4)

size and speed, "size gives us staying power through market cycles in big, promising businesses... Size gives us the resources to invest over a half-billion dollars a year on education... What we are trying relentlessly to do is get that small-company soul – and small-company speed – inside our big-company body" (1992 GE Annual Report, p. 2, 3)

hybrid enterprise, "the hottest trend in business in 1994 – and the one that hit closest to home – was the rush toward breaking up multi-business companies and 'spinning-off' their components, under the theory that their size and diversity inhibited their competitiveness. The obvious question to General Electric, as the world's largest multi-business company, was 'When are you going to do it?' The short answer is that we're not. We've spent more than a decade getting bigger and faster and more competitive, and we intend to continue. Breaking up is the right answer for some big companies. For us it is the wrong answer... Our dream, and our plan, well over a decade ago, was simple. We set to shape a global enterprise that preserved the classic big-company advantages – while eliminating the classic big-company drawbacks. What we wanted to build was a hybrid, an enterprise with the reach and resources of a big company – the body of a big company – but the thirst to learn, the compulsion to share and the bias for action – the soul – of a small company" (1995 GE Annual Report, p. 1, 2)

Welch viewed a rigorous allocation of available resources as a crucial managerial task. Like in his predecessors tenures, succession at all organizational levels has been carefully reviewed. A board committee has been closely involved in a continual evaluation of the company's 130 highest-rank executives. The exhaustive

having globalized markets and sources, GE started "globalizing the intellect of the company... It means using Russian engineering and Indian software – not to arbitrage labor costs, but because these are the best people you can find" (Fortune, September 27, 1999, p. 136).

Here is how GE Capital's top manager, Wendt, saw the integrated, diversified, globalized GE: "The most important part of the GE value to us is its management structure. Jack Welch is not only a heroic form of CEO, there's also a long history of building management practices here" (Fortune, November 10, 1997, p. 188). Besides, the reciprocal relationship linking GEC and the other GE units has been mutually fruitful. GE's long-time knowledge of a number of industries has provided GEC with valuable information on potential clients for its financial products. For instance, GE's centennial familiarity with utilities has enabled GEC's managers to learn firsthand of the utilities eagerness to get rid of ancillary activities such as billing, and collections. As a result, GEC's retailer financial services, which already did billing and collections for 75 million store-brand credit cards, expanded into a new market. The intelligence network has also helped to point out hazards. For example, GE's internal sources signalled a likely instability in the utilities industry due to deregulation. This led GEC to withdraw from insuring utility bonds. On the other hand, GEC has given GE a competitive advantage by providing large contracts financing for the customers of GE businesses, such as aircraft, power systems, and automotive.

GE's managerial expertise in running businesses was also helpful in avoiding the write-off of a bad loan or a leasing loss. In 1983, for example, GEC became a railroad leasing company, when its loans to Tiger International became potential losses. On another occasion, GEC launched Polar Air, an independent air cargo line, by converting passenger planes into cargo carriers, when those passenger planes came off lease in a period of weak demand for passenger airplanes. The synergistic relationship between GEC and GE's other businesses may explain the viewpoint of Wendt, GEC's CEO.

As reported in Fortune, GEC "seeks to eliminate – or at least reduce – all

risks that do not carry a big potential payoff (like insuring utility bonds) and to save its risk-taking for the few that do" (Fortune, November 10, 1997, p. 132). The broad mix of businesses has helped to minimize the risks posed by one particular venture. However, GEC's protection has gone beyond simple diversification, encompassing plenty of collateral. By employing a team of extremely qualified asset managers, GEC has aimed at knowing exactly what each collateral is worth. This has enabled GEC to buy problem loans and properties, which others would not dare to acquire, and reap capital gains from such assets. Risk management has been deeply incorporated in the management of GEC's diversified portfolio of businesses. Business managers have closely worked with risk management experts. According to GEC's chief risk manager, "Part of the assessment our business leaders make on a new piece of business is whether or not we'll get paid. That's why we put risk managers down in trenches with them" (Fortune, November 10, 1977, p. 134). In addition, GEC has also used quantitatively triggered danger signals – smoke detectors – to alert it in case of trouble. To produce these smoke detectors, in each business, its risk manager identified the main factors, usually four or five, which contribute to potential profitability. This involved studying the business history to understand how GEC made money in the financial product sold. Once the profit drivers were determined, smoke detectors were set to alert business managers to any substantial change. Besides collateral and smoke detectors, GEC has performed a real-time financial X-ray of its clients, which has helped to keep track of GE's exposure to every client across all lines of business. Finally, GEC's customers were usually assigned a \$50 million credit ceiling. Any credit extension has required review and signature from GEC's top management. A credit extension beyond \$100 million would go to GEC's board, where Welch sat. In GEC's view, "the limits don't hinder growth, but they do make it more thoughtful and greatly reduce the odds of a nasty surprise" (Fortune, November 10, 1997, p. 134).

As of 1997, GEC's profits accounted for 39% of GE's earnings. Welch "sees good ol' GE, full of slower-growing money makers like plastics, lighting, and aircraft engines", which together "throw off most of what's needed to pay dividends, buy back shares, and fetch that triple-A credit rating" (Fortune, November 10, 1997, p. 118). On the other hand, the opportunistic, entrepreneurial, fast growing GEC has

been producing the necessary fuel to foster GE's growth.

As mentioned earlier, despite its unquestionable superior performance, GEC's acquisition of Kidder Peabody resulted in a catastrophic loss in earnings and talents. In addition, an organizational issue played a major role in Peabody's debacle. Kidder's head, Carpenter, who was Welch's good friend, did not get along with GEC's head, Wendt. By allowing Carpenter to report directly to him, Welch kept Kidder under intense pressure to grow, allowing it to operate entirely detached from GEC's sophisticated financial, risk management controls. As Fortune described, other scandals emerged throughout Welch's tenure (Fortune, September 5, 1994, p. 46):

- . In 1985, GE pleaded guilty to fraud charges for overcharging the Air Force, having agreed to pay \$2 million in criminal and civil penalties.
- . In 1989, GE settled four civil suits brought by whistle blowers who alleged that GE cheated the government by issuing faulty timecards. GE paid \$3.5 million.
- . In 1990, GE was convicted of defrauding the Defense Department by overcharging the Army for a battlefield computer system, having paid \$30 million.
- . In 1992, GE pleaded guilty to defrauding the Pentagon in the sale of military jet engines, having paid \$69 million in fines.
- . In 1993, GE's NBC unit issued an on-air apology to General Motors for staging a misleading simulated crash test, having agreed to pay \$1 million legal and investigation expenses.

GE's and WH's organizational development compared

Unlike their business portfolio development, GE's and WH's organizational development differed considerably from one another. While GE developed into a *highly integrated* organization, WH became a *highly fragmented* organization. As managerial dynasties succeeded, GE's coordinating mechanisms would be improved and expanded, both *internally* and *externally*. WH, on the other hand, would exhibit a fragmented profile both *horizontally* – within the operational level –

and abroad.

GE, on the other hand, underwent a continuing integration effort. To start with, GE was the very product of a merger. In GE's early years, Coffin had to cope with the internal integration battle, while he fought the Financial Panic threat. Swope's actions also emphasized the integration of GE's diverse units into the corporation. The GE monogram campaign, GE's advertising policy and Swope's efforts to reduce the gap separating engineers and salesmen illustrate his integration orientation. Cordiner's coordinated decentralization also stressed integration, while simultaneously aiming at providing some degree of autonomy at the units level. Other Cordiner's integration oriented actions include the creation of Crotonville and the diffusion of concepts such as 'the well-rounded man' and 'interchangeable professional managers'. Borch and Jones developed further Cordiner's corporate services, heavily used Crotonville and continued managerial job rotation. Welch's concern for integration was evident. Not only did he fear to break it apart, but he also undertook a number of integrating initiatives, such as the boundaryless company effort, the six sigma program. Moreover, inter-business integration was increasingly stimulated by means of GE's intelligence network and the reciprocal relationship linking GE units. By so doing, Welch made clear use of diversity to leverage growth. In sum, while GE's organizing approach was oriented to integration, WH's was directed to fragmentation.

The two companies also differed with respect to *top managerial coordination*. While each dynasty at GE enriched and improved coordination mechanisms, WH's coordination approach oscillated across dynasties. During WH's early years, coordination was basically performed by George Westinghouse, who governed the company with a strong hand. Starting with Robertson, coordination weakened. Top management role was rather conciliatory, mainly seeking to harmonize different goals and priorities each unit established. As a result, mixed negotiations delayed WH's bids, thereby slowing the firm's growth. Price made efforts to strengthen top management's coordination role, having created a new top management committee in charge of top-policy making. Burnham reduced top management coordination role by breaking the firm into four autonomous companies. Kirby re-established a strong

top coordination, assigning the management committee functions such as capital budgeting, long range planning and key appointments. By alternating between strong and weak top coordination, top management did not consistently perform strategic resource allocation. Moreover, under weak top coordination, the formation of huge liabilities was left unattended.

Much like George Westinghouse, Coffin used a strong hand to govern GE. In addition, he introduced several financially-oriented coordinating mechanisms. Emphasizing measurement, Swope enriched the existing coordinating mechanisms having introduced several quantitative indicators. A case in point was his study of GE's productivity. Another one was the evaluation of the profit sharing plan GE had introduced. Wilson established the Defense and Advisory Committee to integrate and expedite war orders and organized the pre- and post-war conversion efforts. Cordiner introduced the planning system, which helped him perform GE's coordinated decentralization. Borch and Jones developed further Cordiner's work, having implemented ever more sophisticated coordinating tools. Welch reviewed them aiming at reducing excessive, unproductive paperwork. In addition, he introduced other tools such as six sigma meant to monitor resource usage effectiveness. As a result, GE's consistent coordinating efforts allowed its top management to perform strategic resource allocation, and in an ever bigger company. Generally aiming at improving speed, coordinating mechanisms sometimes took the form of burdensome bureaucracy, bringing about decision-making and implementation slowness. Welch's attack on bureaucracy considerably reduced its heaviness, although controls seem to have been excessively relaxed in some circumstances, leading to the unexpected emergence of liabilities. In addition, GE carried forward a coordinating role in the industry, undertaking initiatives such as NEMA formation and the international lamp cartel organization.

Another major trait differentiated the two firms. While GE tended to approach administrative issues in a *systematic* way, WH approached them in a *piecemeal* mode. Numerous examples illustrate GE's systematic approach: Swope's quantification, measurement and analytical efforts, Boulwarism, pre- and post-war conversion programs, recruiting methods, Cordiner's R&D evaluation and

measurements project, career development, inflation studies, acquisitions screening. WH, on the other hand, more often than not handled administrative issues in a piecemeal, non systematic way. Labor relations, for example, were not dealt in an articulate way. Acquisitions did not go through a systematic screening. Quantification was pursued unevenly, opening up the way for major unpleasant surprises. International strategy implementation was anything but systematic. In sum, while GE's systematic approach enabled it to efficiently handle an ever larger volume of resources, transactions and relations, WH's lack of systematization precluded it from developing size-related efficiency.

The formation and development of a managerial hierarchy is another distinguishing trait of these companies. More than six decades after WH's formation, top management renewal still heavily relied on external talent to run the company. Since the company had been consistently kept fragmented, it is not surprising that corporate managerial skills had not been developed internally. Burnham was the first CEO who had climbed up the hierarchy, although he had been with WH for no more than 11 years. From then on, WH would rely on fully home-grown talent. However, the Danforth-Marous-Lego short tenure seems to indicate that the then hundred years old company faced succession problems. Lack of managerial talent was detrimental to WH. In fact, it brought about uncertainty in episodes like Tripp's sudden death and Lego's shortened tenure. More importantly, it did not favor continuity and consistency.

At GE, the formation of managerial talent started early. As of GE's second succession, a fully home-grown executive, Wilson, came to occupy the CEO chair. Swope's annual assessment of managerial people was developed and enriched further on by the successive CEOs. Over time, recruiting systems were increasingly refined, setting ever higher standards in the recruitment of top talent. Moreover, with the creation of Crotonville, managerial development was pushed forward. In sum, human resources development became ever more crucial for GE's corporate strategy. As a result, GE's ability to form and develop managerial talent brought about predictability, consistency and continuity. This notwithstanding, the standardizing approach Cordiner took, aiming at forming interchangeable

professional managers, and the resultant job rotation proved detrimental to the development of entrepreneurial skills. Fostering these skills became one of Welch's top priorities during his tenure. GE's managerial hierarchy development allowed it to experience smooth continuity, while WH's poorly developed managerial hierarchy precluded it from experiencing such continuity, having given rise instead to painful periods of internal uncertainty.

A PANORAMIC LOOK AT GE'S AND WH'S GROWTH TRAJECTORIES

This section advances a panoramic look at each company's growth trajectory seeking to examine *which, if any, traits each company had had throughout its existence could possibly explain why and how GE and WH ended up having so different destinies*. It is possible to identify the distinguishing traits that each company developed during the formation years. Each company's traits would not only guide the firm's major policies throughout its existence, but what is more, they would determine its destiny.

Enduring traits have been classified into two types. *Organization-oriented traits* are concerned with policies and practices mainly associated with the management of firm's resources. The other type, *Business-oriented traits*, are concerned with policies and practices mainly associated with the management of the firm's business itself. Our analysis suggests that each company's enduring traits have favored the development of different firm propensities. GE fostered a *self-perpetuating propensity*, which enabled it to lead a continued existence over 11 decades. WH, on the other hand, developed a *self-destructing propensity*, which lead to its disappearance after 11 decades of existence. As a result, it can be said that GE *learned to be strategic*, while WH failed to.

This section first presents the two kinds of traits the two firms developed throughout their existence. Then, it advances the mechanisms producing firm self-perpetuation and self-destruction. Finally, it addresses the *learning to be strategic* issue.

	GE	WH
Organization-oriented traits		
i. Organizing approach	<i>Integration</i>	<i>Fragmentation</i>
ii. Resource allocation approach	<i>Strong top coordination</i>	<i>Weak top coordination</i>
iii. Problem solving approach	<i>Systematic</i>	<i>Piecemeal</i>
iv. Managerial hierarchy approach	<i>Early developed</i>	<i>Poorly developed</i>
Business-oriented traits		
v. Enterprising approach	<i>Ambitious, stretch goals</i>	<i>Satisficing or less goals</i>
vi. Growth motives approach	<i>Productive, Hybrid</i>	<i>Productive, Defensive, Nil</i>
vii. Change approach	<i>Change handling</i>	<i>Change complying</i>

Table 6.4 – GE's and WH's growth-related traits

i. Organizing approach

GE started its fight for integration upon its inception. The merger itself was a challenge. Moreover, the calamitous economic conditions pressured Coffin to further his integration efforts and seek major productivity increases. Furthermore, GE's financial pains convinced him that it was imperative to build a financially-sound business. Another instance of Coffin's fight for integration, which in fact preceded GE's foundation, had to do with Coffin's awareness of the interdependence between his business skills and his partners' technological skills. Teaming up at first with Thomson, then with Rice, Whitney and other high-tech talents that would join GE, Coffin sought to establish a fruitful, mutually respectful relationship between the two complementary sides. This might arguably help to explain his choice of successors – Swope, a business-minded engineer, and Young, a business-minded lawyer – who would team up in a technology-flourishing and legislation-challenging environment. GE's Research Laboratory provides clear evidence of how successful was the technology-business integration.

Integration efforts were consistently pursued throughout GE's existence. Having realized that manufacturing, the Works, stood apart, Swope underwent continuous efforts to integrate them into the "GE family". Not only did he exercise a

charismatic leadership, but he also inaugurated personnel programs and policies. Under Swope, GE grew quantitatively and qualitatively. As a result, it became ever more challenging to keep the growing organization integrated. and its business to deliver top performance.

Swope's successor, Wilson, had publicly criticized Swope's centralized organization in favor of a more decentralized form. However, before he would dare to implement such major organizational change he had vehemently supported, he commissioned a seven years long study on GE's decentralization, which included one year of tests. In his study, Cordiner had also realized that under the new economic, technological and political conditions, entrepreneurship should be fostered if GE wished to continue to grow. However, the decentralization process he had conceived did not leave much room for initiatives. Decentralization was to proceed in an ordered manner, under top management coordination, and to fight fragmentation threat, Cordiner made heavy use of standardization – pay, skills, performance goals – downplaying, therefore entrepreneurship.

Cordiner's successors, Borch and Jones, refined the coordinated decentralization system Cordiner had conceived and implemented. To help coordinate the decentralized GE, management continuously hired new planning staff. As a result, GE's organization kept growing, although its business performed unevenly. It was up to Welch to release the organization from unproductive procedures, to reduce the number of organizational layers, and the role of corporate planners in the company. However, his measures did not favor fragmentation. Quite on the contrary. Having realized that GE's integration effort had considerably reduced its speed, Welch sought to foster integration mechanisms that could make good use of GE's size and diversity to leverage growth. Communication and interchange among GE's several units would, therefore, be strongly stimulated to enable the fastest diffusion of learning throughout the whole company, as the six-sigma program clearly typifies.

WH was created as a member of George Westinghouse's fragmented empire. George Westinghouse's approach to firm growth consisted of adding quasi-

autonomous manufacturing units both domestically and internationally, while reserving to GW himself the role of integrator. Under his command, it grew in the same fragmented way, both domestically and internationally.

Over time, fragmentation was consistently reinforced. As GW was ousted, the arrival of Tripp, an outsider financier, introduced another kind of fragmentation: not only were manufacturing units kept apart from each other, but top management became considerably more dissociated from WH's operations. In fact, upon Tripp's arrival, although WH's finances were put back in shape, fragmentation was reinforced.

As managerial dynasties succeeded, autonomy without integration was emphasized. Another outsider, Robertson, replaced Tripp upon his sudden death. Robertson instituted profit responsibility at the plant level, and kept manufacturing disconnected from the sales organization. He remained the chief integrator whenever necessary. Moreover, the various manufacturing businesses were kept independent from one another, causing lengthy interunit negotiations and delayed bids. By assigning profit responsibility to WH's plants, Robertson's restructuring introduced a third type of fragmentation involving manufacturing and marketing units. In Robertson's scheme, the CEO played the role of facilitator in the settlement of conflict between them.

By restructuring the whole organization, his successor, Price, made an effort to regain some coordination over the entire corporation. His successor, Burnham, inherited the line-staff organization and conceived an expansion strategy into foreign markets. However, he reacted to the first setback in his strategy by turning back to the familiar fragmented structuring. As a result, expansion and diversification ended up in the hands of business unit managers. This entirely uncoordinated expansion caused enormous losses for several years. By giving managers autonomy to grow their businesses, an amazingly diversified business portfolio was built.

Burnham's replacement, Kirby, made efforts to coordinate WH's restoration, but left unattended the so far highly successful financial subsidiary. Once more,

losses were huge to the point of shutting down the financial subsidiary. Efforts to counterbalance WH's fragmentation merely emphasized the recentralization of decision-making at corporate headquarters, but did not aim at improving the integration of WH's many units. Finally, besides horizontal fragmentation among the various units and functions, vertical fragmentation also occurred. Top management and operations kept each other at a distance. During the first fifty years following GW's departure, top management was recruited outside the company's ranks. Its first insider, Burnham, an ex-GM executive, had been with WH for about ten years when he took over. Only in 1974, WH's new top executive, Kirby, was someone who had grown inside WH. Given this long tradition of fragmented structuring, it should not be surprising that its split into several parts was WH's final destiny.

ii. Resource allocation approach

Coordination of ever more numerous and diverse resources has been a constant concern for all dynasties of GE management. Uncontrolled growth was viewed as a major threat to the continued existence of the firm. On the other hand, speed, initiative, and anticipation were believed essential for business success in the innovation-based electrical industry. Reconciling the need for control and the quest for speed was a major challenge that managerial coordination had to face. Committees were often formed to coordinate and accelerate the handling of new situations as they appeared. The WWII committee formed to expedite defense orders is a case in point. Jones's committees involving the Board of Directors provide another example of GE's intent on developing coordinating mechanisms to help it better allocate its resources.

During their tenures, Swope and Wilson perceived that functional structuring did not fit the growing, speed-oriented organization GE was. The comprehensive decentralization Cordiner implemented aimed at both speed and coordination. Borch and Jones made changes to Cordiner's initial decentralization in an effort to correct observed dysfunctions. Over time, however, speed lost ground for coordination, as a result of the large number of hierarchical layers and controls that were progressively introduced in the organization. Welch identified the need to regain speed. He reduced layers and controls, while maintaining the coordination of the

major strategic issues such as business portfolio composition, resource allocation, business performance assessment, and management's career planning.

Concern for coordination was not considerable at WH. Neither internally, nor with respect to its external relations. For one, GE took care of industry coordination. As for the coordination of its units, WH did not consistently perform a thorough coordination. More often than not, coordination would be suppressed and poorly replaced by a call for independent, uncoordinated initiatives. Examples include WH's reaction to the French government's damages to its international acquisition strategy, and WH's decentralization of labor negotiations. In addition, although it developed some coordinating procedures and measurements, such as its VABASTRAM system, they tended to be episodically, rather than systematically, applied throughout WH's existence.

The weakly coordinated, fragmented WH grew under the comfortable umbrella of the stable industry structure GE had actively built, but failed miserably as stability faded away. On the other hand, GE's highly coordinated, integrated organization stumbled for about two decades before it conceived a powerful strategy to cope with industry structure dismantling. GE not only succeeded in finding ways to benefit from GE's diversified resources, but also did not expose itself to existence-threatening losses.

iii. Problem-solving approach

At GE, the systematic approach to innovation that inventors like Edison and Thomson had pioneered, was consistently applied to the management of the growing organization. Edison's approach to innovation, for example, encompassed a clear understanding of reality and a well conceived implementation aiming at maximizing the chances of success. Important aspects of reality had to be quantified to be understood, and a careful analysis of intervening actors had to be done to successfully implement innovation. Management regularly applied the systematic approach to acquire a better understanding of reality, as well as to increase the chances of success when implementing changes. So it was in matters as diverse as inflation, R&D, and labor relations. The quest for better understanding reality

prompted questions such as: how much money is GE really making within an inflationary economy, how effective has GE's R&D been, or even what is it that really matters for GE's workers.

Conceiving quantitative indicators, measuring them and assessing their evolutive behavior has been a constant concern at GE. Swope, for example, realized that GE's productivity had been reduced ever since WWI and took measures to improve it. The assessment of GE's first profit-sharing plan ten years after its launching showed that the plan's objectives had not been accomplished and adjustments were needed. The importance of measurement was emphasized in several instances (Cordiner, 1956). For instance, Cordiner's book series on professional management (GE, 1954) dedicated an entire chapter to the importance and incompleteness of measurement, having encouraged managers to adopt existing measures as well as to conceive and try out new measures should they feel helpful. Welch provided a more recent example, when he emphasized the need to put a number on qualitative traits such as "how open people are and how directly people face reality" (Pascale, 1990, p. 211).

Comprehensive analyses of the situations GE aimed to change have been regularly done. By accounting for internal and external sources of change, GE seeks to understand the framework of intervening pressures affecting its pursued goals, as well as to increase the success chances of major changes it undertakes. The way GE exerted its monopoly power on lamps and built the industry umbrella is such an example. Boulwarism provides another example of a major systematically implemented change in GE's relationship with external entities, in this case labor unions. Major internal changes have also called for comprehensive, systematic analyses. For instance, to face the pre- and post-war changing environments, careful planning was made concerning the required conversion efforts. Cordiner's decentralization program also illustrates the implementation of a major internal, systematically implemented change that followed a thorough study of the situation. A more recent example of GE's systematic approach was provided by GE Capital, which has performed in the 1990s the role lamps used to play in the company's portfolio in the 1910s.

At WH, on the other hand, the systematic approach to innovation George Westinghouse inaugurated and WH's engineers continued into the 1990s was not consistently applied to management. In contrast to GE, understanding reality was not systematically pursued at WH. Sporadic attempts to problem-solving such as the Vabastram system and quality management were undertaken on a piecemeal basis rather than systematically. At WH, problems were allowed to achieve high proportions, when they would prompt the search for specific, ad hoc solutions. At GE, the systematic approach aimed at detecting problems at their formation. By so doing, GE sought to anticipate adversities inside and around the firm. This enabled GE not only to avoid unpleasant surprises, but also to position itself so as to be able to take advantage of opportunities and neutralize threats.

iv. Managerial hierarchy development approach

Providing GE with organizational continuity has been a permanent concern. In this, human resources retention, growth and renewal played a major role. Early on, recruiting, training and evaluation procedures were implemented at the technical level. The Test Program for engineers is a case in point. Over time, procedures were improved and extended to reach several other functions. At the managerial level, Crotonville training center was built, and an increasing amount of attention has been devoted to managerial succession at all hierarchical levels. In addition, under extreme circumstances, GE made recourse to its rank of retired employees. As of WWII, for example, GE brought back its retired President Swope and Chairman Young to replace Wilson and Reed. Engineers and salesmen were also brought back from retirement during the Korean war.

At WH, on the other hand, no consistent effort was made to foster the development of a qualified managerial hierarchy able to take increasing responsibilities and to coordinate an ever larger organization. In fact, it took more than 6 decades for a home-grown manager to climb up WH's hierarchy. Moreover, the company seems to have undergone succession problems thereafter, as of the Danforth-Marous-Lego short tenure. The poorly developed managerial hierarchy was detrimental to WH, having produced uncertainty and precluded continuity.

v. Enterprising approach

It refers to the firm's willingness to take risks, as well as, to its willingness to search for ways of avoiding risk and still expand (Penrose, 1980). It is therefore associated with general goals concerning gains and profits, as well as, risks and losses. GE pursued ambitious, pushy goals, which aimed at building a financially-sound business. WH's *satisficing or less* goals, on the other hand, aimed at building a financially-satisficing business. GE consistently developed entrepreneurial skills (Penrose, 1980), which includes imagination and vision, fund-raising ingenuity, ambition and judgment. As Penrose states, in the absence of judgment, the firm will tend to consistently make mistakes, over-estimate what it can do, guess wrongly the future course of events. In sum, in Penrose's view, entrepreneurial skills comprise the ability to make gains and profits, as well as the capacity to refrain from avoidable risks and losses. GE's entrepreneurial approach consistently aimed at maximizing profits and gains and minimizing losses and risks. WH's *satisficing* approach tended to set only *satisficing* goals. According to Simon (1987), *satisficing* is associated with a choice "that meets or exceeds specified criteria, but that is not guaranteed to be either unique or in any sense the best" (p. 243). WH's approach certainly did not aim at maximizing/minimizing, but rather tended to aim at attaining *satisficing* performance levels.

GE never disguised its intention of being and remaining the number 1 company. In fact, up to the late 1960s, when WH's decentralized diversification started, GE had always been the largest and most profitable company in the electrical manufacturing industry. WH had always been the second-best firm that would never aim at the first position. Moreover, WH had a certain built-in stability, given that it was to the best interest of customers, government and industry players to keep WH alive. The two companies approached WWII in very distinct ways. GE, eager to grow as much and as fast as possible, grasped every expansion opportunity there was and increased its floor space considerably. The selective WH, on the other hand, chose new ventures and floor expansion so as to minimize post-war conversion. Welch revived GE's long-established intent by adapting it to fit the diversified company GE had become. As of Welch tenure, GE would aim at being

number 1 or number 2 (with strong chances of becoming number 1) in every business it competed, as well as, at growing faster than the American GNP.

Maximizing profits and minimizing losses encompassed the building of a financially-sound business. The concern for building a financially-sound business dates back to GE's foundation. Bankruptcy risk in 1893 led Coffin to adopt conservative accounting policies regarding the acknowledgement of profits and losses. Also, the 1926 policy which provided reserve in excess of normal depreciation, helped to take inefficient assets out of service as fast as needed. As a result, cash availability and fast decision-making were favored over the distribution of earnings. In addition to awareness and neutralization of potential financial vulnerability, awareness of GE's high-tech nature has also contributed to shape a financially-sound business. The early intent on exploiting the monopoly power that patents awarded their owners oriented GE's policy concerning prices and bases of competition. Aware of its high-tech, risk-taking profile, as of its inception, GE would not conceive of entertaining a price-based competition that risked to jeopardize industry gains. In lamps, the elaborate schemes GE conceived over almost fifty years to neutralize or eliminate the action of price pressure sources provide an example of its consistent unwillingness to engage in price-based competition. As a result, GE managed to maximize its returns in the lamp business, while guaranteeing handsome (satisficing) returns to the other industry players, such as WH. In apparatus, product complexity precluded/imposed straightforward comparison between competing products. Instead, features- and quality-based competition would take place. Financial matters continually played a major role in the management of GE and innovative procedures were devised to handle them and control for risks. The cost-cutting effort in the 1950s and inflation handling in the 1970s illustrate the meticulous way whereby financial issues tended to be dealt with. GE's concern for minimizing losses and risk led it to right time its exit from the computer business, to retreat from the weather control business, to hedge against its nuclear fuel commitments.

On the other hand, early on, due to George Westinghouse's self-reliance, WH took far too many risks, which threatened its existence. The following three

CEOs – Tripp, Robertson, Price – implemented a cautious management style, seeking to build a financially-satisficing business. By leaving risks unchecked, Burnham reproduced George Westinghouse's financially-risky business. His careless management of risks caused huge losses in several businesses, such as nuclear, urban development and mail-order. Apparently, the lesson was not learned. A few years later, careless management of risk once more produced huge losses, this time at WH's financial subsidiary. It should be noticed that GE was not risk safe, having incurred in some significant losses every once in a while. However, only once was GE's existence threatened – right after its formation. Thereafter, it would pursue gain maximizing and loss minimizing goals.

In sum, more often than not, GE's enterprising approach aimed at ambitious, pushy goals, while WH's goals were satisficing or less. GE's financially-sound business generated profits and equipped the company with cash, creating favorable conditions for fast decision-making in money matters. By setting and consistently pursuing 'stretch goals' (Hamel & Prahalad, 1994), GE grew profitably and developed a sustained competitive advantage relative to its less ambitious rivals, particularly WH.

vi. Growth motives approach

It concerns the kinds of motives inspiring the firm's expansion. According to Chandler (1977), productive motives are more likely to produce continuing growth than defensive ones. Our analysis has suggested the possibility of two other types: hybrid motives, i.e., both productive and defensive, and nil motives, i.e., neither productive nor defensive. Hybrid motives allow a firm to circumvent the dominance dilemma, while nil motives typically refer to empire-building types of growth.

Both firms developed technological skills that endowed them with opportunities for productive growth throughout the twelve decades analyzed. In fact, WH's early origins as a high-tech pioneer were consistently maintained throughout its existence, having produced continuing growth into several related technological fields. Even as it was being dismembered, WH possessed valuable high-tech businesses. GE also underwent continuing growth in high-tech businesses. In fact,

the constitution of a research laboratory during GE's infancy has endowed it with an important source of internal growth.

However, the two firms differed in two significant respects: the hybrid motivations (both productive and defensive) inspiring GE's expansion and WH's empire building (nil motivations) growth undertaken in the late 1960s and early 1970s. The simultaneously productive and defensive characteristic of GE's research activities has contributed to the firm's growth by pioneering innovations and/or improving existing technology. Productive motives gave rise to continuing efforts to improve existing technology, as well as to diversify into high-tech related fields. Defensive motives inspired the search for innovation that might replace existing technology. In this way, GE sought to protect its valuable patents, its dominant position in the industry, and the relative positions of other players in the industry. GE's implementation of the umbrella strategy provides another example of GE's hybrid motivations.

At WH, on the other hand, hybrid motives did not inspire its expansion. With the cross-licensing agreement, WH negotiated a privileged, yet secondary position in the industry. As a result, its productive-motivated research efforts aimed at keeping pace with GE's, leaving the defensive role to GE. Also, while under the protective umbrella structure, WH left to GE the role of protecting the industry. Throughout the uncoordinated diversification WH initiated in the 1960s, neither productive nor defensive motives inspired its expansion. Thereafter, the importance of high-tech businesses in WH's overall portfolio of businesses would undergo a progressive reduction. Such diversification did not create opportunities for significant scale and/or scope gains and economies. Market expansion was the single mechanism each business relied on to expand. Changing economic conditions – oil crisis, high inflation – brought about contraction in several markets WH had expanded into, leading WH to undergo continuing contraction, rather than continuing growth.

vii. Change approach

GE and WH approached change – both inside and around them – in very

different ways. GE actively pursued the handling of change so as to anticipate and make the best use of opportunities and threats forming inside and around the firm. Change handling encompassed the identification of different sources of change – internal and external – and expeditious actions aiming at securing GE the best possible position in a changing scenario. By virtue of a systematic scrutinizing of change GE sought to identify change early on. For example, to anticipate technological change in the newly born electrical industry, GE not only set up its Research Laboratory, but also entertained close, equity-based relations with European electrical manufacturers. By implementing a number of mechanisms – licenses, agreements, acquisitions and joint-ventures and alliances – GE sought to take the best advantage of change to the point of neutralizing it, whenever possible and advisable. GE's management of the lamp business provides a clear example of the comprehensiveness of GE's change handling approach.

WH, on the other hand, tended to comply with change. Comfortably placed in a privileged position in the industry's umbrella structure, WH enjoyed a stable second-place. Under GE's coordination, WH would tend to respond to, rather than foster change.

Self-perpetuating and self-destructing propensities

Our analysis suggests that the above described enduring traits in each company have favored the development of different kinds of propensity at each company. GE fostered a *self-perpetuating propensity*, which enabled it to lead a continued existence over 11 decades. On the other hand, WH developed a *self-destructing propensity*, which lead to its disappearance after 11 decades of existence.

In *The Visible Hand*, Chandler (1977) advanced two necessary conditions for the firm to self-perpetuate: continuing growth and continued existence. According to him, continuing growth was associated with a continuing productive use of skills and resources, while the formation and development of a managerial hierarchy was a critical prerequisite for continued existence. GE's and WH's development confirm

Chandler's proposition. In fact, more often than not, GE undertook productive growth, expanding the use of its existing resources and skills into new lines of business. On the other hand, WH not only failed to undertake continuing growth as of Burnham's huge decentralized diversification, but it also underwent a continuing contraction process thereafter. In addition, it is undoubtful that while GE consistently developed a managerial hierarchy, WH did it poorly. As early as of its second succession, GE had internally developed management replacing its outgoing CEOs and Chairmen. At WH, this would happen as late as of its fifth succession. Moreover, the promotion of more aged people, such as Danforth-Marous-Lego, indicates that WH faced problems in developing its managerial hierarchy and/or in carrying out the succession process.

Having described relevant facts of GE's and WH's existence throughout twelve decades, this study not only finds confirmatory facts for Chandler's self-perpetuation propositions, but also enriches this concept. For one, it examines the formation of two firm propensities in the context of the growth of the firm: *self-perpetuation*, and its opposite, *self-destruction*. In addition, it advances mechanisms leading to self-perpetuation and self-destruction. Finally, it relates firm traits to the development of self-perpetuating and self-destructing propensities.

Our analysis of GE's and WH's growth trajectories seems to indicate that WH was not beaten by GE, but rather by itself. Despite the several fierce battles the two companies fought both in the technological and in the market field, poor management, rather than superior competition, seems to have been the major factor in WH's breakdown. On the other hand, GE's managerial capabilities played a major role in GE's self-perpetuating propensity development. This study advances the notion that *as a firm grows, it faces conflicting forces that push the firm towards either of two extreme poles: its self-perpetuation or its self-destruction.*

The explanatory mechanism of self-perpetuation/self-destruction production has the following characteristics:

i. *As a firm grows, it brings about changes inside and around the firm*

In fact, firm growth increases internal volume and diversity. To the extent that the firm grows into more of the same, its volume of similar things – transactions, skills, resources, markets, outputs – increases. To the extent that the firm expands into new, different activities, its diversity increases. In addition, to a greater or a lesser extent, firm growth changes competitive conditions that affect the players' competitive advantages, competitive parity and competitive disadvantages (Porter, 1980; Ghemawat et al., 1999).

ii. *Inside and around changes encompass opportunities/threats to the growing firm*

Inside change encompasses volume and/or diversity increase. Change in volume likely brings about opportunities for scale gains and economies. Likewise, diversity increase is likely to create opportunities for scope gains and economies. In addition, internal diversity may give rise to competitive processes among the firm's parts, as well as, for cooperative processes in the event of complementarity of resources and skills. Around change concerns change in the competitive situation. Change in competitive conditions may produce opportunities for strengthening and/or solidifying the firm's competitive position, weakening rivals' position, or even completely changing the rules of the competitive game. All these opportunities may turn out into threats to the expanding firm if not properly managed. In addition, rivals' responses to firm expansion may give rise to threats to the firm's competitive position.

iii. *Firm self-perpetuation propensity will be reinforced to the extent that expansion generates more opportunities than threats and to the extent that opportunities are taken advantage of and threats are neutralized. Otherwise, firm self-destruction propensity will be reinforced*

Firm growth brings about opportunities for continuing growth, continued existence and sustained competitive advantage. It may also give rise to threats to the firm's continuing growth, continued existence and competitive advantage. *Self-perpetuation* will be sustained if (a) expansion generates more opportunities than threats; (b) proper care is taken of opportunities; (c) more often than not, threats are neutralized. In sum, self-perpetuation is reinforced to the extent that the firm manages to foster continuing growth, to nurture continued existence and to produce

a positive balance of changes concerning its competitive advantages/parity/disadvantages. *Self-destruction* will be fostered if (a) expansion fails to generate more opportunities than threats; (b) insufficient care is taken of opportunities; (c) more often than not, threats materialize.

As a result, as a firm grows, it will develop a *self-perpetuating propensity* if:

- i. It succeeds in managing volume (scale) and diversity (scope). In other words, in balancing internal competition and complementarity, as well as, in transforming opportunities for scale and/or scope gains and economies into actual gains and economies;
- ii. It succeeds in materializing opportunities for profits and surplus generation;
- iii. It succeeds in favorably changing, to a larger or a lesser extent, the industry players' balance of competitive advantage, competitive parity, competitive disadvantage.

On the other hand, as a firm grows, it will develop a *self-destructing propensity* if:

- i. It fails to properly manage volume (scale) and diversity (scope). In other words, volume and diversity turn into weaknesses rather than strengths reducing gains and/or producing losses;
- ii. It fails to materialize opportunities for profits and surplus generation;
- iii. It fails to favorably change the balance of competitive advantage, competitive parity, and competitive disadvantage.

Drawing on the analyses advanced before – first on each period of their growth trajectories and then on their organizational development – two sets of traits have been identified: *organization-oriented* and *business-oriented*. *Organization-oriented* traits encompass each firm's approach to organizational growth. If organization-oriented traits fail to properly manage volume and diversity, self-destruction is fostered; otherwise, self-perpetuation is nourished. *Business-oriented* traits refer to each firm's approach to business growth. If business-oriented traits fail to favorably change the balance of competitive advantage/parity/disadvantage, self-destruction is nurtured, otherwise, self-perpetuation is promoted. Table 6.5

synthesizes these two sets of traits.

	Self-perpetuation pole	Self-destruction pole
Organization-oriented traits		
i. Organizing approach	<i>Integration</i>	<i>Fragmentation</i>
ii. Resource allocation approach	<i>Strong top coordination</i>	<i>Weak top coordination</i>
iii. Problem solving approach	<i>Systematic</i>	<i>Piecemeal</i>
iv. Managerial hierarchy approach	<i>Early developed MH</i>	<i>Poorly developed MH</i>
Business-oriented traits		
v. Enterprising approach	<i>Ambitious, stretch goals</i>	<i>Satisficing or less goals</i>
vi. Growth motives approach	<i>Productive, Hybrid</i>	<i>Defensive, Nil</i>
vii. Change approach	<i>Change handling</i>	<i>Change complying</i>

Table 6.5 – Growth-related traits and firm propensity development

Learning to be Strategic

A firm may be said to be *strategic* to the extent that its actions, policies, and systems enhance the success chances of its enterprises, and reduce its chances of making losses. Coping with uncertainty (Thompson, 1967), i.e., *handling change* both inside and around the firm is critical to the development of the firm's ability to be strategic. Consistently *applying the systematic approach* is crucial to the development of the firm's ability to learn. In sum, these two traits – problem solving approach and change approach – are instrumental to the *learning to be strategic* process. The other five traits – organizing approach, resource allocation approach, managerial hierarchy formation approach, enterprising approach, growth motives approach – constitute essential aspects of being strategic, since they may contribute to enhancing success chances and reducing losses.

Our analysis of GE's and WH's growth trajectories suggests that GE made consistent efforts to learn to be strategic, while WH failed to. GE's enterprising approach to business viewed GE as a high-tech company entitled to high returns. As a result, GE's businesses should be kept away from price-based competition. With the exception of consumer appliances, and sparse price wars in the apparatus business, GE was able to keep distance from price-based competition, though it made recourse to collusion for a while. By aiming only at #1 and #2 market positions, Welch's portfolio restructuring further emphasized this intent on staying away from price-based competition. WH, on the other hand, adopted a satisficing or less approach to enterprising. For instance, WH shared industry leadership, yet in a secondary position. Apart from technology, a field where the two companies' strengths were in balance in several respects, WH did not consistently pursue highly ambitious achievements.

In addition to its pursuit of high returns, GE was intent on minimizing losses. As a result, GE kept under close scrutiny not only its ongoing operations, but also changes occurring inside and around GE. The systematic handling of internal change helped it learn to run the ever bigger organization GE was becoming. To balance the fragmentation threat that decentralization originated, GE created integrating mechanisms such as the services function and the multiple layers of planning review. The resulting decision-making slowness, short-term orientation, and risk-aversion were the price GE paid to learn how to run a large integrated organization. By stimulating growth initiatives at lower organizational levels and releasing their managers from close scrutiny, WH's approach, on the contrary, fostered speed and risk-taking. However, lack of continuous surveillance and/or proper performance indicators opened the way for major, fast produced disasters that drained WH's resources.

Change handling to enhance the success chances of GE's business strategies was systematically carried out ever since Edison's incandescent lamp patent was upheld. The numerous agreements with licensees, suppliers, actual and potential rivals neutralized most sources of change that might in some way jeopardize GE's strategy for the lamp business. Growth strategies conceived to cope

with inflation, as well as GE Capital growth strategies also exemplify the systematic handling of change to improve the success chances of business strategies. By so doing, GE came to perform a leadership role in the industry. WH, on the other hand never carried out such a role. Under the umbrella structure, WH went with the flow. Its merely accessory participation in the shaping of the industry prevented it from learning to handle various sorts of change pressures and to consistently succeed in the competitive environment. Its inclination to fragment the organization prevented it from learning to fight the forces that turn size into a self-destructive weapon.

Careful risk management together with systematic handling of change have not only spared GE major problems, but also enhanced the success chances of GE's strategies. On the other hand, WH's risk management was virtually non-existent. As a result of WH's weak top management coordination, the numerous poorly coordinated initiatives taken at lower levels would cause huge damage to the company, often catching top management by surprise. Lacking a systematic approach to management, WH failed to learn from previous mistakes. Apparently, no lessons were learned from the uncoordinated growth and diversification that threatened WH's very existence. A few years later, uncoordinated growth in the financial subsidiary brought fatal damages to the subsidiary, and major losses to WH.

It is worth noticing that the construction of GE's successful *<business-organization>* pair in an increasingly larger firm underwent a learning process, which included mistakes and excesses. For instance, GE's unwillingness to engage in price-based competition reached the malignant extreme of industrial conspiracy. The underlying challenge as a firm is learning to grow consists of transforming its size into a leverage mechanism instead of a self-destructive weapon. Although, more often than not, GE did succeed in using its size to leverage growth, it has sometimes turned size into a self-destructive weapon. A case in point is GE's restructuring after the dismantling of the umbrella structure. The already huge, diversified firm GE was at the end of WWII kept growing quantitatively and qualitatively throughout the 1950s. Learning to coordinate this growing company took three decades (1950-1980), along which excessive use of controls gave rise to red tape, speed slowdown

and personnel departure. Welch's changes have to a certain extent redirected GE back to its origins. By emphasizing business portfolio restructuring and speed restoring, Welch re-established important traits of the <business-organization> pair GE had been building throughout its existence: a financially-sound business with plenty of cash and earnings generation, together with a growth-oriented organization stressing integration, coordination, speed, continuity and growth. Moreover, his so-called revolution was executed with the help, rather than despite of several long time existent organizational systems, such as training, auditing, recruiting, research and development. Excesses were cut, but the main structures were kept. For example, control was not banished but alleviated. However, mistakes and excesses still played a part in GE's actions under Welch. Learning to be strategic in an ever larger organization facing ever changing conditions is an unceasing process that requires close scrutiny so as to prevent the firm from crossing the fine line separating self-perpetuation from self-destruction.

CONCLUSION

This essay sought to help understand *why and how some firms enjoy a continuing growth and a continued existence, while others also grow big but eventually contract and disappear*. The two companies we have studied epitomize these two profiles. General Electric has enjoyed a continued existence and several continuing growth periods over its almost 110 years of existence. Westinghouse, on the other hand, in spite of several continuing growth periods throughout its history, underwent a long declining period and ceased to exist after more than 110 years of existence. By scrutinizing their twelve decades long histories, it was possible to identify why and how the two companies ended up following two different paths after many decades of synchronic growth.

The analysis of GE's and WH's growth trajectories suggests that the two companies developed distinguishing, enduring traits that directed each firm towards a different direction. GE consistently fostered integration, strong top coordination,

systematic problem solving, managerial hierarchy development, ambitious goals pursuit, productive and hybrid growth motives, and change handling. WH, on the other hand, consistently fomented fragmentation, piecemeal problem solving, poor managerial hierarchy development, satisficing or less goals, productive, but also defensive and nil growth motives, and change complying. In addition, WH consistently oscillated between weak and top coordination management. GE's traits were conducive to its self-perpetuation, while WH's to its self-destruction.

The comparative study suggests that GE turned into an institution (Selznick, 1957), while WH did not. According to Selznick, "institutionalization is a process" (p. 16) and to *institutionalize* "is to infuse with value beyond the technical requirements of the task at hand" (p. 17). Maintaining that "the test of infusion is expendability" (p. 18), Selznick asserts that "the transformation of expendable technical organizations into institutions is marked by a concern for self-maintenance" (p. 20). In fact, self-maintenance was a constant concern to GE. Not only did GE regularly make efforts to fortify its position in business, but it also consistently emphasized indoctrination and engaged in communication programs targeting society at large. GE sought to diffuse the notion that its existence was indispensable to the well-being of the American nation. It therefore put forward communication programs that aimed at clarifying GE's prominent role and commitment to values the American society praised – pioneering, progress, quality of life, the American way. In sum, such programs suggested that GE was to be seen as non expendable. WH, on the other hand, failed to properly indoctrinate its members, torn apart by the prevailing internal fragmentation. Although, for a while, it mimicked GE's communication programs to the public at large, WH's problems ran counter to such programs. As of WH's extinction in November 1997, The Wall Street Journal wondered how a century-old name such as Westinghouse Electric could vanish so quickly, indicating that WH had not succeeded in inculcating the notion that it was non expendable.

Drawing on the comparative study findings, implications for theory, and management of growth are advanced. Finally, avenues of research are indicated to address the study's limitations and extend its reach.

Implications for the theory and management of growth

Two inter-related theoretical issues emerge from this longitudinal comparative study. First, as a firm grows, its size may turn into a self-destructive weapon or a growth lever. Second, early-developed traits are likely to guide the firm's behavior throughout its existence, i.e. throughout their existences, firms tend to behave in old ways (Mintzberg & Waters, 1982). As a result, early-developed traits are likely to determine whether size will turn into a weapon or a lever.

Growth inevitably brings about diversity. Although a firm may grow in a quantitative way by replicating its procedures in the development of new products and new markets, some degree of diversity is always introduced throughout the growth process. From the organization viewpoint, diversity may give rise to internal competition or complementarity among firm's parts, and both are needed if the firm is to experience healthy growth. Too much competition pushes towards fragmentation, while excessive complementarity brings about slowness and procrastination. Too little competition leads to complacency, while insufficient complementarity fails to produce continuing growth opportunities. Any of these excesses weakens the firm's position in the competitive landscape, as well as the likelihood of experiencing a continued existence. From the business viewpoint, diversity brings about opportunities. To the extent that such opportunities are properly taken care of, diversity is likely to improve the firm's competitive position; otherwise it is likely to jeopardize the firm's competitive position. In sum, diversity contains the seeds of self-perpetuation and self-destruction.

Management of growth, therefore, comprehends the management of the tension between self-perpetuation and self-destruction. It consequently calls for the adequate management of diversity. Adequate degrees of competition and complementarity among the firm's parts should be sought. Moreover, care should be taken in diagnosing the firm's disorder, and most importantly, in applying the adequate prescription. Robertson, for example, rightly diagnosed WH's complacency and slowness. His prescription, however, was inappropriate. By implementing profit

responsibility at the manufacturing level, he brought about the fragmentation of complementary parts – manufacturing and marketing. The management of growth will be successful to the extent that (a) it balances competition and complementarity among the firm's parts; and (b) opportunities for gains and economies are taken care of. As a result, instead of fostering self-destructive features – fragmentation, complacency, slowness, continued contraction – management will nurture integration, innovation, speed, and continuing growth.

In view of the notion advanced in this study that growth generates a tension between firm self-perpetuation and self-destruction, a theoretical implication is that growth can be good, but also harmful to firm's health. This seems to indicate that research on growth should focus on diversity increase and the mechanisms whereby it impacts the firm's <business, organization> pair. For management, on the other hand, this seems to imply that close scrutiny of diversity increase should be done in the event of internal growth or growth through acquisitions or mergers. Awareness of the possible extreme growth outcomes, self-perpetuation and self-destruction, and the mechanisms whereby diversity operates, may help management assess firm growth processes, enabling managers to direct efforts to foster the desired outcomes.

The notion that early-developed traits seem to determine the firm's future destiny raises the *determinism* versus *voluntarism* issue at the firm level. According to Van de Ven & Astley (1981), *voluntarism* is the view according to which human actions and institutions "are autonomously chosen and created by human beings" (p. 429) and *determinism* is "the view that human beings and their institutions are ... determined by exogenous forces" (p. 429). This thesis does not regard change by means of mutually exclusive poles, such as determinism and voluntarism. In fact, the modes of change framework advanced in chapter 4 suggests several change modes, all but one would hardly fit either pole. The notable exception is the causal mode, which would fit the determinism pole.

This notwithstanding, the very notion that early developed traits are likely to determine the firm's path over time seems to imply a path-dependent, self-reinforcing

idea of change, according to which voluntary first moves would end up determining the firm's following moves. Such behavior would therefore preclude/rule out voluntarism once the firm has voluntarily advanced its first steps in a certain direction. In such a scenario, management would most likely tend to elaborate on existing paths rather than innovate in new avenues. These results seem to be in line with Mintzberg and Waters's (1982) study, which reports a firm's replication of a strategic move made 53 years earlier. In their words: "in 1986, in contrast to the lingering problems in the new businesses, the company acted dramatically and decisively in the old one, adopting a strategy remarkably similar to the one Sam Steinberg had used on that eventful weekend in 1933, and with the same result in performance" (p. 489).

Making use of a biological analogy, early-developed traits would correspond to the firm's genes, possibly enabling behavior prediction of firm behavior. In fact, the study findings showed some evidence of a path-dependent, self-reinforcing change at both GE and WH. However, further work is needed to investigate the mechanisms that might explain why and how such recurring behavior may occur, as well as those which enable management to circumvent the firm's genetic predispositions.

Avenues of research

This study has limitations. After all, it has investigated but two companies and a single industry. Without doubt, the longitudinal approach and the detailed analysis done have produced a panoramic, comprehensive view of GE's and WH's growth trajectories. However important these companies have been in the world economy and in technology development, greater breadth is called for. Similar studies of centenarian companies would allow us to verify the extent to which the ideas advanced here can help explain different growth trajectories of firms in other industries. Complementary studies should investigate mechanisms whereby firm traits are formed and eventually reinforced, or not, over time. Particularly interesting are studies on firms that underwent major turnarounds from a self-destructing to a self-perpetuating profile. Such studies can be expected to help clarify why and how,

as well as to what extent, management is likely to revert a path-dependent, self-reinforcing propensity, such as those that supposedly entail the firm's self-perpetuation or its self-destruction.

Chapter 7

CONCLUSION

The *Grow or Die!* imperative is flawed. *Grow and Die* may also be the case – perhaps more often than not. The growth of the firm is far too complex and cannot afford simplistic approaches. Indeed, growth is positively and negatively affected by a variety of types of change occurring inside and around the firm. As a result, growth moves may undermine the modern firm's distinctive feature – regenerative existence – and bring about its end.

The four essays in this thesis have aimed at better understanding relevant issues for the dynamics and management of growth. The first essay has considered the bulk of Chandler's theory on the growth of the firm (Chandler, 1977). The second one has advanced a typology of modes of change likely to affect the growth process. The third piece has proposed a growth indicator, which enables the drawing of growth trajectories of firms in the economy. Finally, the fourth study has examined the growth trajectories of General Electric and Westinghouse, advancing explanations for their so different destinies.

As described in the introductory chapter of the thesis, the essays are interrelated. The first two, chapters 3 and 4, were developed in parallel, having therefore helped each other's ideas formation. The third one, chapter 5, has not only been instrumental in the analysis of GE's and WH's growth trajectories, but also helps to visualize concepts advanced in previous essays, such as Chandler's continuing growth notion (Chandler, 1977). The analysis performed in the last study, chapter 6, has also built on the first two essays. As a result, the

success chances of its lamps business strategy. The handling of different modes of change was shown to play an important role in such cases, i.e., the more types of change that are properly accounted for, the higher the chances that a business strategy will be successful. In fact, by simultaneously accounting for several modes of change, GE succeeded at anticipating, neutralizing or shaping change according to its best interests. As a result, the modes of change framework proposed in the second essay can be expected to help managers to identify external, internal, and interactional sources of change. By so doing, management is likely to conceive sound strategies, which prevent, neutralize or leverage whatever sources of change could be anticipated.

This chapter is organized into three sections. It first synthesizes main insights of the thesis into theory about growth. Then, it summarizes the original contributions of the thesis. Finally, it suggests implications for research and practice.

THESIS INSIGHTS SUMMARIZED

Insights were organized into two main classes: *basic concepts and definitions* and *growth dynamics insights*.

Basic concepts and definitions

- ***Growth/contraction concepts***

The *Growth of the Firm* is defined as the process of increase in the firm's size, an increase in the volume and/or diversity of the firm's activities. *Contraction* is the process of decrease in the firm's size, a decrease in the volume and/or diversity of the firm's activities.

- **Size indicator**

The *Size of the Firm* in a given year can be indicated by:

$$\text{Size} = \frac{\text{annual total sales} * 100}{\text{annual GNP}}$$

- **Growth trajectory**

The plotting of the size indicator over time allows the drawing of the firm's *growth trajectory*.

- **Expansion move**

— With respect to growth progression over time, growth is either an isolated expansion move or an expansion that can be continued over time. The firm can therefore experience *one-time growth*, such as in the event of a merger, or *continuing growth*, when expansion contains the seeds of further expansion.

- **Expansion motives**

There are four types of expansion motives:

productive, stimulated by the pursuit of increased productivity

defensive, aimed at protecting existing operations

hybrid, both productive and defensive motives inspire expansion

nil, neither productive nor defensive motives stimulate growth

- **Modes of change**

The firm actively carries on or reactively experiences changes through different modes. These different modes of change were specified in table 4.1, which is reproduced here:

CHANGE MODE	WHAT IS CHANGED	HOW IS CHANGED
Quantitative	A thing's property(ies)	By replicating procedures. This produces more of the same property(ies)
Dialectical	Two or more conflicting properties	By solving the misfits. This produces a new property(ies)
Interactive	A relational property between/among things	By competition and/or cooperation. This changes how things relate to one another
Causal	A thing's property(ies)	An external event causes the change in a thing's property(ies)
Structural	An emergent property of the thing	By competition and/or cooperation among system's components. This changes properties a thing has by virtue of being a component of a system
Random	A thing's property(ies)	By the action of independent or quasi-independent events/processes. This may change any type of property of the thing
Goal-directed	A thing's property(ies)	By fixing a priori into what will the property(ies) change

- ***The firm's subsystems***

The firm is constituted of two subsystems: *business*, and *organization*. The firm's business system is outward directed, while the organization system is inward focused. Firm evolution can be studied by analyzing the concomitant evolution of the *firm's pair* <*business, organization*>.

- ***Firm traits and firm evolution***

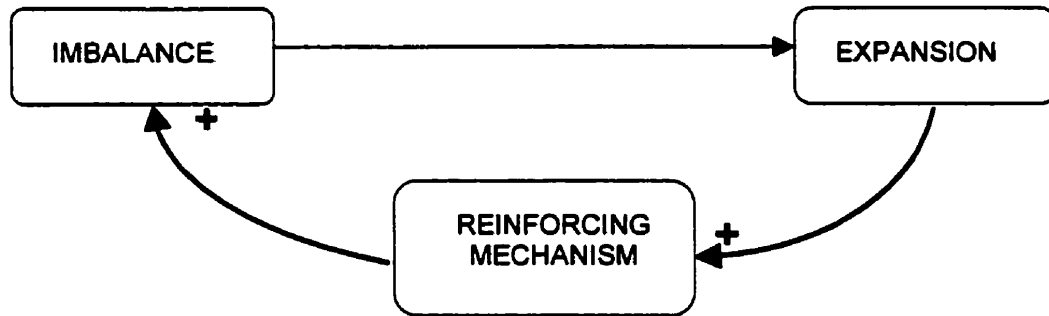
The firm develops two types of growth-related traits: organization-oriented and business-oriented. The first relate to ways of managing the organization, its resources and practices. The latter refers to ways of managing relevant issues in business. The two set of traits are:

Organization-oriented:

Organizing approach – how the firm organizes its parts: keeping them apart or integrating them

Resource allocation approach – the extent to which the firm coordinates resource allocation from the top

course of the expansion process causes imbalance increase or new imbalance.



In the event of hostile imbalance that results in firm contraction, then continuing contraction – rather than continuing growth – would materialize.

The nature of the imbalance can be expected to correspond to any one of the modes of change. A few examples are listed in Table 7.1:

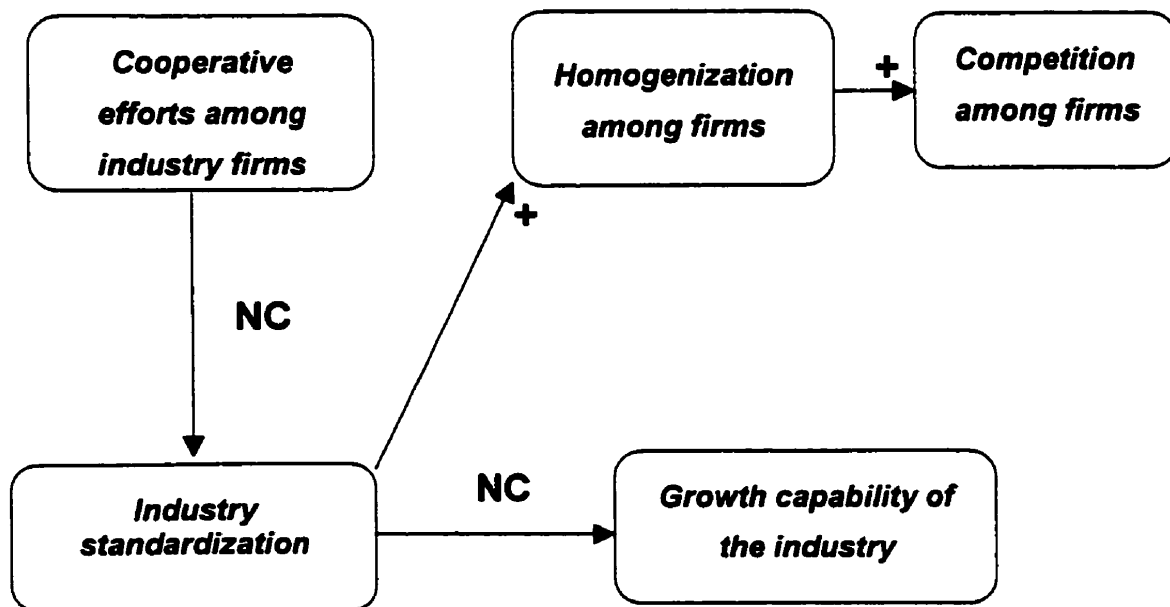
Nature of imbalance	Reinforcing mechanism
Quantitative	Diffusion of novelty increases the demand for it
Dialectical	Fixing misfits generates new products/features and new sorts of misfits
Structural	Poor synchronization of sizes, quantities, speed, etc among components of a complex system gives rise to new uses of idle resources and new instances of poor synchronization

Table 7.1 – Examples of types of imbalance and corresponding reinforcing mechanism

- **Co-evolution firm-industry**

Firms and industry co-evolve. The co-evolution mechanism during the industry formation stage was first represented in figure 3.7, which is reproduced

below:



Obs.: NC = necessary condition(s) for

- ***Growth-related dilemmas***

Two growth-related dilemmas can be identified:

- i. ***Growth dilemma*** – whenever some degree of standardization is required to foster industry growth capability, firms are likely to cooperate to bring forth a certain degree of standardization. By so doing, firm homogeneity increases, and firms are therefore likely to face higher competitive intensity later on. Management faces, therefore, the dilemma of deciding to what extent it should undertake certain strategies to foster industry growth, since these very strategies are likely to constrain firm growth later on.
- ii. ***Dominance dilemma*** – productive (positive) strategies are required to foster firm growth and industry dominance. However, as the firm's dominant position is threatened, defensive (negative) strategies are likely to be embraced, bringing about the weakening of its dominant position. Management faces therefore the dilemma of implementing growth-

constraining strategies to maintain achieved dominance.

- **Motivation impact on growth and domination**

Expansion motives impact growth in the following way:

Hybrid motives – very likely to bring about continuing growth and to protect achieved dominance

Productive motives – likely to bring about continuing growth

Defensive motives – likely to protect achieved dominance

Nil motives – not likely to bring about continuing growth nor to protect achieved dominance

Figure 7.1 represents the likelihood of expansion motives impact:

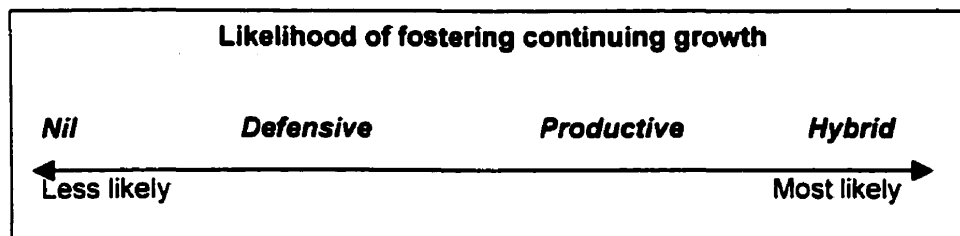


Figure 7.1 – Likelihood of expansion motives impact

- **Volume and diversity increase in growth**

Growth brings about volume and diversity increases. To the extent that the firm grows into more of the same, its volume of similar things – transactions, skills, resources, markets, outputs – increases. To the extent that the firm expands into new, different activities, its diversity increases. Change in volume likely brings about opportunities for scale gains and economies.

To the extent that organizational members perceive growth-resulting diversity, two approaches are likely to be adopted in handling diversity: *competition-oriented* and *complementarity-oriented*. Both are needed and neither should reach extreme intensity. Too much competition leads to organization

fragmentation, while too little competition brings about complacency. Too much complementarity produces slowness and procrastination, while too little complementarity fails to generate continuing growth opportunities. In sum, diversity contains the seeds of *self-perpetuation* – organization integration, speed, innovation, continuing growth – as well as those of *self-destruction* – organization fragmentation, slowness, complacency, continuing contraction. Diversity increase is likely to create opportunities for scope gains and economies.

Growth also brings about change around the firm, including the competitive situation. Change in competitive conditions may produce opportunities for strengthening and/or solidifying the firm's competitive position, weakening rivals' position, or even completely changing the rules of the competitive game. All these opportunities may turn out into threats to the expanding firm if not properly managed. In addition, rivals' responses to firm expansion may give rise to threats to the firm's competitive position. Therefore, to a greater or a lesser extent, firm growth changes competitive conditions that affect the players' competitive advantages, competitive parity and competitive disadvantages.

- ***Basic tension in firm growth***

As a firm grows, it faces conflicting forces that push the firm towards two extreme poles: its self-perpetuation and its self-destruction. Firm self-perpetuation propensity will be reinforced to the extent that expansion generates more opportunities than threats and to the extent that opportunities are taken advantage of and threats are neutralized. Otherwise, firm self-destruction propensity will be reinforced.

- ***Self-perpetuation propensity development***

The firm will develop a self-perpetuation propensity to the extent that

- i. It succeeds in managing volume (scale) and diversity (scope). In other words, in balancing internal competition and complementarity, as well as, in transforming opportunities for scale and/or scope gains and economies

into actual gains and economies;

- ii. It succeeds in materializing opportunities for profits and surplus generation;
- iii. It succeeds in favorably changing, to a larger or a lesser extent, the industry players' balance of competitive advantage, competitive parity, competitive disadvantage.

- ***Self-destruction propensity development***

The firm will develop a self-destruction propensity to the extent that

- i. It fails to properly manage volume (scale) and diversity (scope). In other words, volume and diversity turn into weaknesses rather than strengths reducing gains and/or producing losses;
- ii. It fails to materialize opportunities for profits and surplus generation;
- iii. It fails to favorably change the balance of competitive advantage, competitive parity, and competitive disadvantage.

- ***Firm traits and the basic tension***

Firm traits are likely to push towards self-perpetuation or self-destruction according to table 6.5, which is reproduced below:

	<i>Self-perpetuation</i>	<i>Self-destruction</i>
Organization-oriented traits		
i. Organizing approach	<i>Integration</i>	<i>Fragmentation</i>
ii. Resource allocation approach	<i>Strong top coordination</i>	<i>Weak top coordination</i>
iii. Problem solving approach	<i>Systematic</i>	<i>Piecemeal</i>
iv. Managerial hierarchy approach	<i>Early developed</i>	<i>Poorly developed</i>
Business-oriented traits		
v. Enterprising approach	<i>Ambitious, stretch goals</i>	<i>Satisficing or less goals</i>
vi. Growth motives approach	<i>Productive, Hybrid</i>	<i>Defensive, Nil</i>
vii. Change approach	<i>Change handling</i>	<i>Change complying</i>

ORIGINAL CONTRIBUTIONS OF THE THESIS

The essays make original contributions to theory building and research methods on growth and management studies. Based on systematic efforts to clarify concepts and to organize and expand knowledge on growth-related mechanisms, this thesis has filled some gaps in the present literature. For example, the proposed modes of change framework may help researchers to look systematically for other than causal relations. Also, the co-evolution motor associating firms and industry growth allows for the development of a more contextual dynamic perspective of growth processes.

Drawing on Snow and Thomas's article (1994) on contributions of field research methods to theory building and testing, contributions to theory building are classified according to their descriptive, explanatory and predictive nature. Figure 7.2 summarizes them.

DESCRIPTION	EXPLANATION	PREDICTION
<ul style="list-style-type: none">. Firm size. Growth and contraction trajectories. Firm traits. Expansion motives	<ul style="list-style-type: none">. Change modes. Co-evolution firm-industry. Continuing growth. Growth-related dilemmas. Handling diversity. Basic tension in firm growth	<ul style="list-style-type: none">. Firm contraction trajectory (tentative)

Table 7.2 – Thesis original contributions to theory building

At the descriptive level, the thesis proposes an indicator of *size*, which shows the company's relative growth and automatically corrects for inflation. As the indicator produces a measure that is comparable over time, it allows for the drawing of *growth and contraction trajectories* of firms throughout their existence.

Plotting curves for firms in the same industry enables the visualization of industry evolution.

While growth trajectory curves depict the firm's evolution within the economy, the thesis identifies a number of *firm traits* associated with the growth process. The thesis suggests that these traits, classified into organization-oriented and business-oriented types, allow distinguishing between firms whose growth process promotes either a self-perpetuating propensity or a self-destructing propensity.

Also at the descriptive level, the thesis enriches Chandler's *expansion motives* notion. In addition to Chandler's productive and defensive types, the thesis suggests two other types: hybrid, when productive and defensive motives inspire growth, and nil, when neither of them stimulates expansion.

At the explanatory level, the thesis proposes a number of ways whereby things change. In addition to causality, the *modes of change* framework advances several types of change which individually or combined can constitute explanatory mechanisms of the growth phenomenon. In fact, the thesis explains the growth process of firms and their industry – the *co-evolution of firms and industry* – by means of the co-evolutionary motor, i.e. a complex unit of growth dynamics made up of the combination of three simple modes: competitive, cooperative and structural. The firm-industry co-evolution perspective also illuminates the growth dilemma set forth in the thesis.

The thesis also sketches the main constitutive blocks of *continuing growth* processes of the firm: imbalance, expansion and self-reinforcing mechanism. In addition to Chandler's continuing growth stimulated by operating disequilibrium, i.e., underutilized transferable skills and resources, the thesis advances other instances of continuing growth motors having different types of imbalance and reinforcing mechanisms.

Two *growth-related dilemmas* are also advanced. The growth dilemma concerns the difficulty management may face to harmonize firm growth and industry growth. In what concerns the dominance dilemma, management's challenge consists of harmonizing firm growth and firm dominance. While the need for industry standardization is the key explanatory mechanism in the growth dilemma, the dominance dilemma's mechanism involves the choice between productive and defensive expansion.

Maintaining that growth brings about increases in volume and diversity, the thesis identifies different ways of *handling diversity*. It suggests that to handle diversity, management may adopt competition- or complementarity-oriented approaches.

Still at the explanatory level, the *basic tension in growth* is advanced. As the firm grows, conflicting forces push it towards two extreme poles – self-perpetuation and self-destruction. Maintaining that diversity contains the seeds of firm self-perpetuation, as well as those of self-destruction, the thesis suggests that too much or too little of either approach – competition or complementarity-oriented – is likely to foster self-destruction. In sum, competent handling of diversity is likely to foster self-perpetuation, requiring a balanced adoption of the competition- and complementarity-oriented approaches. In addition, self-perpetuation is likely to be stimulated to the extent that the firm turns opportunities for scale and scope gains and economies into actual gains and economies; the firm materializes opportunities for profits and surplus generation; and the firm favorably influences industry balance of competitive advantage, competitive parity and competitive disadvantage

At the *predictive level*, the thesis does not make substantial contributions. It however puts forward a conjecture related to firm growth trajectories curves. The present embryonic state in the study of growth trajectories provides no substantial evidence that growth curves may be endowed with predictive power to forecast growth. After all, these curves are merely descriptive of the firm's

behavior in the economy, lacking explanatory content. Moreover, growth might be seen as an unbounded kind of problem, i.e. given a variety of opportunities, a firm may grow, simultaneously or not, in several directions and size change may vary accordingly. However, the thesis speculates about the possibility that contraction might in some circumstances be predicted, specially when firm size change becomes a bounded problem, i.e. firm's deficiencies constrain the range of alternatives. Growth trajectories of firms like Westinghouse, Armour, Swift, US Steel describe a long contracting path that might perhaps have been predicted from a certain point on. For the time being, contraction prediction, still belongs in the speculative realm.

Finally, from the research methods viewpoint, the thesis proposes an operator, %US GNP, that produces a variable whose value automatically adjusts for inflationary and deflationary changes in currency value. Enabling to generate time-comparable accounting-based measures, this indicator allows for longitudinal inter- and intra-industry comparisons. As a result, the proposed operator may contribute to the development of longitudinal process-oriented studies in strategic management.

Also, the modes of change framework may help research to enlarge concepts, to the extent that qualitatively different modes of change are taken into consideration. Enlarged concepts may be operationalized in a more comprehensive way, giving rise to variables that account for several ways whereby things come into being or transform themselves in the course of their existence. Enlarged conceptualization may contribute to data collection design. In addition, enhanced comprehensiveness may allow the carrying out of more robust tests, because variables may provide a more complete operationalization of concepts.

Finally, the descriptive power of growth trajectories drawn may inspire and guide longitudinal comparative studies on growth and contraction. For example, the growth trajectories of firms in the electrical manufacturing industry

inspired the research questions examined in chapter 6. Also, several growth trajectory curves in chapter 5 describe intriguing situations, which may prompt researchers to look for answers.

IMPLICATIONS FOR RESEARCH AND PRACTICE

The thesis insights support some notions advanced in the literature and challenge other widely accepted notions in strategic management and organizational studies. The empirical study on GE and WH supports notions such as:

- . — Entrepreneurial and managerial skills constitute necessary conditions for the growth of the firm (Penrose, 1980; Chandler, 1962). In fact, WH's poor managerial skills opened the way to unprofitable growth first and to contraction later on;
- . Expansion may lead to further expansion or to contraction (Starbuck, 1971). This is precisely what happened to WH;
- . The firm's future is more likely to be determined by its history than by outside forces (Greiner, 1972). Although external forces – world wars, antitrust suits, competitive and economic conditions – shaped in part GE's and WH's path, the study seems to indicate that firm traits were more likely to determine each firm's destiny;
- . Normann's (1977) natural driving forces and the dialectic process are contributing factors to growth. In fact, both companies underwent growth through repeated reproduction (Normann's principle of least resistance). They also grew by exploiting opportunities resulting from internal resources over-capacity and external pressures (Normann's other natural driving forces). Growth was also inspired by the search for conflicts and trade-offs (Normann's dialectic process in his planning for growth notion);
- . Surplus margin is the basic variable in firm growth (Katz & Kahn, 1978). Both in GE and WH, profitable expansion opened the way for continuing

growth, while unprofitable growth generated a continuing contraction process in WH;

Firms eventually return to what they know best (Mintzberg and Waters, 1982). In moments of crisis, both GE and WH behaved in this way. When Welch took office, unlike most others, he saw GE going through a crisis. His prescription encompassed a number of moves towards GE's original strategy: high margin businesses (back to Coffin's original intent with respect to lamps), being number 1 or 2 in the industry (back to domination aim). At WH, when De Gaulle vetoed WH's expansion plans, WH's newly implemented top coordination quickly reorganized the firm into the familiar more autonomous organization WH used to be.

The thesis also challenges some notions. *The myth of the savior CEO* is a case in point. The belief that CEOs make a difference is unquestionably true. They so do for better or worse. Welch, for example, has definitely renewed GE, while Burnham's growth intent certainly reinforced WH's continuing decline. However, the seductive belief that one single individual can restore or destroy a modern business enterprise in one (a few) stroke(s) is deceptively simple. Both Welch and Burnham have relied on the existing system to change it. Existing auditing, human resources and information services have definitely helped Welch implement the changes he saw fit. Burnham, on the other hand, just released newly implemented coordinating procedures to have the whole system quickly adapt to a fragmented operating mode. Depending on how the pair <business-organization> has developed, more or less effort and time will be required for change to take place. Moreover, major changes will require an accurate diagnostic of the firm's traits, so as to enhance the success chances of the change initiative. In addition, accuracy in establishing the facts may help stakeholders to make the most appropriate decisions, specially under unfavorable circumstances.

The solutions package myth is another example. Time and again, managerial and business success stories are reported both in academic and

business press. As a result, superior managerial styles and best practices tend to be inferred and their adoption by other managers and firms stimulated, if not prescribed. However, unless firms share a certain degree of similar traits, replication of somebody else's style and/or practices is not likely to produce similar effects.

The thesis challenges Greiner's (1972) and the *life cycle model of firms*. Greiner's stage model of growth portrays GE's and WH's evolution at different accuracy levels. Although GE seems to have gone through Greiner's stages 2, 4 and 5 (sustained growth, coordination and collaboration), GE skipped stages 1 and 3 (birth and delegation). In fact, GE started as a merger of two existing companies, having therefore skipped stage 1. According to Greiner, in stage 3, delegation is implemented and generates a control crisis that makes top executives sense "they are losing control over a highly diversified field operation" (p. 43). Although at a certain point GE implemented delegation, it never lost control over its highly diversified operation, having therefore bypassed the control crisis. In fact, it seems GE combined stages 3 and 4 (delegation and coordination). As for WH, Greiner's model describes less accurately its evolution. Greiner's first crisis, "to locate and install a strong business manager who is acceptable to the founders and who can pull the organization together (p.42)", did not materialize because of the ousting of WH's founder. WH's second stage never fully implemented a functional structure and a strong top coordination, having instead introduced profit centers at the plant level. As a result, it does not seem that WH went through the second crisis which develops from "demands for greater autonomy on the part of lower-level managers" (p. 42). It seems WH did go through the third stage crisis, having top management sensed it had lost control over a highly diversified operation. However, WH did not succeed at conceiving and implementing coordination techniques, a stage 4 characteristic. GE's evolution shows that stages may be skipped and revolutions may be avoided, contradicting, therefore, Greiner's prediction that each evolutionary period is followed by a revolutionary period. After all, GE did not go through the control crisis. GE's evolution also contradicts Greiner's prescriptions that stages

should not be skipped and that revolutions should not be avoided. WH's evolution suggests that Greiner's model should account for unsuccessful handling of stages. Greiner's model accuracy might improve should it consider growth within two scenarios: development of firm self-perpetuation and of firm self-destruction propensities.

The notion of organizational isomorphism (DiMaggio & Powell, 1983) should be clarified. In many respects, it might be said that there was a high degree of isomorphism between GE and WH. From the viewpoint of an external observer, these two companies were pretty much alike: same businesses, same sales structure, same distribution channels, and so on. However, they markedly differed in their business approach, organizational coordination and their growth orientation.

Competition as a subfield in the study of business success should not disregard organizational characteristics. The study on GE and WH seems to indicate that, without doubt, competition may drive a firm out of a certain business. GE, for example, decided to divest its computer business due to its poor competitive position. However, the study also seems to suggest that, rather than competition, organizational characteristics are more likely to drive a firm out of the business landscape altogether. Despite several business failures, GE has managed to develop a continued, profitable existence. WH's organizational traits, on the other hand, have directed it towards its self-destruction.

Contingency theory approaches to organizational theory (Lawrence & Lorch, 1967; Burns & Stalker, 1961) need to incorporate a co-evolutionary and trait perspectives on organizations. Contingency-based approaches have undoubtedly contributed to organizational theory by advancing relevant concepts, such as differentiation, integration, standardization. They however emphasize the fit notion, according to which organizations adapt to the environment in order to survive. The longitudinal study of GE and WH histories has shown not only the concomitant formation of the firms and their environment, but also the formation

of persistent traits within each firm.

As advanced in previous chapters, a few implications for practitioners can be identified. Analysis and assessment of the firm's situation concerning growth may benefit from (i) the application of the modes of change framework to identify and evaluate ongoing and devised growth strategies; (ii) the drawing and analysis of growth trajectories for the firm and main players in the industry; (iii) the identification of the growth and dominance dilemmas; (iv) the identification of firm traits; (v) the identification of instances of the co-evolutionary and continuing growth motors. Such analysis will hopefully help management address the underlying tension in growth processes that pushes towards the firm self-perpetuation or its self-destruction.

It should be noticed, though, that some organization-oriented goals, such as firm longevity, should also be taken into account. In other words, firm self-perpetuation aim should not be taken for granted. In fact, many a internet and high-tech firm has been incorporated with a short-term existence horizon, so that in a short period of time it is sold for profit to larger firms. As a result, management should seek to broaden and clarify firm goals. Business-oriented goals, such as profitability, productivity and market share, seem to predominate in management. However, organizational goals clarification would help assess expansion motives, firm traits development and firm strategic conditions. In the absence of a self-perpetuation goal, hybrid expansion motives do not seem to be required. For example, Hanson Industries, which continuously and profitably grew through unrelated acquisitions for two decades developed an organizational model that forbade integration among its several parts. When this model ceased to produce increasing profits, the firm was broken into pieces and surplus was distributed among its shareowners. In addition, strategic assessment of firm conditions should also be made within the context of organizational goals. SWOT analyses, for example, would produce different analyses depending on whether the firm seeks for self-perpetuation or not.

Further research is needed to verify, elaborate, and rectify the ideas advanced in the thesis. Longitudinal studies investigating the concomitant evolution of firms and their industry would certainly contribute to the identification of distinguishing, enduring traits of firms. It would also enable to unveil the processes whereby such traits develop over time. Efforts to quantify imbalance and self-reinforcing mechanisms of continuing growth would likely contribute to refine continuing growth modelling. All such studies would hopefully then enhance and deepen our understanding of the dynamics and management of the growth of the firm.

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Appendix 6.1

Reference list on General Electric and Westinghouse

Reference list on General Electric and Westinghouse

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Appendix 6.2

GE, WH, Allis-Chalmers: rates of change in size and profits (1922-1954)

GE, WH, Allis-Chalmers: rate of change in size (1922-1954)

PERIOD	SIZE & GROWTH	GE	WH	Allis-Chalmers
I	Firm size - 1922	0.2702	0.1346	0.0355
	Firm size - 1929		0.2082	
	Firm size - 1930	0.4125		0.0455
	Growth rate	0.01779	0.01051	0.00125
II a	Firm size - 1929		0.2082	
	Firm size - 1930	0.4125		0.0455
	Firm size - 1933	0.244	0.1186	0.0252
	Growth rate	-0.0562	-0.0224	-0.0067
II b	Firm size - 1933	0.244	0.1186	0.0252
	Firm size - 1937	0.5126	0.226	0.0956
	Growth rate	0.06715	0.02685	0.0176
III a	Firm size - 1937	0.5126	0.226	0.0956
	Firm size - 1938	0.421	0.185	
	Firm size - 1939			0.0814
	Growth rate	-0.0916	-0.041	-0.0071
III b	Firm size - 1938	0.421	0.185	
	Firm size - 1939			0.0814
	Firm size - 1943	0.7961		
	Firm size - 1944		0.3928	0.1795
	Growth rate	0.07502	0.03463	0.01962
IV a	Firm size - 1943	0.7961		
	Firm size - 1944		0.3928	0.1795
	Firm size - 1946	0.4289	0.1752	0.0442
	Growth rate	-0.1224	-0.1088	-0.0677
IV b	Firm size - 1946	0.4289	0.1752	0.0442
	Firm size - 1952			0.1461
	Firm size - 1953	0.9447		
	Firm size - 1954		0.4379	
	Growth rate	0.07369	0.03284	0.01699

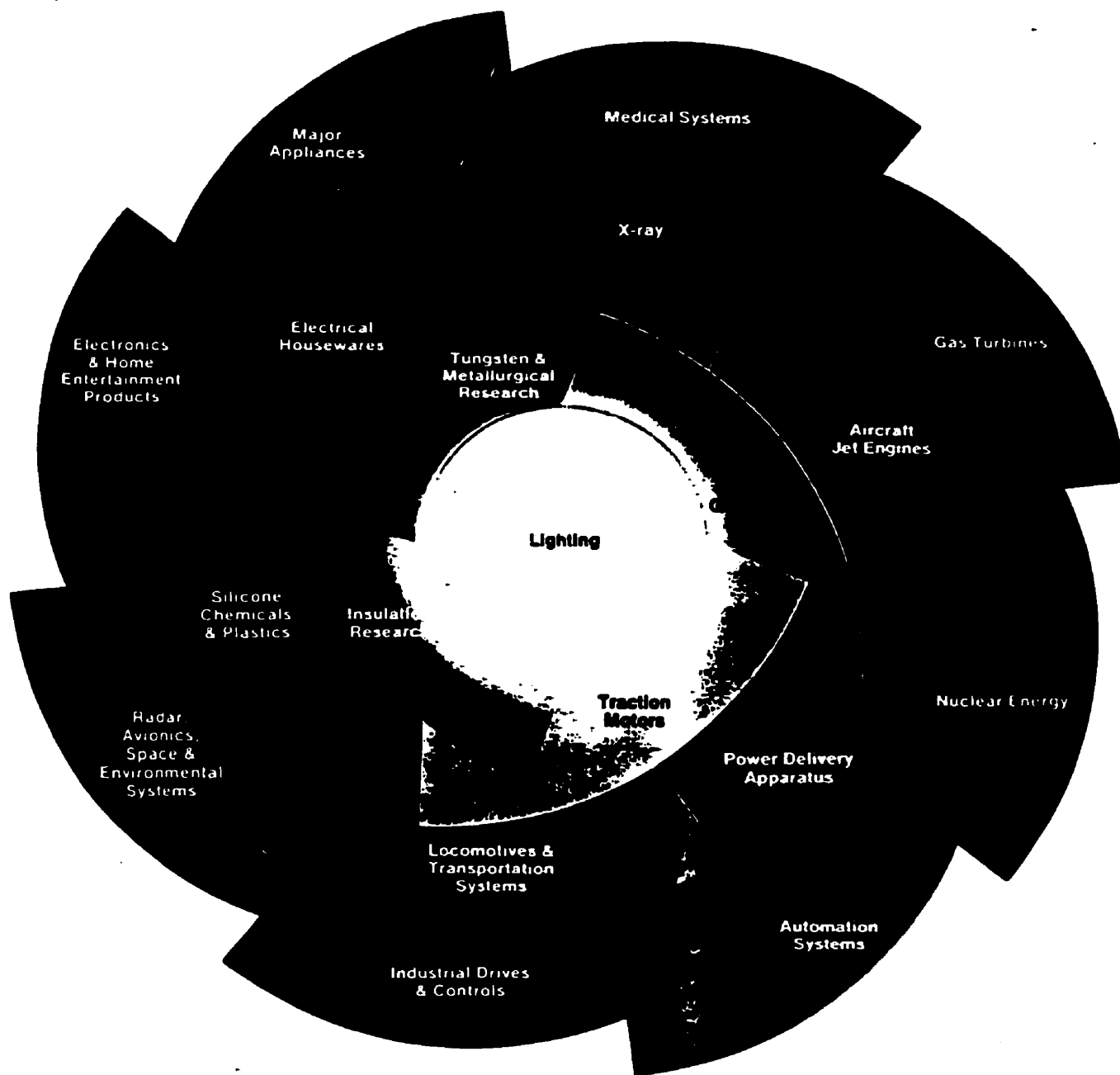
GE, WH, Allis-Chalmers: rate of change in profits (1922-1954)

PERIOD	PROFIT & RATE	GE	WH	Allis-Chalmers
I	Firm profit - 1922	0.0416	0.0079	0.0030
	Firm profit - 1929	0.0677	0.026	0.0042
	Profit rate of change	0.00373	0.00259	0.00017
II a	Firm profit - 1929	0.0677	0.026	0.0042
	Firm profit - 1933	0.024	-0.0154	-0.0052
	Profit rate of change	-0.0109	-0.0104	-0.0024
II b	Firm profit - 1933	0.024	-0.0154	-0.0052
	Firm profit - 1937	0.0687	0.022	0.0086
	Profit rate of change	0.01118	0.00935	0.00345
III a	Firm profit - 1937	0.5126	0.226	0.0086
	Firm profit - 1938	0.0307	0.0106	0.003
	Profit rate of change	-0.4819	-0.2154	-0.0056
III b	Firm profit - 1938	0.0307	0.0106	0.003
	Firm profit - 1940	0.0563	0.0189	0.005
	Profit rate of change	0.0128	0.00415	0.001
III c	Firm profit - 1940	0.0563	0.0189	0.005
	Firm profit - 1942		0.0109	0.0037
	Firm profit - 1943	0.0253		
	Profit rate of change	-0.0103	-0.004	-0.0007
IV a	Firm profit - 1942		0.0109	0.0037
	Firm profit - 1943	0.0253		
	Firm profit - 1944			0.0044
	Firm profit - 1945	0.0273	0.0126	
	Profit rate of change	0.0039	0.00057	0.00035
IV b	Firm profit - 1944			0.0044
	Firm profit - 1945	0.0273	0.0126	
	Firm profit - 1946	0.0206	0.0042	0.0001
IV c	Profit rate of change	-0.0067	-0.0084	-0.0022
	Firm profit - 1946	0.0206	0.0042	0.0001
	Firm profit - 1950	0.0616	0.027	0.008
IV d	Profit rate of change	0.01025	0.0057	0.00198
	Firm profit - 1950	0.0616	0.027	0.008
	Firm profit - 1951	0.0401	0.0194	0.0067
	Profit rate of change	-0.0215	-0.0076	-0.0013
	Firm profit - 1951	0.0401	0.0194	
	Firm profit - 1954	0.0549	0.0227	
	Profit rate of change	0.00493	0.0011	

Appendix 6.3

***General Electric's unifying technology wheel
(Source: GE's 1972 Annual Report)***

General Electric's unifying technology



The thousands of General Electric goods and services that enhance the quality of life today spring from a unifying core of related technologies. This interlocking unity is dramatized above in a circular sculpture fashioned from translucent arcs of tough Lexan® engineering plastic. The invention of electric lighting triggered the development of entirely new technologies for the generation and delivery of power. Then, efforts to seek better electrical insulating materials and lamp filaments brought discoveries that underlie present businesses in consumer products as well as in chemicals, plastics, x-ray equipment and medical systems. Similarly, pioneering of steam turbines led to engines for jet aircraft and to heavy-duty gas turbines. Applied worldwide, these interrelated and interdependent technologies form the heart of the Company's service to customers and to society.

Appendix 6.4

WH's businesses in 1971
(Source: WH's 1971 Annual Report)

WH's four "companies" in 1971

Power Systems

- . Nuclear and power plants
- . Platform-mounted, floating nuclear power plants
- . Gas-turbine: combined gas and steam turbine plant
- . Transmission and distribution equipment
- . Environmental services – recommends action programs to meet environmental regulations; runs the School for Environmental Management; manufactures an environmental monitoring system (air and water quality)

Industry and Defense

- . Construction group – water and wastewater treatment
- . Housing – building house units in existing and newly formed cities
- . Computer controlled production systems
- . Components and Materials – new industrial plastics and chemical coatings; wiring services; self-grounding receptacles for maximum safety in home and industry; lines of appliance motors; TV picture tubes; distribution subsidiary
- . Transportation – rubber-tires vehicles (horizontal elevator)
- . Apply defense technology to civilian tasks: weather sensors, planning a new generation of hospitals, isotope-powered-heart-pump engine

Broadcasting, Learning and Leisure

- . Communication business – radio and TV broadcasting
- . WH Learning – new school systems
- . Leisure time – mail-order; Longines-Wittnauer watches; time pieces
- . Econo-car leasing and rental
- . Soft drink distribution

Consumer Products

- . Homeology products – water purifiers, room air cleaners, safer ranges
- . Standard products – bulbs, space-saving refrigerators, laundry equipment
- . Consumer service
- . New businesses – home security (electronic home protection system against intruders, fire smoke, other emergency conditions); interior systems for industrialized housing (prepackaged kitchens, bathrooms, heating, air conditioning)

Appendix 6.5

***GE's businesses by the end of 1997
(Source: GE's 1997 Annual Report)***

Business line	Initial activities
Aircraft engines	1903 (1 st gas driven turbine wheel in the US)
Appliances	1905 (electric iron)
Capital Services	1880s (financing central stations)
Lighting	1879 (First incandescent lamp)
Medical services	1896 (X-ray apparatus)
NBC (broadcasting)	1986 (acquisition)
Plastics	1900 (Research Lab mainly founded to develop new filament materials)
Power systems	1880s (central stations)
Electrical distribution and control	1886 (acquired Sprague. By 1896 GE was producing GE electric motors)
Information services	late 1950s (time-sharing services)
Transportation systems	1890s (street railway) 1904 (locomotives)

Appendix 6.6

Top management tenure at GE and WH
(Source: Moody's 1922-1997)

<hr/> General Electric <hr/>	
Charles A. Coffin	1892-1922
Owen D. Young & Gerard Swope	1922-1940 1942-1944
Charles E. Wilson & Philip D. Reed	1940-1942 1944-1950
Ralph Cordiner	1950-1963
Fred J. Borch	1963-1972
Reginald H. Jones	1972-1981
John F. Welch, Jr.	1981-2001
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Westinghouse	
George Westinghouse	1886-1911
Guy E. Tripp	1912-1927
P. D. Cravath (acting Chairman)	1927-1929
Andrew W. Robertson	1929-1950
Gwilym A. Price	1950-1964
Donald C. Burnham	1964-1974
Robert E. Kirby	1974-1983
Douglas D. Dunforth	1983-1987
John C. Marous	1987-1990
Paul E. Lego	1990-1992
Gary M. Clark (acting CEO)	Jan-Jun 1993
Michael H. Jordan	Jun 1993-1997
