Reaping the advantages of organizational innovation. A case study towards the possibilities and obstructions for adaptation

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Abstract

This study deals with the ability of management to successfully innovate their organizations by means of adaptation. Two main theories, organizational ecology (OE) and contingency theory (CT) have used the concept of organizational form to debate if inertia (OE) or adaptation (CT) is more the order of the day. This study wants to make a contribution towards this debate by asking to what extent managers of existing firms can (or cannot) support innovation by means of organizational adaptation. We use evolutionary economics to deal with this question because on the one hand this field has arguments for both organizational change and stability and other hand it enable us to extend the evolutionary model with the concept organizational form.

The results show that organizational innovation is not only a product of selection on population level. A case study of the automobile industry demonstrates that new subpopulations are created by changing incumbents and not only by new entrants.
Introduction

This paper deals with the issue of the change of business organizations. It asks if management is able to successfully innovate their organizations by means of adaptation. This may be innovations of products (product innovation) and innovations of primary processes - production and distribution - and management processes administration of the company (process innovations). Studies of innovation have so far often concentrated on products and production/distribution changes. This study focuses on administrative innovation by means of the concept of organizational form. To this end, I compare several major theories in the field management studies that pay attention to this subject.

At least three theoretical approaches are concerned with the beneficial or detrimental impact of major changes. Organizational Ecology (OE) studies populations of organizations, meaning organizations in the same industry. It has a special focus on subpopulations, which refers to those organizations in the industry that have an equal organizational form. Organizational form refers to the identity of organizations, which holds that the organization is clearly recognized by different stakeholders. OE claims that sticking to this identity is beneficial for organizations because it increases their reliability and accountability in the eye of the customers and so legitimates the form. This approach makes OE an institutional theory (Hannan & Freeman, 1984). In addition, they emphasize costs and risks of the change process so that inertia becomes a prerequisite for survival. OE studies this issue by comparing the mortality rate of unchanged incumbents with changed incumbents, and generally finds higher hazards of changing.

Contingency theory takes another route. Researchers study tasks characteristics of individual organizations in order to find suitable administrative designs. The features of organizational tasks, such as their analyzability and predictability follow environmental (market characteristics) and internal (size, strategy, age) demands, and lead to fitting structural levels of standardization and centralization (Perrow, 1970; Thompson, 1967). Contingency theories have a long history of typifying organizational form as an aligning configuration of production tasks, structural and strategic elements (Greenwood & Hinings, 1988, 1993; Miles & Snow, 1994; Miller 1986; Romanelli, 1991). Different
studies show that organizations need to change their form in order to (re-)gain fit with the environment. Non-changing organizations are seen as caught in a competence trap (Miller, 1993).

Summarizing, OE supports inertia because of change costs and decreasing legitimacy whereas CT claims that inertia in the end leads to failure because of the misfit with a changing environment. Both theories lack a clearly defined change mechanism in order to get a real debate going. Evolutionary theory may bridge this debate. Contrary to OE and CT, this field has developed a change mechanism, which includes concepts of routines and capabilities. Evolutionary economy lacks, however, a specific position about the concept of organizational form.

The goal of this research is to use the concept of routines in order to clarify the discussions on innovation between OE and CT and simultaneously to position the concept of organizational form in the field evolutionary economics.

The paper is organized as follows. Firstly, it introduces the three fields of study and relates them by several questions on the issues of possible change and successful organizational forms. Secondly, the paper continues with the design and results of a case study that combines primary and secondary data of the automobile industry. The results lead to the final conclusion.

Theoretical background

This section introduces the points of view on innovation form three different angles: OE, CT and evolutionary economy.
Organizational Ecology

OE has won much ground in the two last decades. Rooted in the institutional approach of Meyer & Rowan and Powell & DiMaggio, it studies all kinds of characteristics of population such as the number of firms (density) and the viability of firms. OE found, for instance, that size and age are important explaining factors for the survival of organizations (Baum, 1996). In 1993, Amburgey et al. (1993) focused on the impact of change on the mortality rate of organizations. They found exploding hazard rates of Finnish newspapers when they changed the frequency and content of their editions. This change can be viewed as a change of one of the core elements of an organization, namely strategy. The other three core elements are structure, technology and marketing strategy. Together, they determine the identity (or form) of the organization. All organizations in the same industry with identical forms are part of the same subpopulation. Organizational (process) may be viewed as a change of core features. The OE scholars are not wholly decided yet about the detrimental impact of innovation because counter examples of successful innovations have been reported (Carroll & Teo, 1996; Kelly & Amburgey, 1991). The general opinion is that adaptive efforts have a random survival rate, meaning that managerial efforts do not have a positive impact on firm survival (Baum, 1996 Hannan & Freeman, 1984).

Two points of discussion come up about the relative bad performance of intentionally changing incumbents compared with stable firms. Firstly, stable incumbents have potential drawbacks. As long as their environment is stable, their form fits the features of the environments. But what if the environment demonstrates a dramatic change? OE studies give little information about the content of the fit between the environment and the population, the consequences of environmental change for this fit and the results of a change of fit. Although environmental indicators such as population density and environmental shocks have generally been measured, it is not clear how they fit with, for instance, the old and new strategy of the Finnish newspapers. Only incidentally fits have defined, such as the fit between specialists (low niche width) and a concentrated environment (Dobrev et al., 2002). This information is important to understand if the
prevailing forms are on the right track or if the transformed organizations, despite all the costs and risks, make the right content choice and survive in the end. OE studies do not follow organizations with specific organizational forms because of their population level of analysis. The historian Hannah (1997) demonstrated the relatively good performance of adaptors: although disappearance and decline have been the common fate of the 100 largest industrial firms since 1912, the few survivors have been adaptors.

This discussion leads to the first question: to what extent can adaptation be successful at all? In the introduction of the contingency theory, I will argue that non-changing incumbents in populations without a proper environmental fit will fade away and that organizations need transformation to survive in the long run.

A second point of discussion concerns the comparison of the success/failure of transformed organizations with new entrants in their industry. These new entrants are the fellow inhabitants of the newly formed population. On the one hand, organizational ecologists claim that new entrants determine the features of new populations, arguing that entrants are superior to incumbents (that is, they show a lower mortality rate) when it comes to exploiting resources (Baum et al., 1995). On the other hand, they show that totally new entrants in the automobile industry without any history (de novo firms) have a higher hazard rate than organizations with an earlier history in neighboring industries such as bicycle, carriage and engine production (alio firms). Obviously, earlier built-in competences offer, next to age and size, a safeguard against early failure (Carroll et al, 1996). Changing automobile producers may be defined as ‘old’ alio’s (as if they are new entrants instead of incumbents) because they change from one population to another in their own industry\(^1\). The question rises why these old alio’s, having their abundant automobile competences, would perform worse than normal alio’s with competences inherited from neighboring industries. Carroll et al. argue that there is only a start-up effect. But capabilities scholars would argue that previous knowledge contributes to later viability (Iansiti, 2000; Thomas & Weigelt, 2000). This argument also resonates in the field of OE (Klepper, 2002). Utterback & Suarez (1993) demonstrated that the learning

\(^1\) It is also possible to think of all alio’s as incumbents, leaving the group of new entrants exclusively to de novo firms.
experiences of organizations in periods of ferment supported their survival in periods after the transformation to the dominant design. This argument has been derived from Tushman & Anderson (1986) who showed that transformations may be competence enhancing. This also depends on the complexity of the innovation because it is related with the role of previous knowledge. Without important previous knowledge, de novo new entrants have major advantages (competence destroying innovation), with important previous knowledge, incumbents have a leading edge (competence enhancing innovation). Burgelman (1991) gives a clear example of such a competence enhancing transformation when he described the development of Intel’s new microprocessors. Hannah (1997) also makes clear that changed incumbents are relatively more successful than the average new entrant in the population. This is in line with the interpretation of Chandler (1962), who had earlier documented the transformations of organizations towards conglomerates with the very successful multi-divisional form. Obviously, these conglomerates were not born into this form but have developed themselves to it.

This raises the second question: to what extent have new populations formed by new entrants and/or by innovated incumbents, and how successful (in terms of productivity, profits, size, ages) are these two groups? In the discussion about evolutionary economics, I will come back to this question.

**Contingency theory**

Both questions are also addressed by contingency theory (CT), a classic theory that has lost much of its popularity in the literature since the 1980s but is still relevant for organizational design theory and practice (Donaldson, 2001; Forte et al., 2000). CT agrees with OE that the success of these organizational structures is dependent of their congruence with the environment but disagrees with the anti-managerial view where it boils down to failing transformed incumbents. Donaldson (1987) asks more attention for the productive impact of managerial change efforts by introducing the concept of structural adaptation in order to regain fit (SARFIT). The rationale is that exogenous changes in market and technology create disequilibria that stimulate organizations change
in order to regain equilibria positions. More recent theorizing adds an endogenous explanation. Organizations in state of equilibrium are rewarded with a high performance, causing change in the contingencies of size (growth) and strategy (diversification). Hence, the organization gets out-of-fit. After that, the process of SARFIT set in again (Donaldson, 2001). This new approach aligns with proactive theory of Miles & Snow (1994), where configurational changes are not only the result of external stimuli, but of internal initiatives as well.

The idea that organizations can change successfully between different forms has been discussed by at least four groups of contingency thinkers (see also Lewin et al, 1999). The first group circles around the ideas of Miles & Snow (1994). They have developed several organizational forms (defenders, prospectors, analyzers and reactors) that each consist of a specific mix of strategic, structural and technological elements. These elements are not very strict defined. Forte et al. (2000) demonstrated how incumbents switched between the different forms in order to find alignment with the environment.

Miller & Friesen form the center of the second group. They have provided more detailed measures for the strategic and structural elements, compared with Miles and Snow. In 1982, they discussed the then prevailing debate between incremental changes and quantum changes (defined as concerted and dramatic changes). They contrasted the views of on the one hand Lindblom and Cyert & March (incrementalism) and on the other hand Minztberg and Khandwallah (configurations) and demonstrated the beneficial impact of quantum changes. This is not to say that incremental adaptation does not occur. Subunits of loosely coupled organizations can change locally without deeply affecting the work of other subunits. If organizations have highly interrelated parts, incremental change may be detrimental for mutual relations. In 1984, Miller & Friesen added Greiner’s concept of the corporate life cycle to this debate by finding that organizations went through different stages of organizational forms, although not in the same sequence. The precise definition of organizational form followed in 1986, in the Miller’s award-winning Strategic Management Journal paper on configurations.
The warning these authors give to managers that look for a specific configuration is that it can result in a competence trap. Organizations may become too focused on a specific direction that they become too ‘simple’, and are not able to leave the configuration (Miller, 1993). This idea is also know as the Icarus Paradox. This trap resembles the idea of inertia, although it is not the same: inertia deals especially with legitimating, whereas simplicity is about competences in a dead lock situation.

A third line of research on organizational forms has also originated in the 1980s. In several papers, Greenwood and Hinings (1988; 1993) have discussed the concept of changing archetypes. The main difference with Miller is “ a departure from the more common treatment of structures and systems as disembodied attributes of organizations related in an adaptive way to context and performance…(they) are not neutral instruments but embody …intentions, aspirations, and purposes” (Greenwood & Hinings, 1993, p. 1055). Although organizational tracks have been discovered between the different archetypes, organizations tend to stick to a specific archetype rather than to change between types.

Finally, Romanelli (1991) and colleagues have elaborately discussed the concept of organizational form. She defines it as “those characteristics of an organization that identify it as a distinct entity and, at the same time, classify it as a member of a group of similar organizations” (1991, p. 81). This group states that organizations follow a pattern of punctuated equilibrium. This holds that incumbents quickly transform from one form to another by a rapid series of small changes (exploration) which interrupts longer-lasting periods of incremental changes where organizations stay within their present form (exploitation) (Romanelli & Tushman, 1996). O’Reilly & Tushman (1996) dub this exploration efforts revolutionary and state that this requires a simultaneous shift in strategy, structure, culture and people (see also Siggelkow, 2002). Without such shift, an organization will end up in a competence trap.

Most of the discussed approaches have the underlying idea that new forms come into being by quantum leaps or a very dense series of incremental changes. Within-form
changes are meant for refining the organization to the form and useful as long as real environmental changes do not take place. Cooper, Hinings, Greenwood and Brown (1996) have a different opinion; they view change “not so much as a shift from one archetype to another, but a layering of one archetype on another” (p. 624). This opens the door for accepting the importance of incremental changes of incumbents for the formation of new subpopulations. Henderson & Clark (1991) showed that even small technological changes can get organizations out of their present form.

Therefore I conclude that a subpopulation can be realized by quantum or incremental changes of incumbents. This is a preliminary answer to the first question.

**Evolutionary Economy**

Both discussed theories explained reasons for inertia and change (why, what) but did not take the process of change (how) into account. Evolutionary economy may offer an appropriate change-mechanism. Nelson & Winter (1982) used routines to elaborate on firm activities that were normally hidden in the neoclassical production function.

‘Organizational routines’ are prescriptions for stable patterns of organizational tasks.

The common denominator between contingencies approaches and evolutionary economics is the fact that activities (tasks, competences) are the units of analysis that determine the coordinative structure of organizations. This makes evolutionary economics a competence-based approach (Winter, 1990). The tasks themselves are not routines, but outcomes of routines. Nelson and Winter describe routines as the “genes” of the organization, that is, causes of which tasks are effects (1982, p.14).

Innovations concern changes in organizational routines. Internal search and learning routines make prevailing routines more productive. Search routines are started on a higher hierarchical level to improve the functioning of the organization by recombines earlier routines. Other organizations copy these improved routines so that they are distributed over the industry. This is not to say that routines change easily; they are
“sticky” because of reasons of satisfying. Besides, not all innovations are derived from existing companies; they are also the result of the introduction of new routines by new entrants.

Evolutionary economist did not specifically distinguish between functional and coordination routines although manufacturing and the M-form were respectively seen as routines for production and coordination (Winter, 1990). In fact, technology and structure are the phenotypes of functional and coordination routines.

Dynamic capabilities-theorists picked up the theme of coordination as one of the unique capabilities (knowledge elements) of individual organizations. Coordination routines create coherence between activities of different business lines to enable the smooth flow of goods between functional activities. This smooth flow would not have been possible in the event of ordinary market conditions; basically the production set improves through specific coordination routines. This forms the ‘raison d’être’ of organizations (Teece et al., 1997). Chandler (1992, p. 86) considers the “routines…to coordinate …several functional routines even as more important than…functional routines (themselves)”. This coordination routine, which is relevant for firm productivity, is firm-specific (Bresnahan et al., 1999). This makes clear that capabilities theory goes against the main thrust of industrial organization (IO), where in the same market the internal coordination is the same for all firms and only labor and technology are relevant for the production function. Basically, the internal coordination is hidden in the technology factor (Foss, 1997).

Coordination and integration are, of course, well-known concepts in capabilities theories and implicitly present in business functions such as “product development” (Eisenhardt & Martin, 2000, p. 1107). These functions are labeled dynamic capabilities, combinative capabilities or architectural competence (Teece et al, 1997; Kogut & Zander, 1992). Often the dynamic part gets all the attention (learning and searching for new routines) and the coordination issue disappears in the background. Therefore, Loasby’s (1998) distinction between direct and indirect capabilities is appropriate: direct capabilities (referring to the ability of internal and external operating units to perform functional activities) need to be related by indirect capabilities.
Capability theories do, however, not specify the content of the relations between coordinating and functional routines of companies. This leads to underdeveloped configurations of organizations (Teece et al, 1994; O’Reilly & Tushman). The concept of organizational form may be useful in order to better grasp the ties between strategy, structure and core capabilities that are “three different if strongly related features of a firm that must be recognized if one is to describe it adequately” (Nelson, 1991, p. 67; see also Chandler, 1992). Galunic and Weeks (2001) pay attention to this issue by referring top the meta-routines that reconfigure existing functional routines. Takeishi (2001, p. 413) offers some operationalization in his study to product development in the automobile industry: internal coordination takes place within engineering departments and between engineering departments purchasing. Capabilities theory may borrow from Thompson (1967) for more specific relations between functional and coordinative routines. He has earlier offered a rationale for these relations by borrowing March & Simons’s coordination routines (standardization, planning and feedback) and linking them to the interdependence relations between the different functional tasks (pooled, sequential and reciprocal).

Based on this theory, I propose that organizations may successfully change by means of learning experiences (answering the first question) and that these learning experiences offer them advantages over de novo new entrants (preliminary answer to the second question)

Research design

The automobile industry offers a good opportunity to answer the research questions. It has been studies extensively in OE approaches (Carroll & Teo, 1996; Carroll et al, 1996; Dobrev et al., 2002; Klepper, 2002) as well as in capabilities studies (Kogut, 2000; Thomas & Weigelt, 2000; Takeishi, 2001).
Research strategy: a case study

The industry description is based on a selection of authoritative secondary sources. In addition the main financial results and policy statements of Chrysler between 1926 and 1955 have been described to get a view on individual firm development. Chrysler has been selected because of its central position in the industry: it is not the biggest of the Three and shows, compared with Ford and General Motors, the most similarity with the independent producers. I focus on the period of mass production: 1920-1955 (Carroll & Hannan, 1995). In 1955, the Big Three (General Motors, Ford, Chrysler) dominated the world market whereas American independents had been gradually displaced by mergers or bankruptcy. After 1955 foreign companies entered the market with new compact models. These later periods (growing diversification and JIT production) are not discussed in this paper.

Source

There are several sources available to obtain company data. In this study, I have used the annual reports from the ‘Bedrijfseconomisch Archief’ (Business economics archive), a 90-year-old archive that has been set up to collect and manage annual reports in the Netherlands. It is managed by the Erasmus University Rotterdam and offer additional information about individual companies to the often purely financial data of the other sources.

Case results

The era of mass-production started off around the 1910 with the assembly line production of the T-model. This system, based on interchangeability of products between single-purpose technologies, offered Ford scale advantages. The costs to reach such

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2 Comparable with Accounting Trends and Techniques for the American Institute of Certified Public Accountants.
standardization were easily offset by the major output and efficiency gains. In the mid 1920s customers demanded more variation. The transformation to new models, the model-A and later the V-8, became problematic because the production system was not able to leave the rigid system quickly (Hounshell, 1984). And although these new product lines could be updated annually, they still lacked the possibility of major changes.

General Motors (GM) evolved as the main contender of Ford. GM was a creation of William Durant who gathered companies such as Cadillac, Oldsmobile, Buick and Chevrolet so that GM could offer a product range at different price levels. Contrary to Ford, GM used general-purpose technology so that they could work on several models and create scope advantages (sharing purchase, manufacturing and distribution). GM’s operations were created by jigs and fixtures, which were much easier to update and of which the costs could be spread over all the models (Raff, 1991). Sloan reorganized Durant’s “hodgepodge of operating units” and developed the multi-divisional structure that was needed to lower the central information overload and still offer a broad line of product lines (Chandler, 1990, p. 206). The tactical responsibilities were laid down in the divisions (in fact quite centrally), with an over-all financial reporting structure. The coordination structure facilitated reporting efforts and assured “a smooth product flow from supplier to consumer and a fairly steady use of plants, facilities, and personnel in an industry where the markets fluctuated heavily” (Chandler, 1962, p. 152). This coordination structure was kept intact until the 1970s. The only significant change after 1925 was that the general office became even more aimed at strategic decision-making whereas the divisional management concentrated on tactical administration. The resulting form created the opportunity of flexible mass production (Hounshell, 1984). GM became very competitive because it succeeded to change its products each year in order to create more market demand. Ford would copy this structure form in its full form after World War II.

Chrysler Corporation came into being in 1925 when Walter Chrysler bought Maxwell Motor Company. The Plymouth was the low-priced successful model that competed with GM’s Chevrolet and the Ford lines. In 1928 they bought the Dodge brothers, which
offered the manufacturing and marketing capabilities. Chrysler was now able to exploit more capacity for the Plymouth without becoming even more dependent of outside suppliers. This offered an opportunity to cut costs. Besides, they could add a dealer network of 1000 dealers (Rae, 1959, 1984). In 1928, also a third line was introduced: the De Soto. Chrysler improved its position by using many of the same facilities in all divisions (economies of scope). The 1929 Annual report shows the basis set-up.

Product lines
- Automobile divisions:
  - Plymouth (created in 1928)
  - Dodge (acquired in 1927)
  - De Soto (created 1928)
- Trucks and busses (e.g. Fargo)

Strategy:
- a complete line of vehicles to meet public demand in its price field
  (diversification)

Structure:
- central coordination of engineering, manufacturing and purchase (centralization)
- each divisions markets its own line of vehicles

Chrysler would retain an organization that was centrally managed the various divisions until the 1970s, although first decentralization efforts came up mid 1950s (Abernathy, 1978; Carroll & Hannan, 1995).

Ford was the most integrated producer of its time; they developed, made and produced many of the parts others purchased. Main reason was the need to align the various technologies perfectly to squeeze out all possible economies of scale. Although the overall figures for internalization of parts decreased in later years, Langlois and Robertson (1995) demonstrate data that show that in 1933 still three-sevenths of all the
added value of is created by Ford itself. GM later surpassed Ford, but they stayed close. Only Chrysler was significant less integrated and made use heavily for a supplier network; basically it was a giant assembler. The main difference with the other two was the low level of especially backward integration: despite the purchase of Dodge, the low level of integration enabled Chrysler to obtain cheap parts throughout the depression instead of the more expensive internal production (Chandler, 1990). It also gave the freedom to be innovative in engineering, which was important in the prewar period that demonstrated so many technological changes (Abernathy, 1978). This strategy also emerges in the policy statements; a permanent search for innovation is the number one priority, closely followed by low costs programs and dealer attention (see appendix 1). Chrysler had some well-timed innovations for the low-priced Plymouth and the more expensive Chrysler and De Soto, namely the overdrive (Rae, 1959).

All three producers were generalists; they produced three-quarters of the total American industrial output. Taking into account that the American total output consisted of 85% of world production (Chandler, 1990), they were worldwide the leading producers. Table 1 shows that Ford had a problematic time during the crisis. First GM passed Ford’s output level in the late 1920s and stayed the leading producer for over fifty years. Second, Chrysler succeeded to out compete Ford from 1935 onwards.

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Table 1: Market share (number of cars). Derived from Chandler (1990) and Rae (1959).

World War II had a major impact on the industry. The years 1942-1945 asked for military production. Only in 1946, civil automobile returned on large scale. Ford managed to become the second producer because they transformed Ford into a full-fledged multi-divisional company (Rae, 1984). Chrysler dropped to the third rank because of wrong
assessment of customer preferences in relation with the design of new models. Figure 1 shows that the amount of sold Chryslers increased as well as the sales (a more elaborate development of Chrysler’s results is presented in appendix 2). This rise of sales was however lower than Ford’s gains.

![Amount of cars sold](image)

**Figure 1:** The amount of cars sold from 1926-1955 (number of cars in thousands)

In the 1950s, product designs stabilized so that cost reduction and dealer involvement were more important for a competitive edge than only the repeated changes in models (Abernathy, 1978). This development required a different organization (more alignment between vertically related production units) than Chrysler’s centralized and relative low integrated structure. Main policy statements in the mid 1950s demonstrated that Chrysler tried to respond to this challenge by decentralization and integration efforts. With these efforts, Chrysler started copying the earlier adopted multi-divisional model (the full development of policy statements is depicted in appendix 1).

The number of other active producers quickly dropped from 300 in the beginning of the 20th century to approximately 50 in the mid 1920s. The smaller producers had a hard time to survive the depression. Only five intermediate-size producers shared the rest of the
market (Rae, 1984). After World War II, most of the independent middle priced producers would leave the business (Chandler, 1990; Rae, 1984). In 1960 there were only four passenger automobile producers: the Big Three and American Motors, a merger between Hudson and Nash, which focused on the production of small cars. Three capabilities emerge:

- Manufacturing advantages crushed smaller sized firms in the mass market: smooth production capacity required capital (also to survive bad years), scale and administrative knowledge
- R&D was necessary for on-going annual changes
- In addition, a dealer network was of eminent importance (Rae, 1984).

The only viable alternative strategy left for other producers was specialization to commercial vehicles or a focus on small passenger cars production. The niche for that output was small and would come up from the mid 1950s onwards. Foreign manufacturers jumped into the market that was left idle by the Big Three and the nearly inexistent remaining American producers.

Case analysis

The case description gives clues for a first description of several subpopulations. It is possible that only a subpopulation has only one or two members, especially in the case of a monopolistic or oligopolistic market. If an organization reaches a unique form, it is a subpopulation of its own.

Subpopulation 1: single-line low cost producers

- Strategic capabilities: few models without major variation: non-diversification
- Functional capabilities: special-purpose technology: incremental changes to exploit present products model, smooth but rigid manufacturing, perfectly controlled supply and distribution
- Coordination capabilities: centralized and standardization.
There is a fit if the niche is predictable and non-complex (e.g. a one segment market). Coordination demands are met by information processing capacity. Reward: economies of scale.

Problems emerged when there was a change to more variation and less mass demand.

Relevant periods:
- 1910-1925: Ford obtained an internal fit between the mutual capabilities, and an external fit with the environment.
- 1925-1940: lower total demands increased the need for sharing the costs of all production lines types (economies scope). Extra model changes were necessary for the higher variation of customer demands. Ford could not realize this in the organizational form of subpopulation1: external misfit
- 1945 onwards: Ford copied GM and left this subpopulation 1.

**Subpopulation 2: single-line mediate costs producers**
- Strategic capabilities: few models without major variation: non-diversification
- Functional capabilities: general technologies
- Coordination capabilities: centralization

There is a fit if the niche is non-concentrated so that competition stays moderate.

Rewards are normal rents.

Problems emerged in the situation of market concentration (Dobrev et al, 2002).

Relevant periods:
- 1900-1930: independent producers became increasingly squeezed by the Big Three. The internal fit is not optimal because general technology requires more managerial efforts to be aligned. If these technologies are used for only one product line, their capabilities are under-exploited and redundant.
- 1930 onwards: producers left for subpopulation 3 or exited the business.
Subpopulation 3: Specialists
- Strategic capabilities: one or two specific models: non-diversification
- Functional capabilities: special-purpose technologies
- Coordination capabilities: centralization

There is a fit if the niche is relative empty. Rewards are no scale advantages but a high extra value which is recognized by a sufficient number of customers in an identifiable market segment.

Problems emerged in case of diversification of generalists or other (foreign) specialists

Relevant periods
- 1930-1950: American Motors (small size car) and White (commercial cars, e.g. trucks) did have an internal fit, not for major economies of scale but for reasonable prices.
- 1950 onwards: foreign competitors (compact cars and trucks) out competed American specialists (Rae, 1984)

Subpopulation 4: Full-line low cost producers
- Strategic capabilities: diversification
- Functional capabilities: shared technology, enabling processes of product development (adapt), mass production (share), controlled distribution (relate with supplier and dealer)
- Coordination capabilities: decentralized and flexible: diversification requires decentralized administration to prevent information overload (Chandler, 1962)

There is a fit if the environment is predictable but complex (more segments). Reward: economies of scale and scope.

Problems emerged if there was more innovation and unpredictable markets (overcapacity).
Relevant periods:
- 1925 onwards: GM
- 1950 onwards: Ford and GM
- 1980 onwards: problems by lean manufacturing system (Womack et al., 1990)

**Subpopulation 5: Full-line flexible producers**
- Strategic capabilities: diversification and flexibility
- Functional capabilities: quick product innovation and less direct costs (but lacks overall costs control) in supply and distribution (but lacks certainty of delivery)
- Coordination capabilities: centralized (direct control)

There is a fit if the environment is unpredictable (flexibility is rewarded)

Problems emerged when mess less variation was needed and more mass was required so that indirect control was more suitable.

Relevant periods:
- 1925-1940: Chrysler had an internal fit because the changing market rewarded flexibility. Centralization is suitable for fast reactions. The low integrated company was a light version of population 4 producers so that it could be overseen by central top. During the depression it could negotiate low supplier prices and certainty of delivery was not a problem. Policy statements (appendix 2) call for new models, efficiency and centralized controls. The management is eager to show their market share.
- 1940-1955: the stabilizing market required programmed innovations: central control was not needed anymore. Because external suppliers were not as easily available as in the depression, Chrysler became more and more dependent of them. Besides it could not lower the costs by costs control programs in the whole chain. Policy statements did not mention the shrinking market but they called for
more decentralization and integration (appendix 2). Chrysler was ready to leave this form to accompany Ford and GM.

Conclusion

Looking back to the first question (to what extent can adaptation be successful at all?) we clearly see successful adaptations (Ford and American Motors both went to new subpopulations) compared with the non-changing incumbents (especially the independents that did not specialize). This aligns with contingency thoughts but also with the finding of Dobrev et al. (2002) that a specific environment asks for a specific subpopulation.

The answer to the second question (to what extent have new populations formed by new entrants and/or by innovated incumbents, and how successful (in terms of productivity, profits, size, ages) is slightly mixed. New subpopulations have been formed by transformed automobile manufacturers. This is true for GM (that had been transformed since the entry of Sloan) but not for the entry of Ford in subpopulation 1 (Ford is viewed as a spin off from Cadillac, according to Klepper, 2002). Ford later transformed to a new subpopulation. This answer aligns with Utterback & Suarez (1993) who explained the importance of the knowledge of incumbents that had been developed before the dominant design was established.

Many elements of the paper are open for discussion. For instance:
- evolutionary theory has scarcely been used: e.g. how do functional and coordination routines relate one of them changes;
- contingency theory has only superficially been used for the definition of the subpopulations, the difference between incremental and quantum change has not yet been studied to understand transformation;
- OE and CT have not yet been studied concerning the difference between identity and technical competence as the basis for organizational form. Even more, the definition of new entrants stay problematic; are incumbent organizations new
entrants in a new population (this study) or can are all existing organizations incumbents (leaving only de novo firms as new entrants).

The case has been used as illustrative material to support the secondary material. Especially the policy statements and the pattern of performance and assets give more insights in the individual firm development. This insight adds to population approaches. CT and OE offered the idea of organizational form, which evolutionary researchers can use for the measurement of coordinating and functional routines. Vice versa, evolutionary economics offers capabilities as a handy starting point for the application of change mechanisms in CT and population studies. In this way we can shed more light on the ties between the innovation of products, processes and administration.
References


Appendix 1  Main Chrysler policy statements

The key-words below represent the main attention points of the central management of Chrysler.

1927: four product lines, creation of new models
1929: efficient, new line added, Dodge dealer network, replacement used cars
1930: depression, new better products (design), new better production facilities, economies in operation: Manufacturing, Engineering, Sales
1931: depression, introduction new update, efficiency, new engineering principles
1932: depression, losses (only once), investments in engineering and product lines
1933: depression but larger share of car sales
1934: recovery program
1935: faster introduction of new model
1936: large demand
1938: 25% share in USA market
1940: war production
1945: difficult to start new models and to re-contact dealers
1946: capacity problems by a lack of supplies (problem non-integration)
1948: shortage of supplies, more marketing activities (research & promotion)
1949: sales record, especially successful new model
1950: many innovations
1952: attention for dealers (no market share figures anymore)
1953: more competition
1954: delegation of authority to divisional managers (MDF)
1955: new divisions and more integration
## Appendix 2: Financial data Chrysler 1926-1955

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*: = War time

!: = x $1,000

TA = Total assets

EBIT = Earnings before interest and taxes