

Prolegomena on Co-Evolution of Internal and External Selection

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Abstract

The paper content is embedded in an evolutionary approach in management, in which the processes of selection, variation, and retention are significantly salient, however, the logic of selection and co-interrelated adaptation is primary. The paper focuses on external and internal selection. Moreover, the paper concerns co-evolutionary integrating research perspective. Both internal and external selection mechanisms reveal at many ontological and epistemological levels and, what is the most critical, they are under co-evolutionary dynamics influence. Undoubtedly, the external and internal selection co-evolution phenomenon merits further exploration. The purpose of the paper is to order various proposals regarding multilevel and co-evolutionary relationships between internal and external mechanisms in terms of an evolving organization. The most important value of the paper is: a) recognizing the difference between internal and external selection in terms of the driving force sources, b) recognizing the levels at which both internal and external selection occurs, c) recognizing what constitutes both internal and external selection units, d) establishing the most salient hallmarks of co-evolution phenomenon e) considering whether there is any interrelationship between internal and external selection co-evolution and adaptation, f) considering whether the mechanisms of internal and external selection (separately and jointly) are mutually interdependent and co-evolutionary, g) recognizing what might constitute the determinants of external and internal selection co-evolution, and finally h) recognizing what are the consequences of internal and external selection co-evolution for interdependency between the organization and environment. The method has been used is the critical comparable analysis of literature studies and evolutionary scholars' research.

Keywords: evolutionary approach, co-evolution, external and internal selection, multi-level selection

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Introduction

'The view of evolution as chronic bloody competition among individuals and species, a popular distortion of Darwin's notion of 'survival of the fittest,' dissolves before a new view of continual cooperation, strong interaction, and mutual dependence among life forms. Life did not take over the globe by combat, but by networking'

(Margulis & Sagan, 1997)

The paper is embedded in the evolutionary thought that emerges from evolutionary economics (the first evolutionary models blossomed in the 1970s) and from some streams in sociobiology and certainly influences both management, especially strategic one, and organization theory. The milestone of evolutionary analysis constitutes the work of Nelson & Winter (1982) presenting routine-based models of action, where the routines are the most salient subject of evolution. The most important hallmark of the evolutionary theory as well as simultaneously the overarching scheme for the paper is the VSR (variation-selection-retention) model. The starting point and frame of reference incorporated in the paper is, however, selection logic and its different levels of analysis. '(...) certainly the exploration of multilevel selection processes is key heading, both for empirical work and modelling. The question of where routines and capabilities come from, the learning processes and contextual factors that give rise to them, deserves vastly more attention that it has received' (Murmman *et al.*, 2003, p. 8).

Simultaneously, the paper content concerns the philosophical, biological and even cosmological, astronomical, and technological concept called co-evolution that is also the subject of considerations in evolutionary theory and organization science.

Finally, the paper involves the issues connected with explaining phenomena ranging from the micro to macro levels of organizational analysis, especially in terms of the units in the multi-level selection analysis.

The purpose of the paper is to order various proposals regarding multilevel and co-evolutionary relationships between internal and external mechanisms in terms of an evolving organization. The aim of the paper has been realized attempting to find the answer for the following research questions: a) what is the difference between internal and external selection in terms of the driving force sources?, b) at which levels both internal and external selection occurs?, c) what constitutes both internal and external selection units?, d) which are the most salient hallmarks of co-evolution phenomenon? e) is there any interrelationship between internal and external selection co-evolution and adaptation?, f) are the mechanisms of internal and external selection (separately and jointly) mutually interdependent and co-evolutionary?, g) what might constitute the determinants of external and internal selection co-evolution?, and h) what are the consequences of internal and external selection co-evolution for interdependency between the organization and environment?

The paper is conceptual and its content is exploratory so as to enhance the state of the art in the field of selection logic in the evolutionary approach.

Additionally, it is organized fourfold. The first section presents theoretical foundation of considerations applied. Then, the essence of internal and external selection as well as the units and levels of internal and external selection analysis have been illustrated.

It has led to the description of co-evolution in terms of external and internal selection. Finally, chief conclusions have been highlighted.

Theoretical foundations

The paper is embedded in the evolutionary thought that emerges from evolutionary economics (the first evolutionary models blossomed in the 1970s) and from some streams in sociobiology and certainly influences, apart from a number of different fields, both management, especially strategic one, and organization theory. A leading model in the evolutionary stream draws heavily on the variation, selection, and retention mechanisms (VSR model) (Campbell, 1960, 1969; Aldrich, 1979), especially concerning the level of entire organizations and trying to systematize how organizations, industries and their structures change over time and deal with a major discontinuity. The variation occurs mainly as a result of entrepreneurial innovations resulting in developing new objects or adapting existing ones. The variation mechanism is expressed by continuous renewal and new objects constitute the primary source of that process. Then, selecting objects is based on the degree of their adaptation to changes in environment that constitutes a primary evolutionary agent in that case. The result of selection might be either the retention or death of objects. According to Aldrich (1979), organizations retain or fail, as they are more or less adapted (fit) to the particular selective environment. In line with that thought, organizations possess or not suitable traits for the particular selecting environment irrespectively of managers' intentions due to those traits. Simultaneously, the evolutionary approach is under the influence of the Nelson & Winter's (1982) body of work focused on routine-based models of organizational action embedded in the considerations of Cyert & March (1963, 1972), March & Simon (1958), Simon (1976), and Schumpeter (1934, 1942, 1950).

Simultaneously, the paper content concerns the philosophical, biological and even cosmological, astronomical, and technological concept called co-evolution that is also the subject of considerations in organization science and the evolutionary theory (the essence of co-evolution in organization science and the evolutionary approach has been presented in the paper's section 'Co-evolution of internal and external selection – preliminary ascertainment'). Regarding the co-evolution aspects from philosophical perspective, the exemplary issues being considered are as follows: rough waters between genes and culture (Mulder & Mitchell, 1994), gene-culture co-evolution and the nature of human sociality (Gintis, 2011), or integral emergence *versus* co-evolution permeating also sociology and psychology fields (i.e. Goodwin, 1978, 1994, 2000). According to biological aspects of co-evolution that were briefly described by Darwin (1859, 1877), co-evolution is used to describe the situation where at least two species reciprocally affect each other's evolution. For instance, an evolutionary change in the morphology of a plant might affect the morphology of an herbivore that eats the plant and so forth. Co-evolution is feasible to occur at many biological levels when different species ecologically interact with one another. These ecological relationships include predator/prey and parasite/host, competitive species, and mutualistic species. One of the most frequently cited co-evolution models is Van Valen's Red Queen's Hypothesis, which states that 'for an evolutionary system, continuing development is needed just in order to maintain its fitness relative to the systems it is co-evolving with' (Van Valen, 1973). Whichever organism that is not able to keep up with the other will be eliminated from their habitat, as the species with

the higher average population fitness survives. Due to biological co-evolution applications in astronomy, Jantsch (1980, 1981) attributed the universe evolution, ranging from cosmic and biological evolution to sociocultural one and viewing in terms of the unifying paradigm of self-organization, to co-evolution aspects. Moreover, the Jantsch's work is focused on on the interaction of microstructures with the entire biosphere, ecosystems, etc., and on how micro- and macro-cosmos mutually create the conditions for their further evolution. Taking into consideration biological co-evolution incorporation to astronomy, current theories insinuate that black holes and galaxies develop in an interdependent way analogous to biological co-evolution. For instance, Britt (2003) states: 'If co-evolution reigns, as most researchers believe, then two older (but not-dead-yet) theories are wrong: that a galaxy forms first and directs the development of a black hole; or that a black hole is generated first, providing the seed around which a galaxy can coalesce. It is also possible that different types of galaxies form by different means, and that coevolution will only be found to describe one path to galactic adulthood.' In terms of technological issues, co-evolutionary hallmarks are used in some algorithms, namely co-evolutionary algorithms applied by Hillis (1998) and Sims (1991, 1994) and used for generating i.e. artificial life, virtual creatures, optimization, game learning, machine learning, and sorting networks.

Finally, the paper involves the issues connected with explaining phenomena ranging from the micro to macro levels of organizational analysis, taking the links between micro- and macro-level into consideration, especially in terms of the units in the multi-level selection analysis.

Internal and External Selection – the Context, Levels and Units of Analysis

While the mechanisms of variation and retention are more prevalent and they rather are not misunderstood in a number of studies, the selection logic, being opposed to equilibrium notions and separating evolutionary theory from other theories in management, reflects more ambiguities and inconsistencies. Consequently, it requires deepened considerations and research.

In accordance with the Campbell and Aldrich's considerations, the selection mechanism concerns the environment as the selector and evolutionary agent. It involves so-called external selection. Similarly, selection-based explanations for the development of industries made by Hannan & Freeman (1977, 1984), the supporters of population ecology of organizations, deal with the environmental agent of the selection logic. Moreover, Klepper (1997), Klepper & Simons (1997), Holbrook *et al.* (2000) empirically studied that the development of some industries and their considerations might be located in the perspective of external selection processes. In a similar vein, Levinthal (1992, 1997) stresses the selection process in terms of competitiveness and fitness landscape. Thus, his studies as well refer to external selection. Additionally, external selection mechanisms correspond to the concept of path dependence lock-in. In accordance with that issue, the selective force of environment depends on a historical context of industry evolution – both its early and later renewing stages.

In contrary, Burgelman's work (1991, 1994) on the mechanisms of companies' transformations in terms of intra-organizational ecology of making strategy contributed to the development of the concept of selection processes within the firm - so-called internal selection where managers are (not environment) the primary evolutionary agents. As for internal selection theory, the organization as a portfolio might internally diverse and managers anticipate the environment's forces and attempt to adjust (Henderson & Stern, 2004). Enhanced internal variety leads to renew established organizations and mitigate threats posed by dramatic external change (Miner, 1990, 1991). In a similar way, Sakano & Lewin (1999) advance arguments that managerial intentionality is an important driving factor of co-evolution. Such intra-organizational selection processes assume a role for conscious managerial intervention in the evolutionary mechanism. It is consistent with contingency theory that asserts that management task is to achieve fitness with environment (i.e. Burns & Stalker, 1961). The role of managerial intentionality and intervention is also supported by industrial organization field and behavioural theory. Interestingly, external selection adherents posit that organizational (managerial) attempts to renew organizations might even suppress the organization chance for survival. It also encompasses the structural inertia concept in population ecology theory as external selection theorists support inertial organizations that reproduce their actions despite environmental change (Henderson & Stern, 2004, p. 42). The organization is perceived as not the portfolio, yet a monolithic whole.

Referring to Winter's considerations presented in the work of Murman *et al.* (2003), the internal and external selection processes are complimentary each other even if evolutionary selection pressures are important drivers, they provide only a very low-dimensional feedback from current environment transactions and internal selection processes support it through elaborating that limited feedback into developing some behaviour and suppressing another.

Evolutionary perspective is open to a significant role for more levels of organization than only one typical in the orthodox theory. Consequently, the selection processes occur at various levels and need to be probed deeper into details. Envisaging multi-level selection means in fact that some activities of particular units of analysis (i.e. individuals, teams, organizations, populations) can decrease their individual fitness, however, on the other hand, increase the fitness of the unit itself (Sober & Wilson, 1998) – the authors show a great instance illustrating that phenomenon, namely the envision flocks of chickens on an egg farm. Generalizing, multi-level selection attempts to establish what benefits or decreases the fitness of a unit within a larger one (Murmman *et al.*, 2003).

The debates on the types and number of selection levels have led to distinguish mainly genetic, individual, group, organizational, industry, and even higher levels (Piórkowska, 2015; Strużyna *et al.*, 2015). For instance, three levels of analysis, namely individual human beings, the organization (Wedgwood), and the industry (the pottery one), were taken into considerations by Langton (1984) who examined the process of selection simultaneously with the variation mechanism. On the other hand, Nelson & Winter (1982) have contended organizational routines as the micro-behaviour portrayal developing the character of system (macro)-level. Moreover, taking the routines in isolation into account, the group selection occurs. The more pervasive, the more systemic the routines, the stronger is the basis for group level

selection (Murmman *et al.*, 2003, p. 12). Going beyond the industries, the next level of selection reveals meta-populations and ecosystems.

The next issue that requires being taken into account is what constitutes the unit of selection and ways (what co-participates in those processes) in which they spread, replicate and insinuate themselves into organizations or into epistemologically higher levels. The answer depends on the particular level of selection considered as well as on selection levels taxonomy approved. In terms of the genetic level, the genes constitute the selection unit. In turn, the individual level is accountable for habits and their antecedents in the form of mental models and cognitive abilities. In accordance with the group level, the selection unit might be either habits with antecedents or routines in isolation. Regarding only the organizational level of analysis, the units of selection are routines and competencies that appear, from the organizational level lens, in bundles (even sometimes - idiosyncratic ones) – not in isolation and express in deeds. In that case, the organization is a temporary repository of routines and competencies (like a vehicle) what means that proliferating those routines and competencies depends on the selective survival of organization. Nevertheless, the routines and competencies do not care about organizations. Such a thought is coherent with the Dawkin's concept of selfish genes (Dawkins, 1976). The last level going beyond the organization deals with meta-routines (i.e. dynamic capabilities that refer to the higher level and constitute the aggregate of routines) as the selection unit. Moving sanguinely further insofar as it would turn desirable to endeavour, however, a number of considerations of scholars due to that are hostile, the next possibility is to assume controversially the organization as the unit of selection. It is salient, then, to consider how the organization itself might be an interesting unit of analysis for selection. It is also connected with the concept of selecting across organizations and selecting for organizations and consequently with the natural selection of marketplace and the artificial selection occurring inside the organization. Hence, the selection of the assemblies of organizational routines is different from the selection on the basis of individual traits and the proliferation of these individuals traits across organizations. It is also worth alluding the last but not least metaphor used for describing the selection units - the concept of 'meme' (Blackmore, 1999). In line with that conceptualization, the routines and competencies constitute the equivalent of memes, in which they make copies of themselves. It seems that they are connected with the organizational level of selection. The possible selection units described above refer to 'clean' levels of analysis without taking into consideration lower and higher stages of particular epistemological levels.

Obviously, the matter of selection levels and the units assigned to them amplifies the doubts which level is connected with internal or external selection. It might be envisaged that external selection begins where organizational level and routines occur, however, only in the case, in which the levels are treated separately.

Indeed, the selection mechanism might be considered at various levels simultaneously or separately. Nonetheless, taking the contextualization of 'selection' notion into account, the processes at every level of selection are dependent on one another. Moreover, the relationships amongst selection interactors and replicators are mutual, co-evolutionary and they are under co-evolutionary dynamics influence.

Co-evolution of Internal and External Selection – Preliminary Ascertainment

The coevolution phenomenon thrives also in organizational science (early work in: Weber, 1978; Chandler, 1962; Kieser, 1989) and the evolutionary approach, however, there are not concerted views about that process amongst scholars from different fields. Anyway, the co-evolution perspective is under common agreement that it is potentially able to integrate micro- and macro-level evolution as well as selection and adaptation illusive chasm (i.e. Lewin, Volberda, 1999; Baum & Korn, 1999; Baum & Singh, 1994; Levinthal, 1997).

In organizational science neocontingency theorists ensure that adaptation is congruent with both managerial active action and environmental forces through the process of mutual adaptation between the organization and environment what is consistent with mutation processes of new emerging forms in the evolutionary lens. Consequently, ‘the joint outcome of managerial adaptation and environmental selection instead of naïve selection or naïve adaptation’ (Lewin, Volberda, 1999, p. 523) should be considered. Envisioning that internal selection concept is confluent with managerial intentionality and intervention, co-evolution phenomenon might explain the interrelationships between external and internal selection mechanisms as well as between adaptation and selection, as the change is the joint outcome of intentionality and environment influence.

Co-evolution inferences ought to be ushered in the following co-evolution properties: multi-levelness/embeddedness, multi-directional causalities, nonlinearity, positive feedback, and path and history dependence (Lewin, Volberda, 1999). Co-evolution takes place at multi-levels (there are interactions between multiple levels of co-evolution and lower levels occur in the context of higher levels) and scholars (i.e. Mc Kelvey, 1997; Baum & Singh, 1994; Cohen & Stewart, 1994) distinguish micro-coevolution (co-evolution within the organizations in intra-organizational competitive context) and macro-coevolution (co-evolution amongst organizations in co-evolutionary competitive context). It converges towards emphasizing co-evolution of internal selection (co-evolution amongst selection units at genetic, individual, and lower group level) and external selection (co-evolution amongst selection units at higher group as well as lower and higher organizational levels). Hence, micro-evolutionary selection within organizations emerges in the context of macro-evolutionary selective pressure. Additionally, all selection units change in never-ending processes, which are not merely linear subsequent, yet diffusing selection ones, in order to sustain their current level of fitness.

With very few exceptions (i.e. Henderson & Stern, 2004), scholars have not examined internal and external selection as interwoven processes and from the perspective of co-evolution. The most important for considerations in this paper research result of Henderson & Stern (2004) is that internal and partial external selection co-evolves, as each affects the other’s future rate and the odds of organization failure.

On the basis of reflections presented and in conclusion with this section, it might be asserted that the following hallmarks constitute the determinants of internal and external selection co-evolution: character of variation mechanism, fitness degree, ways of interacting and replicating selection units, mutual adaptation, embeddedness and path dependence as well as nonlinearity and non-subsequence of selection processes. Moreover, multi-level selection and adaptation and their parallelism and

hierarchy help resolve the tension of the exploration and exploitation trade-off (Murmman *et al.*, 2003, p. 11) since it is contended that established organizations are the likely victims of environmental selection (Henderson, Stern, 2004, p. 43). The reason for that evolutionary bias is that established organizations sometimes explore, yet as they grow larger such exploration is interwoven with exploitation consisting of incremental refinement to the status quo (Henderson, Stern, 2004, cf. Cyert & March, 1963; March, 1991, Levinthal & March, 1993).

Concluding all considerations and issues addressed with a careful scrutiny, it is proposed to assume that the most reconciled co-evolution of internal and external selection exists while there are strong both internal and external forces – then, they reflect pooled interdependencies between the organization and environment. When external selection forces are stronger than internal selection ones, the strong environmental selection of the most fitted (counterintuitively - the most structurally inertial as rapid environmental change is antithetical to survival in that case) organizations occurs and the most misfit selection units are ignored by the environment. In the case of stronger internal forces than external ones, the organization has greater chance to develop itself as a diversified portfolio and to embody to the environment – simultaneously, the organization is more likely to influence and create the environment. While weak both internal and external selection forces reveal, it might be regarded that the environment is not focused solely on the particular organization regarding its minor fitness as well as the organization is weakly oriented towards adapting to environment – thus, it becomes stuck in the middle.

Conclusion

The paper content proceeds from evolutionary approach premises, especially from the selection logic and constitutes the prolegomena on co-evolution of internal and external selection. The exploratory literature studies have examined and unveiled the relationship and interdependence between internal and external selection mechanisms. Despite the widespread use of the evolution and co-evolution concepts, the current research on co-evolution between evolutionary mechanisms as, *inter alia*, selection has not been greatly consistent with regard to even defining the construct.

Therefore, there is a challenge to scrutinize and operationalize how the units of selection are similar, yet different in selectively significant ways. Undoubtedly, there is the need for high-quality research on foundation issues. On one hand, the deepened qualitative empirical studies at a micro level are proposed to be conducted. On the other hand, more advanced than so far quantitative modelling research of evolving systems at a macro level ought to be undertaken (compare: Murmman *et al.*, 2003, p. 8) so as to establish the co-evolution models and inferences.

It seems that it is all the grist for the mill.

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