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## Theory and practice of the evolutionary networks of potential in a family business succession

Accepted by Editor Ewa Ziemba | Received: April 18, 2023 | Revised: August 27, 2023; October 7, 2023 | Accepted: October 8, 2023 | Published: November 7, 2023.

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### Abstract

**Aim/purpose** – This paper aims to introduce and describe a new paradigm (model) of evolutionary dynamism of family business potential in the succession process and its empirical simulation in family enterprises from culturally close “post-socialistic” countries: the Czech Republic and Poland.

**Design/methodology/approach** – The conceptual basis for developing the evolutionary model of family business was our research on the sample of 235 small and medium-sized family enterprises from the Czech Republic and Poland. A practical experimental simulation of the model was carried out in 12 Czech and 19 Polish family companies.

**Findings** – The proposed model is based on economic and natural laws, including optimization proportions of the golden ratio, laws of time economics, theory of innovation, and “Moore’s law.” This model allows us to simulate and analyze the pace of accelerating innovation cycles and the dynamism of intergenerational changes of family business potential in the succession process.

**Research implications/limitations** – The social and industrial revolution 5.0 is getting near and global economic, social, cultural, ecological, and other contemporary turbulences, built on the “microcosm optimization” of living matter, having two extreme marginal variants for the subsequent (evolutionary) development of family business: (a) an option of “harmony” or (b) an option of “tragedy.” One limitation of the model is its general nature, making it sensitive to outlier cases.

**Originality/value/contribution** – The proposed model provides valuable analytical guidelines for family business succession and significantly highlights the role of intra-family dynamics in this process. It also represents a novel analytical approach to assessing and predicting the longevity of family business as well as an opportunity for the development of mixed research in family entrepreneurship.

**Keywords:** Family entrepreneurship, family business, succession, innovation, potential.

**JEL Classification:** L26, M21, O31, P47.

## 1. Introduction

Family entrepreneurship and family business are essential, broad, prospective, and still developing areas of research in management sciences (Capolupo et al., 2022; Xi et al., 2015). The importance of this research stems from the fact that family firms are the most ubiquitous form of business organization with above-average growth perspectives as well as highly significant global economic and social impact (King et al., 2022; Miroschnyenko et al., 2021). According to Birdthistle and Hales's (2023) data and previous research analysis, family business significantly contributes to gross domestic product (GDP) and wealth creation worldwide. For example, at the European level, family firms make up about 65-80% of the total number of companies and are responsible for roughly 40-50% of all jobs (Curado & Mota, 2021). In 2023, the largest 500 family enterprises worldwide generated \$US8.02 trillion in revenue, which was a 10% increase from 2021. Many of today's well-known brands stem from family-owned companies, the oldest of which have been in operation for over 1,000 years (Birdthistle & Hales, 2023).

A significant research trend in this area (Rovelli et al., 2022) and, at the same time, an essential manifestation of the specificity of the family business (Yang et al., 2022) is intergenerational development, the primary tool of which is succession – the transmission of the enterprise between generations. The literature emphasizes the dynamic nature of this process, which is crucial for the continuation, success, and longevity of any family business (Porfírio et al., 2020). Based on a scientific literature review, Magrelli et al. (2022) identified many essential and promising topics of research related to succession dynamics, which, according to Porfírio et al. (2020) should be deeply and better explored and explained.

Succession dynamics is determined by the potential of family business, understood as a system of resources, options, and necessity being hidden power for changes over time. Therefore, potential analysis is an essential trend of research

in the field of family business. However, previous research concentrated more on specific pragmatic problems in potential management, especially related to succession (e.g., Rautamäki & Römer-Paakkanen, 2016; Schell et al., 2020; Urban & Nonkwelo, 2022) and innovativeness (e.g., Kyurova & Koyundzhyska-Davidkova, 2020; Leppäaho & Ritala, 2022; Rondi et al., 2019), rather than on the searching for more general (model) principles of the succession dynamics based on economic and natural laws.

This constitutes a research gap that justifies undertaking this research topic. Its aim is the introduction and description of a new paradigm (model) of evolutionary dynamism of family business potential in the succession process as well as its empirical simulation in family enterprises from culturally close “post-socialistic” countries of the Czech Republic and Poland. The authors present the practical and theoretical knowledge they have achieved in the framework of entrepreneurship research over the past ten years. The practical and empirical activities have focused in the last period, particularly on the synergy of the links between the family business, innovative dynamism, and competitiveness of the companies.

The paper offers a professional discussion and implies the generalization of the findings to the theory of synergy, the economics of the time, and the family business, especially in the innovation and dynamism of the evolutionary family business potential in the succession process. The findings are also based on empirical research on a sample of small and medium-sized family enterprises from the Czech Republic and Poland. The presented results deserve a broad discussion and verification in practice, depending on the cultural differences in manifestations of globalization in various parts of the world and under the influence of the social and industrial revolutions 4.0 and 5.0.

The paper is structured as follows: first, the theoretical background is presented with a particular discussion on the conceptualization of family entrepreneurship and family business succession in management sciences. This is followed by a presentation of the methodology and own research results, which inspired a new theoretical model of family business succession. In the following part, this model is presented with references to specific economic and natural laws. On this basis, a simulation and discussion of its use in the theory and practice of management sciences is carried out. In closing remarks, the research conclusions are formulated, the limitations of the proposed model, and further research directions are indicated.

## 2. Theoretical background

Entrepreneurship is the process of pursuing opportunities without regard to resources currently controlled (Stevenson & Jarillo, 1990) for creating something new with value by devoting the necessary time and effort, assuming the accompanying financial, psychological, and social risks, and receiving the resulting rewards in the form of monetary and personal satisfaction and independence (Hisrich et al., 2005; Mikoláš et al., 2011). Henrekson and Stenkula (2016, p. 71) conceptualized entrepreneurship as the ability and willingness of individuals, both independently and within organizations, to discover and/or create new business opportunities to introduce creative ideas in the market under uncertainty while making decisions regarding, e.g., product design, use of resources and reward systems, and to create value, which often, though not always, means that the entrepreneur aims to expand the firm to its full potential.

These approaches indicate that entrepreneurship is a very complex phenomenon. Dilli et al. (2018) perceived entrepreneurship as a conceptual continuum that ranges from Schumpeterian entrepreneurship, characterized as risk-loving, based on radical innovations, and aiming for high corporate growth, on one end, to its non-Schumpeterian counterpart, characterized as risk-avoiding and based on imitation, without aiming for corporate growth, on the other. Based on this diversity, specific contemporary types of entrepreneurship are identified in the literature, characterized by different specifics as well as the scope, directions, and outcomes of activity, e.g.:

- opportunity, necessity, small, rural, or female-led entrepreneurship (Conroy & Low, 2022),
- social, technology/technological, sport, or international entrepreneurship (Ratten, 2020),
- cultural, lifestyle, agriculture, tourism, or health entrepreneurship (Ratten, 2021),
- incorporated or unincorporated entrepreneurship (Can & Fossen, 2022),
- migrant or refugee entrepreneurship (Glinka et al., 2023),
- effectual or predictive/causal entrepreneurship (Galkina & Jack, 2022),
- intrapreneurship, cooperative or corporate entrepreneurship (Giossi et al., 2019),
- academic, student, youth, nascent, mature, or grey/silver entrepreneurship (Adamek et al., 2019),

- sustainable, green/environmental entrepreneurship or ecopreneurship (Piwowar-Sulej et al., 2021),
- digital/cyber entrepreneurship or e-entrepreneurship (Paul et al., 2023).

Family entrepreneurship is an essential and constantly developing type of entrepreneurship, conceptualized at the intersection of entrepreneurship, family, and family business (Randerson et al., 2021). In this case, the family business represents a more institutional dimension and is perceived as a specific (defined) form of commercial organization: company, firm, or enterprise (Daspit et al., 2021; Kayid et al., 2022). Family entrepreneurship is, therefore, a specific, proactive approach to business activity using entrepreneurial attitudes, skills, behaviors, and family drivers (Feliu & Botero, 2022) as the power of family business activity as well as entrepreneurial opportunities exploration and exploitation tools (Cruz et al., 2022).

Family is, in sociology (Jandourek, 2001, p. 206), a solidarity group of persons related to each other by marriage, relationships, or adoption that live together in the long term and whose adult members are responsible for the upbringing of children. Other definitions define the family through its functions: reproductive function, socioeconomic, cultural, educational, socio-psychological, and emotional. The primary (“core”) family consists of a man, a woman, and their children, while the extended family includes other relatives (grandparents, aunts, uncles, cousins, etc.). In addition, a monogamous pair or family arrangement may be a polygamous or single-parent family with one parent or other variations depending on the cultural environment. The family lives in its relevant environment, including the business environment in which it conducts its business activities. The contemporary life (business) environment is influenced by the global and local factors impacting the existence of the family and the business, which is very turbulent (Mikoláš et al., 2016).

In this area of family business, there are no identical criteria but a considerable diversity and multiplicity of definitions. These are based on various criteria, such as self-determination as a family business, planned or completed family business succession, ownership and management of family members over the company, and others. In practice, it is often difficult to check the existence of other criteria apart from self-determination (Marjański & Sułkowski, 2019, p. 103). In this conceptual jungle, however, Harms (2014), based on the review of 267 papers from 49 scientific journals, identified six approaches (clusters) to define family business: (1) involvement and essence approach, (2) family, power, experience, culture (F-PEC) Scale/Familiness, (3) definitions with empirical

orientation, (4) other definitions grounded on previously elaborated definitions, (5) self-developed definitional approaches, and (6) studies without explicit definition.

Succession, as an essential manifestation of the specificity of the family business, generally concentrates on the future and continuation of the activity and expresses the transfer of the enterprise from one generation to the heir (Gagné et al., 2021). When defining succession, special attention is paid to its specific dimensions:

- the object of the transfer between generations, mainly encompassing property, resources, ownership, management rights, leadership, responsibility, power, and control (Bertschi-Michel et al., 2020; Yuan, 2019),
- the process of transfer, including specific stages, such as planning, preparation, and execution of the transfer (Ge & Campopiano, 2022; Sheridan et al., 2021),
- relationships as well as strategic and complex socialization mechanisms between actors (mainly incumbent, successor, family, and nonfamily members) involved in the succession process (Bozer et al., 2017; Devins & Jones, 2016),
- results of the transfer process, such as the satisfaction of the parties involved in the succession, the positive performance and viability of the company, growth, and longevity of family businesses, and other development changes (e.g., new ideas, entrepreneurial orientation, improved innovativeness, sharing of knowledge) (Baltazar et al. 2023; Porfirio et al., 2020).

Succession is, therefore, an essential conceptual differentiator of a family business, marking a common area to most family business definitions as synergy (unification) of four subsystems (circles) (Mikoláš, 2016; Mikoláš & Karpeta, 2015): family, business, environment, and outputs (effects).

In this context, the outputs are a set of acts and issues (in the broadest sense of the word) of family, family business, and relevant environment of the economic, social, technological, biological, ecological, knowledge, cultural, moral, legal, and otherwise. The fundamental character of a family business is the ability to reproduce (evolution) of family, business, relevant environment, and their outputs. This reproduction ability is determined by a family potential, family business, the environment, and their outputs (such as the synergy of the above four subsystems).

We define potential as the difference between what is and what should or has to be (Mikoláš, 2012; Mikoláš et al., 2011). From the perspective of survival and evolution of the family business, the potential is a system of resources, options, and necessity; it is the hidden (non-appear) power of change.

The change in the family is realized by succession and in a company environment and outputs by innovative dynamism. Evolution and innovation potential networks of the family business come into existence in time and space. In space, the innovation spreads like innovative radius (dissemination of innovative waves) and, in time, as evolutionary spirals. These assumptions are the central conceptual axis of the evolutionary model of family business, which will be presented later in the paper.

### **3. Research methodology**

The findings presented in the paper are based on the application, in particular, the diagnostic approach, including diagnostic missions in family firms (Mikoláš et al., 2011), descriptive analysis, standard statistical methods, and synthesis based on propositional logic and Boolean logic in empiric research of companies. This diagnostic approach (Gordon, 2002; Kosieradzka & Rostek, 2021, pp. 159-161) was aimed at the registration of facts (based on specific research methods) and their critical analysis and evaluation related to succession in the family business. This study used a framework analysis in qualitative research (Goldsmith, 2021). It included four key steps: (1) identifying a thematic framework based on theoretical considerations, (2) recording facts based on interviews with representatives of family businesses from the Czech Republic and Poland, (3) analyzing, assessing, and interpreting the study data against the thematic framework, (4) formulating conclusions and conceptual foundations for an evolutionary model of the family business.

235 small and medium-sized family enterprises have been examined, including 163 (69%) from the Czech Republic and 72 (31%) from Poland. Since there is no reliable population frame of family businesses from these countries, a purposive sampling (Clark et al., 2021, pp. 376-390) was applied based on the following criteria: (1) family nature of the entity; involvement of at least two members of one family in ownership and management as well as influence of family on key business decisions and success factors, (2) location in the Czech Republic or Poland.

The average annual employment in full-time equivalents, according to the recommendations of the European Union (Sidek et al., 2020), in each of the examined enterprises was at most 250 employees. In each of the listed firms, the diagnostic case history was undertaken and carried out in the presence of the company's owner. The research was conducted using the semi-structured inter-

view method (Mann, 2016) with a representative of a family involved in the company's management. Interviews were conducted based on a self-designed interview questionnaire directly (face-to-face) or remotely (using ICT technologies) with respondents. The thematic framework of the study covered three main topics: (1) plans and attitudes of family members towards succession, (2) opportunities and threats of succession, and (3) relations between the generations involved in managing the company.

All the results achieved in this research were confronted with the findings of the partner universities in Slovakia (PEVŠ Bratislava and VŠEMVS Bratislava) and Poland (University of Economics in Katowice and University of Lodz).

The methodological procedures of analysis and synthesis, as well as the theory of dynamism in the business potentials, are drawn from the conclusions of the research projects as follows SP/2010167 “A contemporary concept of competing business potentials of industrial enterprises” and 402/08/H051 “Optimization of multidisciplinary design and modeling of systems of virtual companies.” Knowledge as well as findings of both projects are presented in the book “The competitive potential of an industrial enterprise” (Mikoláš et al., 2011).

The theoretical basis was compared to the historical development of family companies (the study of historical sources and based on field research – diagnostic missions). A comparison of theoretical knowledge and realistically recognized development phases for the development of family business (succession) showed that a crucial evolutionary potential of business is born in families; it is transmitted in the form of succession from generation to generation – evolution cycles of the family business are originated. Innovation of family know-how is given not only to the culture, innovative thinking, and entrepreneurship but, in particular, the scope in which the family operates and its innovative dynamism. The business environment has considerable influence on the family business. These theoretical-practical starting points are based on the application of historical and dialectical approaches to the survey of a family business.

#### **4. Research results**

The following table summarizes statistical research results in the Czech Republic and Poland.



**Table 1.** Statistic summary of the research results

Answers to summary questions to pass the family business successors	Number (percentage) of companies	Comments
<b>Research results in the Czech Republic</b>		
Succession done	31 (19%)	
A plan of succession is drawn/designed	12 (7%)	
The plan of succession is not drawn/designed. Reasons include:	105 (65%)	
– no successor	10 (10%)	
– owner is not interested in succession (owner resistance)	19 (18%)	
– family members are not interested in/competent for succession (successor resistance)	57 (54%)	– incompetent successors (lack of education): 20, – incompetent successors (young under 20 or student): 34, – successors are not interested in: 3
– other reasons	19 (18%)	– succession is under consideration (older than 20, working in the company, gaining experience): 18, – succession will be resolved by inheritance procedure: 1
No answer, undefined answer	15 (9%)	
<b>Number of surveyed family firms:</b>	<b>163 (100%)</b>	
<b>Research results in Poland</b>		
Succession done	23 (32%)	– the succession has just taken; the new owner is too young, no children yet: 1
A plan of succession is drawn/designed	19 (26%)	
The plan of succession is not drawn/designed. Reasons include:	27 (38%)	
– no successor	4 (15%)	
– owner is not interested in succession (owner resistance)	0 (0%)	
– family members are not interested in/competent for succession (successor resistance)	16 (59%)	– incompetent successors (young under 20): 8, – incompetent successors (young over 20): 2, – successors are not interested in: 4, – incompetent successors (lack of experience): 1, – the company is just new in the market: 1
– other reasons	7 (26%)	– no good candidate: 3, – successor works in the company, however, the succession in the company is considered, but it has not happened yet: 1, – succession is only just being planned: 1, – successor does not have adequate education: 1, – the founder will not consider the succession: 1
No answer, undefined answer	3 (4%)	
<b>Number of surveyed family firms:</b>	<b>72 (100%)</b>	

Source: Authors' own elaboration based on research results.

The development of family businesses in the Czech Republic and Poland in many aspects manifest common features. Both countries are located in Central and Eastern Europe (CEE) and represent similar economic and socio-cultural development conditions (Peterková et al., 2022). Analyses performed by Hamplová et al. (2019) based on the World Bank Group data indicated very similar business environments and conditions for doing business in the Czech Republic and Poland. However, these countries differ in populations and sizes – Poland is four times bigger and has almost four times more inhabitants.

Furthermore, concerning family business development, we can indicate another impact of historical factors that have evolved differently from Poland in the Czech Republic. In the period from 1938 to 1989, doing family business was significantly suppressed in the country. In Poland after 1945, there was no such intense negative pressure on the family business. In Poland, therefore, small and medium business has a longer duration and more significant experience. Most of the family companies have a long history, translating into a different approach to succession planning. In the Czech Republic, private entrepreneurship, especially family entrepreneurship, has developed (restarted) since 1990. As a consequence, the results of the research are partially different and affected by historical and economic factors.

According to obtained research results, the relatively shorter period of family business activity in the Czech Republic resulted in only 19% succession done so far among the surveyed companies (they were companies when the owners started a business just after the revolutionary changes in 1990 at the age of 40 and more years). In surveyed enterprises from Poland, succession has been done in 32% of cases. The bigger difference can be seen in family businesses, where the business plan is processed by successors for the succession. In the surveyed sample from the Czech Republic, it is only 7% and 26% in Poland. In other cases, there are companies where there is an evident lack of owners or successors to pass family businesses, or there has not been built a plan yet, or other reasons.

Thus, the results indicate the importance of succession in most of the surveyed companies from Poland and many surveyed companies from the Czech Republic. While in Poland, succession has, in many cases, already been done or is in strategic plans, in the Czech Republic, in many cases, it is only under consideration. This implies the growing importance of succession issues in the country in the coming years.

Based on the obtained results, assumptions have been made, whether the succession process is not subject to a specific “innovation” or reproductive cyclical nature. In the next step, the sample of examined family companies was

narrowed down to 31, and an in-depth case history was made. The gained findings from the field research were compared with theoretical conclusions concerning the scope of the paper, which are not presented here (cf. Mikoláš, 2012; 2014; Mikoláš & Wozniaková, 2017; Mikoláš et al., 2011), and led an international research team to the formulation of a new theoretical model of succession in a family business concerning the evolution of its potentials and the dynamics of the economics of time in reproductive cycles.

The research results presented above, as well as conclusions from previous research projects (Mikoláš, 2012; 2014, 2016, 2020; Mikoláš & Karpeta, 2015; Mikoláš & Peterková, 2015; Mikoláš & Wozniaková, 2017; Mikoláš et al., 2011, 2016) became the conceptual basis for the development of evolutionary model of family business. The conceptual background for this theoretical approach is based on economic and natural laws, including optimization proportions of the golden ratio, laws of time economics, theory of innovation, and “Moore’s law.” The proposed approach is presented in the next section of the paper.

## **5. Evolutionary model of family business**

### **5.1. The morphology of the potentials and spontaneous order of network synergy potentials**

The total potential of the family business (P) has this basic morphology of  $P = A + B + C$ , where A is the effective potential (changed with the effect/outputs E), B is the spending potential (changed with the amount of spent resources M to achieve effects E, it also has the potential to eliminate the negative emissions and losses), and C is the stabilized potential deferred for the next generation (cf. Mikoláš, 2012, 2018; Mikoláš et al. 2011).

This morphology of the potential for the family business is dynamically changing by the spontaneous order of objective and subjective factors. It manifests as a combination synergy of objective and subjective order effects and spontaneity in the form of the family business’s threats, opportunities, strengths, and weaknesses.

The following text contains generalized research findings of the authors that describe the “ideal theoretical” variant of a family business that is carried out in the framework of the objective of “natural” order and the rational subjective (human) behavior (negentropy) by accepting the objective and the subjective spontaneity (entropy) (cf. Mikoláš, 2012, 2018; Mikoláš et al., 2011).

## 5.2. Evolutionary dynamism of family business potential

The ideal theoretical variant of the family business relies on the validity of the two basic natural and social evolutionary principles (it follows: laws of nature, instincts, reflexes): (1)  $P_{i+1} > P_i$  and (2)  $(A_{i+1} + B_{i+1}) > (A_i + B_i)$  related to two consecutive generations ( $i, i+1$ ) of the family business.

Therefore, under such conditions of the basic evolutionary (reproductive) legality for the two consecutive generations of the productive system (family business), it is possible to write down the following two variants:

- a)  $\chi_{i+1} = P_{i+1} : P_i > 2 - (C_i : P_i)$ ,
- b)  $\chi_{i+1} = 1 + ((A_i + B_i) : P_i)$ .

These two propensities characterize family business: (1) propensity to consumption  $1 < \alpha_i = (P_i - C_i) : P_i > 0$  and (2) propensity to save  $\beta_i = 1 : ((P_i - C_i) : C_i) > 0$ . Be notified of “a new fuzzy” philosophy of the concept of reproduction (evolution), which offers not only standard an analytical view, so-called, what proportion has the part in whole – see a) equation propensity to consumption, but it also searches for the answer to the question what is the future of all ( $i + 1$ ) in the old part ( $i$ ), from which it draws its foundation – see b) the equation of propensity to save. The propensity for consumption and savings are indirectly commensurate with the relationship.

It follows (derivation of the formulas is indicated in sources (Mikoláš, 2012, 2018; Mikoláš et al., 2011) the perfect growth potential ( $P$ ) of family business the two consecutive generations ( $i, i + 1$ ) is equal to the number  $\varphi = P_{i+1} : P_i$  (Approx.  $\varphi = 1.61803$ ) This growth dynamism is given by the ratio of stabilized (for the next generation of delay) potential ( $C$ ) to the total potential ( $P$ ) of the previous generation ( $i$ ), that is,  $\varphi = 2 - (C_i : P_i)$ .

Finding the balance between the two propensities (for consumption and savings), we come to several optimal values:

- a)  $\gamma = C_i : P_i = 2 - \varphi$ , approx.  $\gamma = 0.382$ ,
- b)  $\omega = (A_i + B_i) : P_i = \varphi - 1$ , approx.  $\omega = 0.61803$ ,
- c)  $\vartheta = C_i : (A_i + B_i) = \varphi - 1$ , approx.  $\vartheta = 0.61803$ .

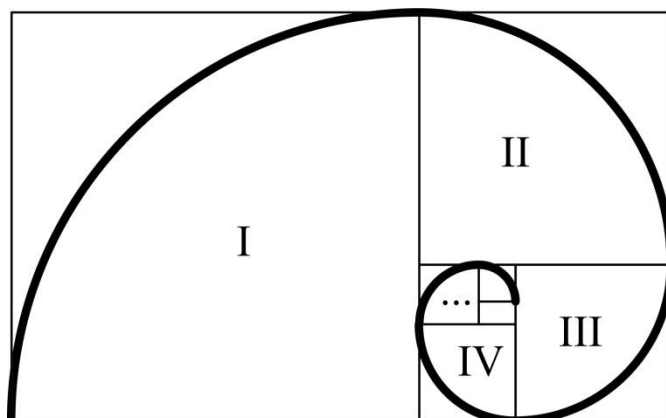
Therefore, if the default ( $i$ ) generation (while being aware that it is a valid value for the “ideal” conditions of reproduction) lays down approximately 38.2% of one’s potential for the future generation, then the following generation ( $i+1$ ) will increase the total potential of approximately 61.8% compared to the total potential of the previous generation ( $i$ ). Therefore, the total consumption ( $A+B$ ) of default generation ( $i$ ) is approximately 61.8% of the total potential ( $P$ ).

However, the proportion of deferred (stabilized) potential (C) on consumption (A+B) is also around 61.8% (Mikoláš, 2012; Mikoláš et al., 2011). Referred numbers (which were derived from some natural phenomena already in ancient Greece) are called the golden ratio (Meisner, 2018).

At the same time, we can deduce that  $\varphi = 1 + \sum_{i=1}^n (1 : \varphi^i)^2$ , for n approaching asymptotically to  $(+\infty)$ .

In other words, the ideal dynamics of the growth potential of the family business is defined by several evolution potentials from (I) the present ( $P_i = 1$ ) up to the past (asymptotically in the endless series of “ancestors,” II, III, IV, ...). The referred argument is graphically demonstrated in Figure 1.

**Figure 1.** Evolutionary series of potentials in family business



Source: Authors' own elaboration.

### 5.3. Optimization proportions of the golden ratio<sup>1</sup>

Everything in nature is composed so that the result is “appealing” harmony related to the golden ratio. Such objects and phenomena are more beautiful, healthier, effective, and work better. This phenomenon has deep causes that express themselves in many different areas, from mathematics (such as the proportions of Platonic solids<sup>2</sup>), computer science (e.g., the theory of heaps), biology

<sup>1</sup> The authors of the paper thank Ing. Jiří Mihola, CSc., who added a few quoted notes when internal reviewing.

<sup>2</sup> About Platonic solids, cf. Ghyka (2008, pp. 50-59). There are also examples of architecture and music.

(shapes of the shells, horns, the proportions of DNA), music, modern and ancient architecture to astronomy (such as parameters or conditions of the orbits) or physics, which won its specific name golden physics.<sup>3</sup> It is obvious that even most of the proportions of nature are directed by the golden ratio, and if it is not controlled, it does not have such harmonious proportions.

Because economics is an optimization science, it should also be reflected in this area. An economist's task is to collaborate with experts in the area to find the most effective solution to achieve the given objective regarding the thrifty treatment of rare resources. Hence, we find that the phyllotaxis, i.e., the spiral-shaped layout of the leaves on the stem in the proportions of the golden ratio, allows us to make the best use of solar radiation. The optimum use of space represents the so-called golden tree,<sup>4</sup> whose branches are becoming shorter in proportion to the golden ratio (e.g., lungs).

This paper is mostly implicating the issue of optimizing the development of the family business. The development of economic (commerce) systems in different hierarchical levels is rarely uniform, but it almost always shows a tendency. This can be considered in the chart with the Cartesian coordinates, where the x-axis is time, or in polar coordinates, with the time represented by an evenly increasing angle ( $\alpha$ ) and the development given by extending the radius vector ( $r$ ). The development is then modeled by the spiral. If the radius vector grows in proportion to the angle (a parameter of proportionality is ( $a$ )), that is Archimedes' spiral, which corresponds to a clear, extensive development,<sup>5</sup> i.e., the development without innovation achieved by simply expanding a production range. Therefore,  $r = a \cdot \alpha$ .

Clear, intense development, supported by the only innovation, is given by the logarithmic spiral and, in real life, is virtually unattainable; therefore,  $r = a \cdot e^{b \cdot \alpha}$ . The so-called "Golden spiral" represents a harmonious development that is sustainably innovative.

#### 5.4. The evolutionary law of time economics in family business

For the total potential of a family business,  $P = A + B + C$  results from the economic theory (economics of time) relationship  $A = B \cdot v$ . Where  $A$  is the

<sup>3</sup> Cf. Olsen (2006). This book has examples of Golden ratios in all the above examples.

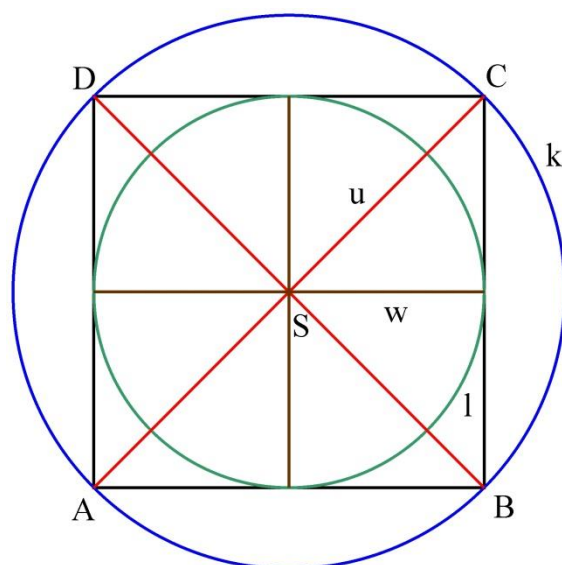
<sup>4</sup> In detail cf. Livio (2006, p. 197).

<sup>5</sup> In great detail about the extensive and intensive development and measurement options, and examples in a monograph by Mihola a kol. (2017).

effective potential (changing into effect E), B is spending (changing into resources spent on mass M). In contrast,  $v$  is the speed of productive transformation of the effective potential B upon the spending potential A. In economic theory and practice, these general characteristic is referred to differently: labor productivity, profitability, yield, efficiency, etc.

Considering descriptive analysis (Figure 2) of behavior in family companies, we have concluded that the following two generations of family businesses innovate a productive transformation with increasing speed, i.e.,  $v_{i+1} > v_i$ .

**Figure 2.** Evolutionary series of productive transformation speed in a family business



Source: Authors' own elaboration.

Ideal acceleration can be described by circles  $k$  (circumscribed square ABCD with center  $S$ ) and (inscribed in a square ABCD with center  $S$ ). The radius of circle  $k$  (abscissa  $u$ ) is equal to the speed of the transformation of the new generation  $v_{i+1}$ . The radius of the inscribed circle  $l$  (abscissa  $w$ ) is equal to the speed of the transformation of the previous generation  $v_i$ . The derivation of that relationship is done in resources (Mikoláš, 2012; Mikoláš et al., 2011).

It follows that the optimal pace of accelerating with innovation cycles (dynamism of generations change) of productive transformation is when  $v_{i+1} = v_i * \sqrt{2}$ , or approximately  $v_{i+1} = v_i * 1.414$ . At the same time, the optimal pace of contraction of relative time in innovation cycles ("business" time) of productive transformation is  $t_{i+1} = 1: (t_i * \sqrt{2}_i)$  or approximately  $t_{i+1} = t_i * 0.7071$ . Theo-

ry of innovation and “Moore’s law” provide a line of argument in favor of the concept of “relative cut” (Mulay, 2022). Moor (co-founder of the chip maker Intel) argues: “Every 18 months, the power of the chip will double, and the cost will fall to half price. So this is true for forty years“ (Jirásek, 2010, p. 17). From the perspective of “relative cut,” it is thus clear that the power of a chip for nine months will increase by a multiple of  $\sqrt{2}$ , and the cost to produce it for nine months will fall in the ratio of  $1 : \sqrt{2}$ . “Moore’s law” affects the principle of “relative cut” the development of potentials of the productive systems. We can find other practical examples confirming this theoretical conclusion (e.g., Mikoláš, 2005; Mikoláš et al., 2011).

Summing up the above findings, then we can write an equation of  $B_{i+1} = (\varphi - 1) : (v_{i+1} + 1)$ , when an ideal evolutionary growth is true relationship  $B_{i+1} = (\varphi - 1) : ((v_i * \sqrt{2}) + 1)$ , for  $i = 0, 1, \dots, n (+ \infty)$ . Alternatively, we can write  $v_{i+1} = v_i * \sqrt{2}$ , for  $i = 0, 1, \dots, n (+ \infty)$ . Therefore, the speed in the following cycles in the ideal order increases in multiples of  $\sqrt{2}$ , and the time of productive transformation (the existence of consecutive cycles) is shortened in multiples of  $1 : \sqrt{2}$  (Mikoláš, 2012, 2018; Mikoláš et al., 2011).

If the speed of transformation  $v_i$  is the basic unit (scale) for changes in the family business for the next two generations, it can be regarded as the unit metrics  $v_i = 1$ , then  $v_{i+1} = \sqrt{2}$ . Therefore,  $\xi = v_{i+1} : v_i = \sqrt{2}$ . Moreover, it can be used for a productive system’s default (basic) generation to infer the approximate ratio of  $\delta_i = \frac{B_i}{P_i} = 0.309$ . Furthermore, for the next generation of the productive system is:  $\delta_{i+1} = \frac{B_{i+1}}{P_{i+1}} = 0.289$ . It follows that the proportion of the mass of resources on the overall potential is reduced,  $\delta_{i+1} < \delta_i$ .

The optimum ratio of the speed of the two following (generations) transformations is derived from the optima of positive synergies “coexistence and competition” of two generations,<sup>6</sup> if  $\xi = v_{i+1} : v_i = \sqrt{2}$ , then roughly  $\lambda_{i+1} = B_{i+1} : B_i = 1.340$  and  $\mu_{i+1} = A_{i+1} : A_i = \xi * \lambda_{i+1}$ , or  $\mu_{i+1} = 1.896$ . The new generation (i+1) achieves a higher speed in the reproductive cycle of productive transformations of 41.4% than the previous generation cycle (i). It follows that the effective potential A of a new generation (i+1) is about 89.6% higher than potential A in the previous cycle (i), and at the same time, spent potential B (resources) intergenerational rises by about 34%. The result of the phenomena described above is:

- a) physical extension of the family business (the family of entrepreneurs)  $t_{fi+1} = (\varphi : \xi) * t_{fi}$ , thus approximately  $t_{fi+1} = 1.144 * t_{fi}$ ,
- b) shortening of the business (working) time  $t_{ei+1} = (1 : \xi) * t_{ei}$ ,  $t_{ei+1} = 0.707 * t_{ei}$ .

<sup>6</sup> Derivation, cf. e.g., Mikoláš et al. (2011, pp. 152-156).



As a result of the productivity growth of the family business, there is a shortened productive (business) time between the following time cycles (generations) of around 29.3%, but at the same time, the increase of the total potential of the productive system causes the physical renewal of time of existence of the following generation of approximately 14.4%. There is, therefore, a paradox (the dilemma) of time: the new generation lives in business shorter time  $t_{ei+1}$ , its business (innovation) life cycle is shorter compared to the original generation of (i), and at the same time, its physical existence time  $t_{fi+1}$  is extended. Disparity or loss (excess) between the physical time and business between the following generations of the family business. Disparity (loss) in the following evolutionary cycles increases, provided there are ideal conditions for spontaneous order of family business. Described phenomena bring various economic, social, ethical, and other disparities into the family business.

## 6. Simulation and discussion

Practical experimental simulation was conducted in 12 Czech and 19 Polish family companies. They were selected based on convenient sampling (Fink, 2009, p. 56) among family businesses previously taking part in the research conducted as an interview that plan to transfer the successors in the most 5-10 years. The average age of current owners is about 45 to 50 years of age. This generation has run its business for approximately 20 years. The company succession they plan is at the age of about 60. It is assumed that the successors (the second generation), at the time of the company's transfer, will be 30-35 years old.

Based on the evolutionary model of family business presented above, we can estimate the evolution of the potential business in the researched family companies. The researched generation of entrepreneurs (i) will be in business (as owners) in diameter  $t_{ei} = 30$  years, as members of the business family will live approximately  $t_{fi} = 80$  years. For the successors, based on the simulation of the evolution of the family business, it is possible to estimate that:

- a) the physical extension of the family business (the family of entrepreneurs) of a new generation (i+1) will be approximately over 90 years of age or  $t_{fi+1} = 1.144 * t_{fi} = 1.144 * 80 = 91.5 = 91.5$  years,
- b) and reaching the shortening of the business (working) time, which will exceed 20 years, so that  $t_{ei+1} = 0.707 * t_{ei} = 0.707 * 30 = 21.2 = 21.2$  years.

These results enrich the broad and current discussion on family businesses' longevity (Jahmurataj et al., 2023) and sustainability (Ahmad et al., 2021).

Using the evolutionary model of family businesses represents a novel analytical approach to assessing and predicting the longevity of these enterprises. It significantly supplements the following methods used so far: conceptual models (Cirillo et al., 2020), approaches based on historical-narrative analysis (Haag et al., 2023), or case studies (Chirapanda, 2020). Introducing an analytical element, this model also represents an opportunity for the development of mixed research in family entrepreneurship and family business. This is consistent with the findings of Reilly and Jones (2017), who encouraged the advancement of the field of family business using mixed methods studies and for family business researchers to advance the field of mixed methods.

Results of own research in family companies show that the successor generation ( $i+1$ ) begins to do business later (as owners) than their parents (between 30-35 years), and active business activity ends by transferring of the family business by their successors ( $i+2$ ) at about 55 years of their age.

The results obtained are of great importance for research in the field of succession of family businesses (Gagné et al., 2021; Ge & Campopiano, 2021), as well as the relationship between succession and innovation in these entities (Baltazar et al., 2023). Suddaby and Jaskiewicz (2020) defined this research problem as managing the tension between continuity and change in family business. The results provide valuable analytical guidelines for succession in the family business (LeCounte, 2022) and highlight the role of intra-family dynamics in this process (Urban & Nonkwelo, 2022). As a result, they significantly influence the formation of development goals in family firms (Williams et al., 2019) and provide essential insights for considering human capital as a critical factor for the longevity of these businesses (Rajan et al., 2020).

These trends are derived not only based on the theory of the evolution of a family business but also from practical research in family companies in the Czech Republic and Poland. Moreover, they suggest many of the dilemmas of the contemporary management paradigm and the social life of families. A significant influence on these facts will have primarily been intergenerational lifestyle changes (Jing & Joo, 2021), globalization, and digitization of the economy and life of contemporary society (Autio et al., 2021).

Family firms represent the typical features of the business subject to objective and subjective spontaneous order. In the ideal (harmonic) variant, very few companies work. These companies have existed for several successive generations, even centuries. Examples of such companies are well documented and presented in the literature (Flören & Jansen, 2011; Koironen, 2002; Kuta et al.,

2017; Lofts, 2019; O'Hara, 2004). However, according to experts, a very risky is the third (i+2) and especially fourth (i+3) business generation, which represents only a few percent (2-3%) of companies founded by the first generation (i) (Bozer et al., 2017; Gagné et al., 2021). This fact is difficult to verify in the Czech Republic and Poland because the transmission of the family companies from the first (i) to the second (i+1) generation is in progress.

The formation of evolutionary networks of family business (both in terms of the dynamics of the potentials and the economics of time) is confirmed. Using the comparative analysis, we concluded that it can be applied successfully in research of spontaneous order within the theory of innovation by Valenta (1969, 2001). His concept divides innovation by degree, i.e., a measure of relatedness or differentiation from other objects (technology/product/service/process) into ten orders (from 0 to 9) within three levels: (I) Quantitative innovations: (0) regenerative innovation: regeneration, (1) quantitative innovation: change in quantity, (2) organizational innovation: change of intensity; (II) Incremental qualitative innovations: (3) qualitative innovation – adaptive change: reorganization, (4) qualitative innovation – functional change: adaptation, (5) qualitative innovation – creation of a new variant, (6) qualitative innovation – concept change: new generation; (III) Radical/disruptive qualitative innovations: (7) species innovation, (8) generic innovation, and (9) clan (tribal) innovation (Lachiewicz et al., 2021, pp. 35-36).

The group of family companies, which move beyond the ideal variant of spontaneous order development, can mean rationalization innovation. Valenta (1969, 2001) distinguishes four systems of rationalization innovations, whereas the basic rule for the recognition of rationalization innovations with different order is a finding of what can sustain an existing economic status process (technical, social, economic, etc.) and what is going to be changed by innovation. This idea raises additional research orientation of the family business.

In every qualitative change remains something of the original initial element, and something qualitatively changes. Then we look at the qualitative change from the perspective of what has changed, and this is something new, or we look at what persists, then it is an enhancement of what persists in a new quality (Peterková, 2017).

Advanced the ideas of Valenta (1969, 2001), we see that innovation of the 6. order is innovation at the level of the new generation, which represents the start of production (transformation, manufacture, or application) of the new economic subject (product, the production factor, technology, in our case the family

company), which is from the closest relatives' other subjects diversified with a completely new structural (design or otherwise defined) layout (i.e., a solution to all its property, work, control functions, etc.) relevant to the user (owner).

If we converted this concept to a family business, then we would understand the fundamental qualitative innovation (6. order) in the family business and the intergenerational succession of the family business by its successors. Therefore, it is a family business innovation on the level of the new generation of successors that represents business in undertaking or starting a new business derived from the closest business relatives (genetically or adoptive), established with significantly different (new) concepts, style, new business issues (or potential) and solution of business functions, relevant for the family, a business entity (company) and the relevant business environment.

## 7. Conclusions

The evolutionary theory of the family business and related practical experiment introduces several final theoretical findings. We may declare our opinion that the social and industrial revolution 5.0 is getting near, and other global economic, social, cultural, ecological, and other contemporary turbulences, built on the "microcosm optimization" of living matter, having two extreme marginal variants for the subsequent (evolutionary) development of family business (Mikoláš, 2018):

- a) option of "harmony," characterized by the most optimistic visions of humanity yet; it means the sustainment of the family business in an ideal evolutionary trajectory,
- b) option of "tragedy," moving to the cleavage of human society into a group of "powerful people – governing" and "servile people – ruled" associated with the downfall of the standard family and the family business as a phenomenon of the Central European cultural experience.

This is particularly important for understanding the causes and determinants of family business heterogeneity and useful for developing new typologies of family firms (Daspit et al., 2021; Neubaum et al., 2019).

The conclusions also allow us to enrich the theory of family business innovation. The key factor for family business development at present is the innovation process in technology, often wholly new and formerly virtually unknown. To absorb this trend, family businesses should proceed to internal changes in paradigms and the dogmas of the behavior of the families. There should be "in-

novation” in the behavior of the families. The successors must be trained from childhood to entrepreneurship, a contemporary technological mindset to maintain family traditions and values in the new historical and social context. Thus, it explains the growing role of social and family capital in family business innovation (Calabrò et al., 2021; Gerulaitiene et al., 2020). Nevertheless, it allows us to treat succession as a specific innovation characteristic for family business.

When analyzing the study’s conclusions, the limitations of the presented theory should also be considered (Geletkanycz & Tepper, 2012). First, it focuses on setting general trends in evolutionary networks of potential (succession) in a family business, making it sensitive to outlier cases. Second, quantitative research should be complemented by longitudinal studies, preferably qualitative. This will make it possible to deepen the results and pay more attention to the factors, course, and effects of changes in potential in family businesses over a more extended time. Third and finally, the empirical verification was conducted only in the Czech Republic and Poland, which limits the cognitive conclusions to the given historical and socioeconomic context.

Therefore, the presented theory deserves a broad discussion and further verification in practice, depending on the cultural differences in manifestations of globalization in various parts of the world and under the influence of the industrial revolution 4.0 or 5.0 ingoing, the migration of nations, environmental changes, etc. We should be aware that the current world is turned, and we are still determining what will follow. Therefore, each expert opinion and scientific discussion are absolutely necessary and useful.

Taking this into account, a comprehensive analysis of the potential is planned in the following selected family companies from the Czech Republic and Poland, which should provide valuable managerial insights. According to preliminary results of the research (within the prologue for planned further research) from about 160 Czech companies, there is an estimation calculated that less than 3% of the firms have the potential to develop further following the criteria of the revolution of Industry 4.0 (Mikoláš & Wozniaková, 2017), which indicates a loss of the evolutionary (innovative) potential in the present global technological changes, retreating from the ideal values of the presented model. From this, it can be inferred that these results come from the preservation of conservative values in families and national cultures of inter-generational conflicts, from the selective impact of globalization on social classes and business entities, etc.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

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