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The Methodological Choices in Entrepreneurship Research: Comparison of Mathematics and Entrepreneurship Paradigm

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Abstract

In this article we investigate the possibility of reconciling two methodological approaches in entrepreneurship research: quantitative and qualitative. Entrepreneurship is one of the youngest paradigms in economics and business fields. Mathematics is the "queen" of sciences but beside its role as basic science, it is recently applied in various scientific fields, including also entrepreneurship. What kind of research question can be answered by using mathematical approach and what questions can be raised by conducting qualitative research, is of main authors' concern. We use an example of entrepreneurial growth, as one of the most intriguing research problems in economics and entrepreneurship to compare the outcomes of research process by using different approaches and philosophical views. Differences in philosophical, ontological, epistemological and methodological characteristics in research process come from different types of research problems. We do not recognize quantitative and qualitatve methodology as opposite sides of the research in entrepreneurship field but rather as complementary. We analyse outcomes of testing Gibrat's Law (mathematical approach) and qualitative research using grounded theory in software industry.

Keywords: entrepreneurship research, methodology, entrepreneurial growth.

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Introduction

In the last quarter of the twentieth century and in the early 21st century entrepreneurship becomes a model for the introduction of innovative thinking, reorganizing and innovating in a wide field of action for achieving goals such as social change and transformation (Steyaert and Katz, 2004, p. 182). This is much more than a simplified perspective on entrepreneurship as a driver of commercial activity and economic growth. Although the economic discourse is dominant in the research enterprise, as a phenomenon that determines the success of cities, regions and countries, entrepreneurship is a more complex phenomenon with its economic, social and cultural characteristics and as such requires a multidimensional approach and better understanding from different viewpoints.

Focusing on fast-growing companies or business billionaires, for example, as an exemplary entrepreneur we fail to consider the entrepreneurial process in the wider social context. When you take broader concept of research and observation, it can be recognized that a community may stimulate growth or create entrepreneurial ventures. Move away from the immediate perception of entrepreneurs as a special case - a special person with special competences or a specific situation in a given time and space, allows the study of entrepreneurship in everyday life - almost everywhere, at any time and on anyone.

In this article we analyze the extent and characteristics of the use of different paradigms and methodologies in the entrepreneurship research. We also present an example of the use of quantitative and qualitative methods in the case of entrepreneurial growth and give suggestions for an alternative approach to research in entrepreneurship by using qualitative methods.

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1. Research Paradigms and Philosophical Assumptions

Strong methodological design of the scientific research could be created after defining research paradigm that is congruent with the researcher's beliefs about the nature of examined reality (Mills, Bonner and Francis, 2006, p. 26). According to Guba and Lincoln (1994, p. 107), paradigm is the dominant worldview or „basic belief system based on ontological, epistemological and methodological assumptions" of the research. Ontological assumption reflects the nature and the form of reality, and the researcher's perception of what is possible to be known. Epistemological assumption shows the nature of the relationship between the researcher and the research subject, and methodological assumption answers the question about the ways or methods which could be used to examine the reality that is possible to be known (Guba and Lincoln, 1994).

While there are many approaches in trying to classify different paradigmatic frameworks (Burrell and Morgan, 1979; Lincoln and Guba, 2000), more recent discourse in the field of philosophy of science defines four fundamental scientific worldviews: positivism, postpositivism, critical theory and constructivism (Guba and Lincoln, 1994; Lincoln and Guba, 2000; Mäkelä and Turcan, 2004; Ponterotto, 2005).

The primary goals of positivism and postpositivism are to predict and control the natural phenomena. Therefore, this paradigms are focused on verification (positivism) or falsification (postpositivism) a priori hypothesis that can be easily converted into precise quantitative models expressing causal relationships. In the ontological sense they are based on naive (positivism) or critical (postpositivism) realism and assume that researcher and research subjects are independent (Guba and Lincoln, 1994; Ponterotto, 2005). For many years positivism and postpositivism had been considered „the only correct views on science". However, justified criticism of the dominant paradigms resulted in suspicion towards quantification on which they are based and encouraged the scientific community to

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review the usefulness of qualitative data (Guba and Lincoln, 1994; Charmez, 2008). Therefore, over the past twenty years researchers have gradually been adopted and scientifically legitimized alternative research paradigms, including constructivism (Lincoln and Guba, 2000; Forson and Others, 2014).

Constructivism's ontology is relativist. According to this paradigm, realities are apprehendable in the form of multiple, invisible, socially and experientially based mental constructions. These constructions are local and specific in the nature, and they are dependent on individuals or groups who create them (Guba and Lincoln, 1994, p.p. 110-111; Mäkelä and Turcan, 2004, p. 3). In other words, the world does not consist of only one objective reality, but of a series of individual, contextually defined realities (Mills, Bonner and Francis, 2006, p. 26). From this point of view the phenomenon should be examined in terms of meaning that is created through the interaction of the researcher and the research subject (literally) in the course of the investigation (Guba and Lincoln, 1994; Mäkelä and Turcan, 2004, p. 3; Henderson, 2009).

Epistemologically, constructivistic approach implies strong researcher's involvement in the research process. Researcher examines the phenomena in their natural environment and seeks to understand and interpret multiple and complex meanings (Gillani, 2014, p.p. 23-26). Therefore, he could not be an objective observer because he is integrative part of the research process (Mills, Bonner and Francis, 2006; Charmez, 2008). Correspondingly, constructivistic methodology is hermeneutical and dialectical and it is usually based on qualitative methodological approaches. Conventional hermeneutical techniques are used in exploring and interpreting the complex constructions, while dialectical interchange enables to compare and contrast them (Guba and Lincoln, 1994; Mäkelä and Turcan, 2004, p.p. 3-4; Henderson, 2009).

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2. Entrepreneurship Paradigm and Research Methods

The question we ask ourselves as researchers is: is there a unique entrepreneurial paradigm and which are its characteristics. In the entrepreneurship research community there has long been debate about the content and direction of entrepreneurship as a scientific discipline. These are discussions that question the definitions, concepts and methodologies in entrepreneurship research and, in general, this questioning implies critical views of how entrepreneurship is defined and understood (Lindgren and Packendorff, 2009, p.p. 26-27).

As one of the younger paradigm, entrepreneurial paradigm uses methods and theories of other sciences: mathematics procures figures to measure variables as well as techniques of data analysis. Psychology explains the behavior of individuals, sociology interprets the relations between people, economics studies the allocation of resources necessary for entrepreneurial survival and growth. There is also a considerable danger to rely solely on mathematics as "the queen of science" as the only reliable "tool" for the purposes of measurement, analysis and theorizing (Bygrave, 1989, p. 9). Table 1. contains a comparison of history of the two paradigms: mathematical paradigm and entrpreneurship paradigm. Mathematics as a science dates from the time of ancient Greece (Schierscher, 2014). But mathematics is empirically developed and applied before that time in Egypt, Sumer and Babylon (Brückler, 2007). Unlike mathematics, entrepreneurship as a discipline is of recent date, and its theory is still emerging.

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Table 1. History of paradigms

	MATHEMATICS	**ENTREPRENEURSHIP**
Origins	6th-5th century BC Tales, Pitagora	18th century AD Smith, Say
Modern	17th century Descartes	20th century Schumpeter
Empirical research	4000 years of application (started in ancient Egypt, Sumer, Babilon, countinuing up to nowadays)	50 years
Theory	2600 years	Still in emergance
Teaching	>2000 years	40 years

Source: Own elaboration.

Aldrich and Baker (1997, p. 377) stated that within the entrepreneurship research field there are different paradigms, and the proposed three possible paradigms are: a unitary, normal science view, a multiple perspective view and a totally pragmatic view. The first of these paradigm assumes the accumulation of empirically tested hypotheses which are developed through incremental research design, quantitative data and statistical techniques. This paradigm assumes the existence of strong theory to help setting hypotheses that researchers will test. The outcome of this process will be the confirmation or refutation of the results of previous research. The result of applying this paradigm is the convergence of research methods. Completely different approach is the multiple perspective view because it makes possible to apply a variety of theories and methods in different research subfields. The pragmatic approach is focused on benefits of end users such as practitioners and policy makers.

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McDonald and Others (2015) in a review of scientific articles published in the top five journals in the field of entrepreneurship find clear evidence of the dominance of positivism, but they also conclude that things are beginning to change in the last fifteen years. Qualitative methods become gradually accepted. Numerous researchers reported approval and satisfaction due to a shift towards more open access to entrepreneurship research in their articles (to name just a few of them: Bygrave, 1989; Davidsson and Wiklund, 2001; Gartner and Birley, 2002; Cope, 2005).

An example of reconciliation of different paradigms is Bourdieu's research framework that can encompass both qualitative and quantitative domain. Using this framework it is possible to simultaneously express both empirical and interpretativistic sensibility through mixed method approach. In this way the implementation of multilevel analysis is achieved in in the same research project to obtain more complex and more accurate representation of social phenomena (Bourdieu, 2011).

As is shown by so many deductive models produced by economists, which are mere mathematical formalizations – and formularizations – of a commonsense insight, this break with ordinary practice is pehaps never so difficult as when what is to be questioned, such as the principles underlying economic practices, is inscribed in the most ordinary routines of everyday experience (Bourdieu, 2005, p.3).

Bourdieu, who also used quantitative methods in his research emphasizes the bad side of exclusivity and reliance on a single positivist paradigm.

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3. Comparison Of Mathematical and Constructivistic Approach in The Case of Enterprise Growth Research

Growth itself is a complex phenomenon, and the nature of the growth process at the firm level shows heterogeneity. Even within the elite part of growing businesses (gazelles), only a small number of those become industry leaders like Microsoft, Google or Facebook.

Within mathematical approach to firm growth research there are two groups of models: stochastic and deterministic (**Table 2**). Stochastic models of firm growth are based on the law of proportional effect. The law in its original form simply states that the expected rate of firm growth in a given period is equal for all firms regardless of their size in the beginning of the period. The law was formulated by French scientist Robert Gibrat 1931. Gibrat's law is very popular among researchers, though it is usually focused on whether the law is proved or not rather than focused on the interpretation of the research. A number of theories that can be broadly classified into deterministic tradition suggests that post - entry performance does not occur accidentaly, but is the result of the specific characteristics of firms.

Table 2. Empirical models of firm growth within mathematical paradigm

Deterministic models	Predicting growth from a regression relationship
Stohastic models	Analysis of variance – explaining variance in the "amount" of growth

Source: Own elaboration.

Davidson and Wiklund (2013, p.p. 4-5) present a critical review of previous studies on firm growth. Using the positivist paradigm, those studies are generally restricted to trying to explain the variance in the "amount" of growth. Another characteristic

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is that researchers treat growth as a unified, undifferentiated phenomenon despite the fact of using multiple indicators of growth in their research.

In our previous research (Vuković, Korent and Kedmenec, 2014) we deployed mathematical paradigm in investigating firm growth in the Croatian software industry. In order to examine the validity of Gibrat's law for the constant sample of all surviving companies in this line of business and the possible existence of convergence towards its affirmation over the years, we used the quantile regression method to evaluate Gibrat's growth model for each particular year and the that a company's growth is independent of its size. We concluded Gibrat's law in the case of Croatia's software industry matching previous findings that small companies in the service industries with small efficient scale tend to grow slower than small companies in the manufacturing industry. However, our conclusions were not strong enough to be of particular benefit for practitioners or policy makers. It seemed to be important to broaden this analysis by conducting a qualitative research about the needs and characteristics of different entrepreneurs, because of the existing heterogeneity in resources and strategies at the firm level. **Table 3** contains an overview of "tools" that we used in our two studies with different approaches (mathematical and constructivistic) and methodologies (quantitative and qualitative).

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Table 3. Research „tools" in mathematical and constructivistic approach to entpreneurial growth

"Tools"	**MATHEMATICAL APPROACH**	**CONSTRUCTIVISTIC APPROACH**
Variables	Precise definitions: age, size: number of employees, annual revenue, assets	Fuzzy definitions: practice, strategy, legitimacy social capital, cultural capital, simbolic capital
Instruments	Accuracy: econometrics	Dubious accuracy: interviews
Population	Distinct: firms as statistical units in official national statistics	Indinstinct: entrepreneurs, owners, founders
Sampling	Random	Theoretical
Language/rhetorics	Formal, impersonal	Informal, personalised

Source: Own elaboration.

Our current research is directed at understanding entrepreneurial phenomena from the perspective of social constructivism. Entrepreneurship research based on social constructivism does not favour functionalistically slanted searches for causality, precise definitions, and statistically constructed generalizations (Pittaway, 2000). As alternative to mathematical approach, the social construction approach explains reality as a social construct, a creation of people (Smith and Anderson, 2007). This implies that the "true" is result of social negotiation. Ontological position (perception of reality) determines entrepreneurial growth practice through intersubjective interpretation and is constructed through social interaction of people (Lindgren and Packendorff, 2009). Although recognized as the essential elements of entrepreneurial behaviour, most of the currently relevant entrepreneurial research phenomena (such as internationalization, innovativeness, and firm growth)

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are extremely complex and so far insufficiently studied (Šmaguc and Vuković, 2016). We examine how the field, habitus and capital of entrepreneurs affect the growth and survival of firms in the software industry and what growth practices are used by firms in the industry concerned.

Epistemologically, social structures are not based on facts but on values (Lincoln and Guba, 1985) . Broad framework of "sociology of knowledge" explains that knowledge is developing, transmitting and maintaining in social situations (Berger and Luckmann, 1967). Epistemological position (view on knowledge) is determined by the knowledge on entrepreneurship field represented in the narratives, discourses, and textual data. In our study we use grounded theory (Glaser and Strauss, 2012; Strauss and Corbin, 2015) which is the most common among qualitative research methods in the field of entrepreneurship. After interviewing the entrepreneurs, the most important part of the work relates to text analysis. In a research based on the grounded theory, data analysis requires the application of coding techniques: open coding, axial coding and selective coding. The aim is sharpening of theoretical concepts and refinement of the theory of entrepreneurial growth through the creation of a typology of entrepreneurs in the software industry. This is achieved by constantly comparing the data and constructs so that the accumulated evidence from different sources converge to simple, well-defined constructs.

Conclusion and Recommendations

Discussions about scientific paradigm are present in all the social sciences, including the field of entrepreneurship. Although the discussions sometimes becomes almost heated debate, there is always effort to avoid a one-sided approach and exclusivity of one paradigm. Due to differences in scientific approach to research areas and the specifics of the research problem, a reasonable approach emphasizes the need for their complementary application. Quantitative approach to research of firm growth aims to answer the questions who, what, how, when and

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why. The answers to these questions should serve the prediction of firm growth. In the qualitative approach the goal is to answer the question how to enable us to understand entrepreneurial process and relations within entrepreneurship field.

We recommend the use of an alternative approach to research in the scientific field of entrepreneurship by using qualitative methods to achieve better understanding of the economic, social and cultural phenomenon of entrepreneurship. However, we would like to mention that the research approach is determined not only by the nature of the research question but also by habitus of researcher. The desirable characteristics of researcher, especially in the research that applies the grounded theory are the following: the ability of returning a step back due to a critical analysis of the situation, the ability to identify the tendency towards bias, the ability to abstract thinking, flexibility and openness to useful criticism, sensitivity to the words and actions of the respondents, a sense of immersion and commitment to the work process.

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