

VLADYSLAV SOLOVIOV

The role of culture  
for innovative processes



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**VLADYSLAV SOLOVIOV**

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School of Economics and Business Administration, University of Tartu, Estonia

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## TABLE OF CONTENTS

LIST OF AUTHOR'S PUBLICATIONS .....	6
INTRODUCTION.....	7
List of papers.....	7
Motivation for the research.....	7
Aim and research tasks .....	9
Novelty of the thesis.....	10
Contributions of individual authors.....	12
Structure of the thesis .....	12
Research outline .....	12
Data and methodology.....	14
Acknowledgements .....	15
1. THEORETICAL BACKGROUND .....	16
1.1. Innovation .....	16
Definition and classification.....	16
Models of innovation. National innovation system.....	18
Indicators of innovation.....	20
1.2. Culture.....	25
Definitions and approaches .....	25
Cultural theories and measuring culture.....	30
1.3. Studies on culture and innovation .....	37
2. EMPIRICAL STUDIES.....	43
3. DISCUSSION .....	110
3.1. Discussion and implications of the empirical research .....	110
3.2. Limitations of the thesis and future research directions.....	115
REFERENCES.....	118
SUMMARY IN ESTONIAN .....	125
CURRICULUM VITAE .....	132
ELULOOKIRJELDUS.....	133

## LIST OF AUTHOR'S PUBLICATIONS

1. Masso, J., **Soloviov, V.**, Espenberg, K., Mierina, I. (2019) Social convergence of the Baltic states within the enlarged EU: Is limited social dialogue an impediment? Daniel Vaughan-Whitehead. *Towards Convergence in Europe Institutions, Labour and Industrial Relations*. (35–77). Cheltenham, UK: Edward Elgar Publishing.
2. **Soloviov, V.** (2022a). Re-examining the links between cultural values and innovation. *Economics & Sociology*, 15 (2), 41–59.
3. **Soloviov, V.** (2022b). Linking regional autonomy–embeddedness value orientation and innovation. *Journal of Innovation and Entrepreneurship*, 11, 18.
4. **Soloviov, V.**, Kaasa, A. (2023). Mediators of Relationship between National Culture and Innovation. *International Journal of Entrepreneurship and Innovation Management*, 27 (3/4), 269–288.

# INTRODUCTION

## List of papers

This thesis comprises three publications, referred in the text below as follows:

- Study 1.** Soloviov, V., Kaasa, A. (2023). Mediators of Relationship between National Culture and Innovation. *International Journal of Entrepreneurship and Innovation Management*, 27 (3/4), 269–288.
- Study 2.** Soloviov, V. (2022a). Linking regional autonomy–embeddedness value orientation and innovation. *Journal of Innovation and Entrepreneurship*, 11, 18.
- Study 3.** Soloviov, V. (2022b). Re-examining the links between cultural values and innovation. *Economics & Sociology*, 15 (2), 41–59.

## Motivation for the research

In the last half-century, innovation has turned from a single-person endeavour into a continuous process that nearly all private and public companies engage in. The role of innovative processes has changed from granting a competitive edge to allowing companies to survive and remain relevant. Both state actors and academia are now actively involved in innovative activity through financial expenditures, policies, research and long-term cooperation. This process is amplified in contemporary knowledge-intensive societies, where the easier access to information and greater ability of entrepreneurs to identify and react to opportunities and challenges leads to increased competitiveness among firms (Malerba, McKelvey, 2019). When combined with the increased role of both the state and academia in innovation, firms are forced to innovate to stay competitive and survive in the long term. Consequently, academic interest in the mechanism behind innovative processes and their drivers have significantly increased as well.

Culture has been hypothesised as a significant predictor of innovative activity since Weber (1904/1958), but the majority of large-scale empirical studies were conducted after Hofstede’s (1980) research provided the first quantitative measurements of culture. Numerous studies have been produced since then, establishing a link between culture and innovative activity (Shane, 1992; Kaasa, Vadi, 2010; Efrat, 2014; Bukovski, Rudnicki, 2019). In particular, individualism has emerged as a strong and significant predictor of high innovative activity and long-term economic growth (Gorodnichenko, Roland, 2011).

The fact that culture and innovation belong to two vastly different fields prompts the need for multidisciplinary research. Immediately, a strong concern arises, one which I would like to address here. Interdisciplinary research, by its nature, requires advanced competency in several fields. It involves a degree of cooperation between researchers from different fields attempting to explain a

phenomenon or address a problem that exists simultaneously in both areas or relies on concepts that are already researched within each field. However, a weak synthesis is entirely possible between the areas of such research, where experts from one field inform themselves on the key concepts of another field and use them as examples or simple proxies for deepening understanding within their own field.

In the course of writing this dissertation (over several years) and going over a long list of existing studies, I concluded that the latter approach is prevalent among researchers. In other words, multidisciplinary research on the link between culture and innovation often contains too little culture or too little innovation. Innovation studies have gone a long way from using linear models of innovation and push and pull models towards integration models that describe the self-enforcing nature of innovations (Rothwell, 1994). Yet the majority of studies relating culture with innovation rely on linear regression and correlation analysis without utilising these models. Recently, new cultural theories have emerged in the field of societal culture that address the critique of older theories and measurements (Beugelsdijk, Welzel, 2018; Minkov et al., 2017; Minkov et al. 2018a), yet the majority of studies on culture and innovation still perform empirical analysis using the dimensions of older theories of culture.

None of this detracts from the quality or conclusions of these studies. Much of the ground-breaking research in both fields is done with necessary simplifications of either culture or innovation, at least in the empirical models. As it is not possible to simultaneously be an expert in several vastly different fields and is equally difficult to assemble a panel of scientists whose expertise covers all of them, some concessions have to be made in the course of research. This does not exclude the author of this dissertation – as I am more familiar with a field of culture than innovation. An expert in the innovation field might find a rather simplified view here on innovation, and I acknowledge this shortcoming. I further limit the dissertation to discussing innovation at a national level, without using firm-level factors or focusing on specific innovation types or innovative industries. Accordingly, I analyse culture at a societal level, leaving aside discussion of organisational culture. These limitations do not aim to claim the larger importance of the selected fields but simply limit the analysis to areas where my knowledge could be best used in producing novel research.

From Kirkman et al.'s (2006, 2016) series of discussions on multidisciplinary studies involving culture, one common point is the lack of research on mediators of the relationship between culture and the other researched phenomena. Consequently, the link between culture and innovation is oftentimes oversimplified to a statistical coefficient, without regard for the underlying processes or possible mediators. In the general framework for innovation systems (Rothwell, 1994; Arnold, Kuhlmann, 2011), elements of the system are interconnected, impacting each other during the innovative activity. It stands to reason that culture, as an informal institution, can affect many of such elements in addition to its direct impact on the innovative activity itself. Therefore, one of

the tasks for this thesis is deepening theoretical understanding of the link between culture and innovation through empirical study of the mediators of this link. Analysis of the mediators could allow narrowing the plethora of phenomena through which culture has an indirect effect on innovation, and, as a result, provide a stronger overall understanding of the role culture plays in the innovative activity of various societies. I explored possible mediators of the relationship between culture and innovation in Study 1.

There are several other particularities of interdisciplinary research on culture and innovation that I have analysed. Utilising countries as the units for measuring societal culture, for example, has long become the norm among researchers. As a result, few studies have utilised cultural dimensions at a level different from the country; fewer still have supplemented analysis with results obtained from linking culture and innovation at different levels. Utilising different levels of analysis for culture-related research can provide insights into within-country cultural differences and allow the creation of a more comprehensive understanding of the role of culture in various processes (Kirkman et al., 2016). I investigated this possibility in Study 2.

On the topic of methodology and data, it should be noted that many studies in recent decades have used a set of cultural dimensions from a single cultural theory and limited the empirical analysis of data to correlation analysis and OLS regressions (Kirkman et al., 2016). As alternative sets of cultural dimensions become available (Beugelsdijk, Welzel, 2018; Minkov et al., 2017; 2018a, 2018b) and more criticism emerges regarding currently utilised practices (Beugelsdijk, Welzel, 2018; Minkov, 2018; Minkov, Kaasa, 2020), I aimed to utilise more contemporary measurements of culture and methodology in the studies of this dissertation. In Study 3, I performed a comparative analysis of several sets of cultural dimensions when analysing the link between culture and innovation.

## **Aim and research tasks**

The aim of this thesis is to investigate the role of culture for innovative activity in different societies by using contemporary theoretical and methodological approaches and data. Consequently, the following research tasks were set to reach this objective:

1. Provide an overview on culture and innovation (Chapter 1).
2. Discuss quantitative measurements of culture and innovation, methodology for obtaining these and shortcomings of different approaches (Chapter 1).
3. Provide a critical analysis of the main approaches, methods and findings of studies linking culture with innovative activity, highlighting the key assumptions and limitations of existing studies (Chapter 1).
4. Explore mediators of the indirect link between culture and innovation, providing possible mediators and explaining the mechanisms behind such links (Chapter 2, Study 1).

5. Compare the indirect and direct effects of culture on innovative activity through the identified mediators (Chapter 2, Study 1).
6. Analyse the possibility of conducting research on the link between culture and innovative activity at a level different from the national, and the possible benefits of future research at this level (Chapter 2, Study 2).
7. Construct cultural dimensions using new primary data and the original methodology prescribed by cultural theory and assess the possibility of using such an approach in empirical studies (Chapter 2, Study 2).
8. Perform a comparative analysis of the link between culture and innovation utilising various older and newer sets of cultural dimensions in studies (Chapter 2, Study 3).
9. Provide evidence regarding the possibility of using newer cultural dimensions in research that links culture and innovation and outline the benefits of such approaches (Chapter 2, Studies 1, 2, and 3).
10. Summarise the obtained results and outline the benefits and limitations of the proposed approaches (Chapter 3).
11. Provide directions for future studies and discuss the role of current findings for these studies (Chapter 3).

### **Novelty of the thesis**

This thesis is based on three empirical studies focused on one research question related to better understanding of the link between culture and innovative activity.

Study 1 (Soloviov, Kaasa, 2023) was focused on the role of mediators in a model linking culture and innovation. As the majority of research on culture and innovation is focused on a direct link between these phenomena, there is little insight into the mechanism through which they are related – or empirical evidence for any indirect links. The study creates a model that utilises two mediators. The first mediator can be measured as a composite indicator of aspects of governance quality, such as control of corruption, rule of law and political stability. The second represents the effect of the economic policies that finance innovative activity and is defined as the share of R&D investments in the country's GDP. The study highlights a significant role for both indicators as mediators of the relationship between culture and innovation – consistently for various sets of cultural dimensions. The total indirect effect of culture on innovation through governance quality and R&D investments is always stronger than the direct effect, and for a majority of sets of cultural dimensions, the indirect effect of any one cultural dimension on innovation through governance quality is stronger than the direct effect as well. This provides evidence of aspects of governance serving as possible mediators of the relationship between culture and innovation, which provides insight into the mechanism through which the former is linked with the latter. It also highlights a strong need for further studies in this area to provide better understanding of the underlying framework through which culture and innovation are linked.

Study 2 (Soloviov, 2022a) highlights the fact that most cultural research is performed using country-level measurements of culture and innovation. There are still valid reasons for using the country level, ranging from the natural tendency of the cultures of various subgroups to cluster around, or gravitate towards, nations as units of culture (Akaliyski et al., 2021) to data availability. However, the study posits that it is possible to obtain more accurate measurements of culture by using a smaller level of subdivision than national borders. One such possibility is explored in this empirical study by utilising the NUTS1 subdivision of European countries. Original national and regional measurements of culture were created for 26 countries by using Schwartz's (2003) methodology and compared through the use of multilevel mixed effects models. The study finds that, for some countries, such as Austria, Germany, Spain and the UK, there is significant regional variance in the scores of cultural dimensions, even though the means of regional scores over the same country for each dimension are close to the respective country-level scores. Additionally, border regions of neighbouring countries can sometimes yield cultural scores closer to each other than to their respective countries. As a result, including cultural dimensions at the regional level in empirical models results in a better relative fit and hints at a nonlinear relationship between cultural variables and innovative activity that country-level scores fail to uncover.

Study 3 (Soloviov, 2022b) discusses the possibility of using contemporary measures of culture when analysing the link between culture and innovation. A vast majority of studies involving culture utilise scores of cultural dimensions from Hofstede's theory (Kirkman et al., 2016), despite heavy criticism of both the theory itself and the resulting dimensions, particularly their low internal consistency and replicability (Fellows, Liu, 2013; Minkov, 2018). The study compares Hofstede's four original cultural dimensions to those of Schwartz, Inglehart and Minkov in empirical models that link cultural dimensions with innovation. The results indicate that all alternative sets of cultural dimensions are superior to Hofstede's, providing better fit and consistent results grounded in a theoretical framework. As a conclusion, while existing studies that used Hofstede's cultural dimensions can still serve as a broad reference point, there is little use in his cultural measurements when better alternatives are readily available.

The studies discussed above offer various solutions and improvements to the methodology of studies that link culture and innovation. The general contribution of the three studies lies in reaffirming the significant link between culture and innovation when using cultural theories and sets of dimensions alternative to those used in the past. All three studies use various newer sets of cultural dimensions, obtaining meaningful and statistically significant results. A consistently significant link between these cultural dimensions and various indicators of innovative activity provides evidence of their suitability for a wide array of empirical studies. The studies additionally highlight a strong and consistently significant role of individualism as a predictor of a high level of innovative activity, emerging either as a separate indicator or as a combination of correlated aspects of individualism.

## Contributions of individual authors

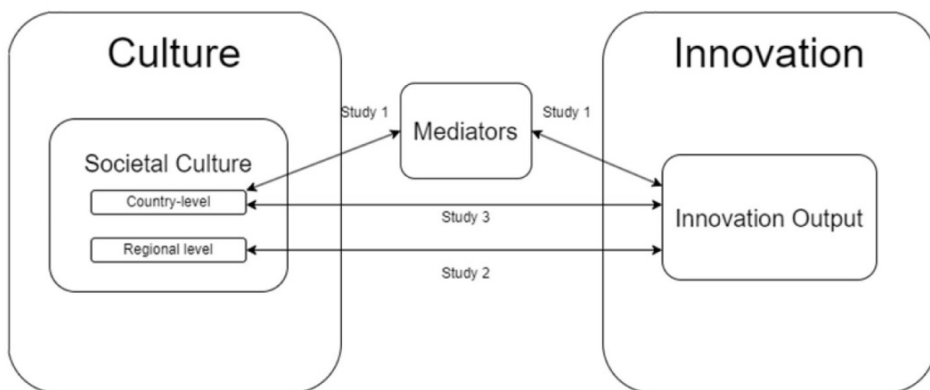
Study 1 was co-authored with Anneli Kaasa. For this study, the co-authors jointly formulated the motivation for the research. The first author wrote the theoretical overview, conducted the empirical analysis and formulated the results and limitations of the study. The second author provided the data for research and contributed with reviews, corrections and suggestions. Studies 2 and 3 were written solely by the author of the thesis.

## Structure of the thesis

The thesis is divided into three chapters, excluding this introductory section. In the first chapter, I provide a theoretical overview and describe the methodology and data sources for the thesis. The subsections of this chapter discuss definitions, classifications and measurements of innovation and culture, as well as the results of studies that link culture and innovation. The second chapter consists of three peer-reviewed and published empirical studies. These articles explore possibilities for improving understanding of the place culture has in innovative activity. In the third chapter, I present a summary of the results obtained from the empirical studies and discuss possible limitations of the thesis.

## Research outline

The structure of the research is presented on Figure 1. While each individual study has a straightforward structure and analyses an important issue, the research questions that these studies are centred around were revealed gradually in the course of several years.



**Figure 1.** Research outline  
Source: Compiled by the author

This dissertation investigates the following research questions:

1. What is the role of culture within national innovation systems? (Study 1)
2. Are the indirect effects of culture on innovative activity stronger than the direct effects? (Study 1)
3. Can culture be investigated at a level other than the country? (Study 2)
4. Can original measurements of culture be constructed from primary data and used in an empirical analysis? (Study 2)
5. What is the role of individualism in explaining innovation? (Studies 1, 2, and 3)
6. Are new cultural dimensions appropriate as replacements for the old ones? (Study 3)

I began the research with an overview of current literature and studies on the topic of culture and innovation. This investigation revealed frequent necessary simplifications of either culture or innovation in the vast majority of multidisciplinary studies. A series of seminal papers by Kirkman et al. (2006, 2016) on studies that link culture with various economic phenomena reveals a plethora of questions that are frequently omitted or not sufficiently analysed by researchers in this field. Yet, these papers do not raise the question of the underlying mechanism of the link between culture and such variables. An issue is raised about properly utilising cultural dimensions as a proxy for measuring national culture, but there is little discussion about what mediates the relationship of culture itself with innovation or other phenomena. Study 1 aims at disentangling this issue by offering a model that links culture, innovation and their mediators into a single system.

After analysis of the current understanding of the role of culture for innovating activity, I discovered two other important issues for this type of research that pertain specifically to culture. The first was the general focus of studies on societal culture at a national level, without considering possible cultural heterogeneity within each country. I aimed to analyse this issue in Study 2. The second issue pertained to the data used in multidisciplinary studies on culture and innovation. A number of contemporary sets of cultural dimensions have been constructed in recent years, presenting a valid alternative to the more generally used dimensions of Hofstede when measuring culture. These dimensions are used in all the studies of this thesis, providing evidence of their validity. It should be noted here that the studies are not discussed in the chronological order of publishing but in a logical order, going from the broader question to the narrower issues of data and methodology.

These studies used varied methodology for their empirical components. Study 1 investigated the frequently glossed-over issue of the indirect effect of culture on innovation and consequently the role of mediators of this effect, using structural equation models. In Studies 2 and 3, analysis of the respective research questions was done through the use of multilevel models. Various other methods were employed to ensure the robustness of the results and additional theoretical insights. Among these were correlation analysis, factor

analysis and various statistical tests pertaining to the model in question. With regard to correlation analysis, it is necessary to stress that while correlations between factors provide insights into how dimensions from different cultural theories represent similar values, beliefs, and attitudes, they never directly influence the results of the research, as no regression analysis includes dimensions from different cultural theories at the same time.

## **Data and methodology**

Studies 1 and 3 utilise the Global Innovation Output index as a generalised measurement of a country's innovation activity in a given year (Cornell University, INSEAD, WIPO, 2020). Study 2 utilises European Patent Register indicators of the number of patents granted in each year to provide measurement of innovation at a regional level.

Hofstede's (1980, 2001, 2011) and Schwartz's cultural dimensions (2006), Inglehart's cultural dimensions obtained from Wave 7 of the World Values Survey (2022), as well as the original Beugelsdijk-Welzel (2018), Minkov et al. (2017; 2018) and Kaasa and Minkov (2022) sets of cultural dimensions are used in the studies of this dissertation.

The three studies of the dissertation are empirical in nature and utilise a variety of econometric methodology. Correlation analysis was used in the studies to provide preliminary analysis of possible simple direct linear links between the analysed variables. Regression analysis was used to create various models to fulfil research tasks 4–9. Structural equation modelling, in particular path analysis, was used in Study 1 to establish a model that links culture, innovation, and selected mediators (research task 4). Mixed effects multilevel models were used in Studies 2 and 3 to link culture and innovation at country and regional levels (research tasks 6, 8, and 9).

Principal component analysis was utilised in Study 1 to combine different aspects of governance quality into a single variable (research task 4) and in Study 2 to create cultural dimensions at a regional level (research task 7). Ipsatiation of the primary data was also used for this goal. Statistical tests and measurements, such as the F-test, Cronbach's alpha, and the Kaiser-Meyer-Olkin test for sampling adequacy were used to control for the statistical significance of the results and the suitability of the data for the analysis (research tasks 4–9). Various statistical measurements were used to compare the obtained models, such as the Akaike information criterion and the comparative fit index (research tasks 5, 8, and 9).

The methodology and the data used for each study are described in Chapters 1 and 2.

## Acknowledgements

This research is a product of hard work over multiple years, and I am happy to see it through. I am grateful for all the help I've been provided in the years I worked on the thesis, and I would like to mention the people who helped me in this journey.

First, I would like to thank my supervisor, Professor Anneli Kaasa, for her comments, suggestions and overall guidance, which were instrumental in improving the quality of the published papers and the thesis. Similarly, I would like to thank Professor Tomasz Mickiewicz for his advisory role on the thesis and his help in properly structuring, bringing out the important and removing the unnecessary. I want to thank my opponents for providing valuable comments that helped improve the quality of this research.

I want to extend my thanks to Urmas Varblane, Maja Vaadi, Priit Vahter, Jaan Masso, and many other people working at the University of Tartu who provided answers to the many questions I had while writing these studies and who graciously offered their guidance. I am also thankful to Katrin Tamm for organising various workshops and events with the Doctoral School in Economics and Business Administration. As I combined research with teaching, I am very grateful to Sirje Haas for her support and for directing me towards the best literature for my studies and to offer to my students. I would also like to thank Sirje Saarmann for being accommodating in arranging my course schedule.

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# 1. THEORETICAL BACKGROUND

## 1.1. Innovation

### Definition and classification

Since its separation into a distinct field of research in around 1960s, innovation and innovative processes have been proven to influence multiple areas ranging from firm performance and growth (Mansury, Love, 2008) to local socioeconomic conditions (Rodríguez-Pose, Crescenzi, 2008). While initially viewed as a result of individual performance, as the innovation grew in importance, it became a staple process for most large firms.

The multifaceted nature of innovation can be observed in the ambiguity of the term, despite intuitive understanding of its meaning. Innovation, as one of the core concepts of entrepreneurial activity, can be defined as a process of creating new products, services, ideas or methods to expand into new markets or obtain a competitive advantage in existing ones (Tidd, Bessant, 2014). But it can also be viewed as the end result of such processes, a new unique way of implementing or organising work processes, increased efficiency in creating, selling, advertising or delivering a product or service, and even an improvement in the core instruments of innovation. Innovation can be a planned process starting with an original idea, a deliberate copying of an existing one, or even the accidental adoption (Kline, Rosenberg, 1986).

The common feature of the mentioned definitions is the continuous aspect: at any point, results from one cycle of innovation can simultaneously serve as a starting point or a reference guide for others. In this sense, innovation is synonymous to the term “innovative process” or “innovative activity”, although the latter two can also be used more narrowly: as an activity, but not the result (Fagerberg, 2006). Innovation, therefore, is not linear: it requires feedback and interaction in order to develop and does not confine to a rigid sequence of events (Smith, 2006).

It is important to note that innovation is not synonymous to invention, for several reasons. Broadly, innovation does not have an endpoint, while invention has a clear result: a product, a service, or a process, to name a few. A commonly accepted view is that invention is a component of the innovative process that helps solve a distinct problem at a given stage. In a narrower sense, small-scale innovations in organisation structure or technology could eventually lead to breakthrough by way of collecting data without necessarily producing any inventions (Kline, Rosenberg, 1986).

Schumpeter (1936) was among the first scholars to research innovation, which he characterised as the driving mechanism for company profits and business cycles. He also created the first method to classify innovations, which was mapped to the 4P, or the “marketing mix” model created several years later. Since then, numerous other classifications have been created, accommodating

different needs of researchers and businesses. An overview of the more commonly used approaches to classifying innovation is presented in Table 1.

**Table 1.** Main approaches to classifying innovation

Approach	Classes
By type (Schumpeter) <sup>1</sup>	Product, method of production, source of supply, market exploitation, business organisation
By type (4P) <sup>2</sup>	Product, process, paradigm, position
By core concepts and knowledge links <sup>3</sup>	Modular, discontinuous, incremental, architectural
By reasons to innovate <sup>2</sup>	New market, new technology, new political and economic circumstances at a national level, legal changes, market shifts, force majeure, other innovations
By knowledge types and its use <sup>4</sup>	Analytical, synthetic, symbolic
By degree of novelty <sup>2</sup>	Incremental, radical
By level <sup>5</sup>	Component, system/architecture

Sources: <sup>1</sup>Schumpeter (1936); <sup>2</sup>Tidd, Bessant (2014); <sup>3</sup>Asheim et al. (2011); <sup>4</sup>Fagerberg, Mowery (2006); <sup>5</sup>Lorenz (2010)

There are several reasons for the increase in interest in innovation. These can be attributed to changes in the processes affecting innovative processes themselves. To start with, the increased role of academia and knowledge infrastructure in most sectors both forced firms to innovate to stay competitive and expanded their possibility to do so. This also increased firms' expenses for innovative activity. Secondly, the role of the state as a factor influencing innovation has also rapidly increased, both directly, in the form of subsidies and other economic incentives for industry, and indirectly, as a determinant of increased research activity by means of government spending on academia (Etzkowitz, 1995). As the cost of innovative activity increased, so did the financial risk. Companies may be pushed to innovate, at the same time struggling to cover ever-increasing development costs (Kline, Rosenberg, 1986). Combined with the fact that one successful innovation increases the chance of success of further technological processes (Arthur, 1983), the resulting economy is one where firms either innovate continuously or rapidly get left behind and leave the industry. As a result, firms, academia and government are all actively involved in innovative processes and benefit significantly from a better understanding of these processes. Finally, innovation has been closely linked to a number of other economic concepts, including (but not limited to) technology, productivity, the clustering of industries, market transformations and knowledge spillovers.

## **Models of innovation. National innovation system**

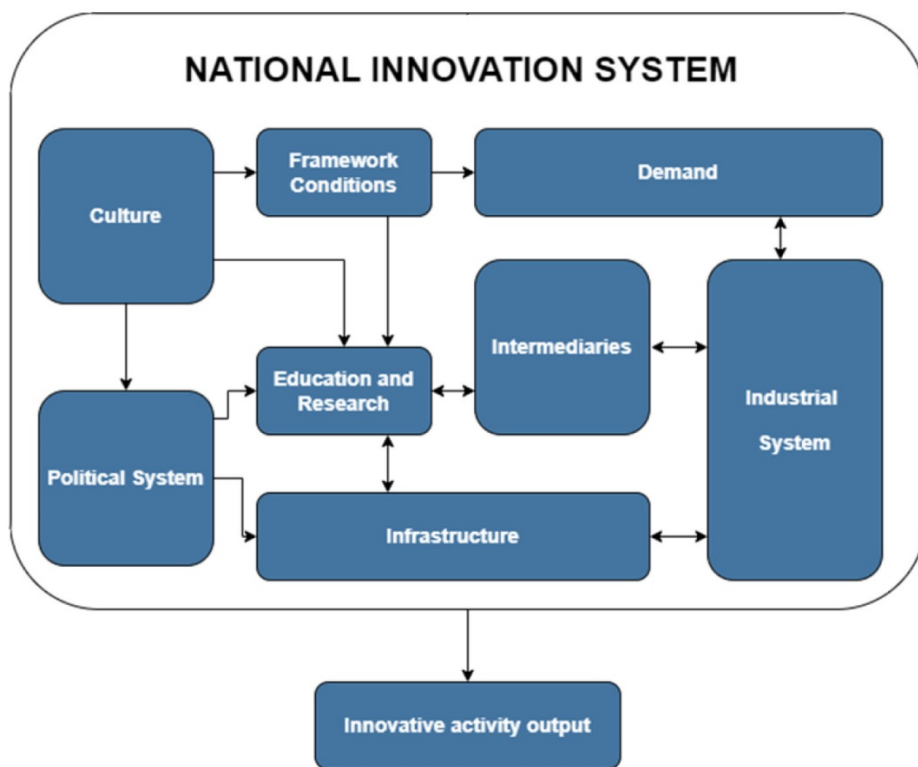
The process of developing innovation spans from creating an idea to its implementation, each step providing feedback for future steps as well as the opportunity to start anew with the data and knowledge collected. It is not surprising, therefore, that to disentangle this complex process, researchers use various models of innovation. The history of the development of the models of innovation is heavily interconnected with how the innovative process was viewed at the time of its creation – from the simple linear process to a complex activity with multiple feedback loops, with each view represented by a separate group of models. Each group is both a result of the innovative activity based on the previous group and a rejection of their views, or, as Schumpeter (1936) called it, a “creative destruction”.

Rothwell (1994) provides one way to classify models into five generations according to two key factors: underlying strategy elements that reject or modify the previous generation, and primary enabling features. The former focuses on the changes in the approach of a firm or an industry to the innovation process, while the latter describes the structural changes in the innovating entity that make the approach feasible, such as access to data or a new organisational structure. To understand an innovative process, it is possible to start with a simple linear model of innovation, where a starting point is some fundamental research, and the endpoint is the innovation itself. Of course, only a small subset of all innovations can be represented in this way, and the continuous nature of the innovative process is not represented here, which leads to newer, more complicated models that might better reflect the innovative process. In a five-generation overview (1994), it culminates in a networking model where several innovative processes run in parallel, and the results of any stage for any of them informs the future development process for all of them. Even then, it should be noted that newer models are still being developed, some of which, like that of Crépon, Duguet and Mairesse (1998), or CDM, provide a balance between the simplistic models of the past and the integrated models of the later generations.

This long-term development of models for innovation has had very little effect on multidisciplinary studies on culture and innovation. Here, the circular nature of the innovative processes remains largely unused in favour of simpler linear models with a particular result of the innovative activity as a dependent variable. This is particularly true when societal culture is discussed, as studies in this area rarely synthesise country-level cultural variables with the firm-level factors that integrated models use.

As the development of innovation studies progressed, it became clear that the focus on any process that starts with idea generation and ends with the resulting innovations is far less significant than the overarching system that enables multiple simultaneous innovative processes that share the same supporting infrastructure. In other words, the intangible benefits of the innovation processes in the same country outweigh the direct influence firms can make on the process with capital and knowledge investments (Freeman, 1995).

A framework which incorporates different indirect determinants of innovation, such as the political system, educational and financial institutions, research, infrastructure, the labour force market, competition and intermediary forces in a market, as well as other relevant framework conditions is called a system of innovation. There are several levels at which such shared features can be observed. Firms belonging to the same industry in one region, for instance, may share the same physical infrastructure and a (less mobile) share of the labour force. Combined, they form a regional innovation system. But a far larger set of conditions, including legal, economic and political, is the same across the country. Such a system is called a national system of innovation (NSI; Figure 2).



**Figure 2.** National system of innovation  
 Source: Adapted from Arnold, Kuhlmann (2011)

Analysis of an NSI follows the process of initiating and implementing innovation, considering the impact of industry, government and academia R&D activity, as well as external macroeconomic factors (Efrat, 2014). In Figure 2, both culture and the political system represent external factors that influence all

other (interconnected) elements of the NSI, such as an industrial system, intermediaries, education and research and infrastructure, while the framework conditions influence the demand in a given market. The result of the operation of this interconnected system is innovation output.

The main point of contention in the national innovation system theory lies in the national aspect. It can be argued that significant differences in development paths, economic growth rates and political and social structure between countries in the second half of the XX century have led to substantially different conditions between countries of the Eastern Block and Western Europe, Latin America and the Middle East (Freeman, 1995). But as the degree of internationalisation between countries increases, most underlying conditions stop being national at their core. The increased mobility of labour forces and common economic policies of the EU are one example of an international innovation system where the influence of common conditions inside the union can be compared to that of unique national features. The same transformative processes that increased the importance of a national innovation system over its regional counterpart now reduce its importance compared to the globalised processes of cooperation between countries. This does not mean, however, that the NSI should be discarded as obsolete. There are arguments (Lundvall, 1992) that it is important to understand the nature of the process before the transformation to predict more accurately which path the new, potentially international system will follow. On the other hand, many technological processes still remain national at their core (Porter, 1990), and any external shocks force firms to rely primarily on their national conditions to stabilise (Freeman, 1995). These reasons may slow international cooperation or decrease its role during recessions. Both arguments allow one to predict that the role of the national innovation system will not diminish as time progresses.

The national innovation system often undeservedly falls outside of the scope of multidisciplinary research on culture and innovation, but its usage could help explain the links between culture and other factors that impact a country's innovation output. While both culture and the other phenomena of the national innovation system are used in empirical studies, their effects are assumed to be independent. Study 1 was focused on providing evidence for the interconnectedness of the components of national innovation systems by analysing the indirect links between culture and innovation.

### **Indicators of innovation**

Any kind of quantitative research on innovation would be impossible without a defined set of indicators that can measure it. However, two broad conceptual problems arise when measuring innovation. One concerns the definition of innovation. Depending on how the term is defined, different activities will be either included or omitted from the measurements. For example, because academia and industry produce different types of innovations, those are measured separately. For this reason, bibliometric data, such as the number of scientific

citations, would not often be used when analysing the innovative performance of a firm (Smith, 2006). Additionally, as previously highlighted, there are different types of innovations according to different classifications. Some researchers might be interested in the broad results of innovative activity, while others might target, say, radical innovation. Therefore, it is crucial to specify the definition for innovation before data collection and analysis (Fagerberg, 2006).

The second problem largely concerns the continuous nature of innovation. Because any result of an activity can simultaneously be viewed as a stage of another innovation, it becomes quite difficult to separate any indicator without underestimating its value. It can therefore be argued that some traditional ways of measuring innovations quantify innovative inputs, rather than outputs (Smith, 2006).

An overview of the main types of existing indicators of innovation, as well as example indicators for each type, is presented in Table 2.

**Table 2.** Indicators of innovation

Generation	Type	Indicators
Classic	R&D data	R&D spending as a percentage of GDP, R&D spending as a percentage of firm sales
	Patent data	Number of patent applications, number of patent grants, number of patent citations
	Bibliometric data	Number of scientific publications and citations
Modern	Synthetic indicators	Global Innovation Index
	Firm performance indicators	Number of new products, sales of new products as a percentage of sales

Source: Adapted from Smith (2006)

R&D data present, perhaps, the oldest and most classic type of indicators, as total expenses on R&D are easy to calculate both for governments and for the single proprietor. Because of their broad nature, they are also likely to capture the innovative process and serve as a basis of comparison for analysis, for example, classifying industries into categories by the share of R&D expenditures in their total spending (Smith, 2006). Patent data also present a reliable source for innovation indicators, as they are freely and regularly available from national and international patent offices, for instance, EPO for Europe, JPO, CNIPA and KIPO for Asia, and USPO, CIPO and IMPI for North America. Of course, since not all patents result in innovation, and not all innovations have to be patented, some types of innovation, particularly those related to the internal business organisation, are not captured by this indicator type. Around two-thirds of the inventions behind patent applications globally are co-invented (Nagaoka et al., 2010), which might also result in underestimation of innovative

activity when using patents as the resulting indicator, since patent data will only be registered in one location. Bibliometric data largely avoid this issue, as it can be argued that the number of citations represents the innovativeness of a particular paper. However, the obvious weakness of this type is its narrow focus on academic activity, which is only loosely connected with industry innovation unless produced as a result of academia–industry cooperation.

Different types of classic indicators are closely interconnected with each other in a nontrivial way. It is reasonable to assume, for instance, that higher R&D expenditures are positively correlated both with the number of patents and the number of scientific publications and citations depending on the area of expenses. However, if R&D expenditures in an industry are too high, academia is often employed to conduct business-related research, and its ability to create novel theoretical frameworks suffers, reducing innovations in the long term (Arimoto, 2011). It is important to understand that industry, state and academia produce different types of innovations, and, therefore, should have enough independence to bring long-term benefits to the innovative processes of a country.

Another relevant issue is the spillover effect of innovative activity. On the one hand, an increased activity in academia that results in a higher number of scientific publications also creates knowledge spillovers that benefit industry (Barra et al., 2019). On the other, almost half of patents are purely developmental, with little to no basic or applied research involved (Nagaoka et al., 2010), which complicates estimation of spillover effects.

The main advantage of the classic indicators of innovation is easier access to data, especially at the country level. Modern indicators, on the other hand, might be more suitable for specific research purposes, with some restrictions on their accessibility. One exception to this rule are national labour force surveys, which are usually made available by the relevant statistical offices. While not focused on information related to innovation, they collect individual-level data on various innovative activities performed in companies by checking the number of workers involved in such projects or undergoing training and improving their qualifications.

Different international organisations collect data usable for innovation studies at various levels and in different countries. Some of these organisations aggregate the collected data and use them to construct innovation indexes, ranking countries on various aspects of their actual or potential innovation-related performance. Examples of these include the Global Innovation Index (GII) and European Innovation Scoreboard (EIS), as well as OECD and UIS reports on innovation. In addition to ranking, these projects provide detailed country profiles, which serve as a useful reference point for small-scale or case studies. The main indexes aggregate all types of innovations and, therefore, are useful for studies that seek to provide insight into a country's innovative activity as a whole, rather than focus on a specific source for innovations.

Firm-level indicators of innovative activity are usually collected as an internal metric of a firm's innovative performance. Such indicators provide insights into the innovativeness of the firm's various operations and, when aggregated,

the innovative activity of different sectors. As this dissertation is focused on innovative activity at a national level, many of such questions (such as the impact of culture on start-ups) lie outside the scope of the current studies.

As the goal of this research was to provide evidence on the suitability of contemporary methodology and data, an aggregate indicator of innovation available for a long period for a large number of countries was a reasonable fit for the regression analysis. For this reason, synthetic indicators were used in Studies 1 and 3, as they combine many types of innovation outputs into a single variable. In Study 2, an innovation variable that is available at a regional level made patent data, which is a classic indicator of innovation, a better fit for the research.

As interest in innovation as a phenomenon grew, a need arose for a standardised framework and tools of data collection. One of the most extensive sources on methodology for innovative activity is the *Oslo Manual*, jointly published by Eurostat and the OECD. It provides definitions for different types of innovations, presents clear guidelines regarding creating questionnaires for collecting data and provides recommendations regarding collating the data and presenting it at different levels. It also addresses the current innovation output of firms or countries, as well as their future innovative capability (OECD/Eurostat, 2018). The *Oslo Manual* has been revised several times following the results of research and to expand the scope of the framework, with service sectors added in 1997 and, later, marketing innovation (to facilitate discussion of nontechnological innovation). The latest edition, published in 2018, provides a framework for measuring innovation in households and non-profit organisations (OECD/Eurostat, 2018). For several decades, states and organisations within and outside the OECD have used the *Oslo Manual* as a de-facto standard for data collection on innovation (Holbrook, Hughes, 2001).

A list of major surveys with the relevant information listed previously is given in Table 3. All of these adhere to the principles established by the *Oslo Manual*, with some directly referenced in the latest edition as sources of internationally comparable indicators on innovation (OECD/Eurostat, 2018). Among these, those providing data at the national level tend to be freely available, while firm-level data are usually limited in availability to on-site analysis or by confidentiality or nondisclosure agreements. While data from developed countries are usually easier to obtain freely, there are several databases with worldwide coverage and free access.

In selecting databases, the goals of Studies 1 and 3 were to present evidence for as broad a number of countries as possible. Thus, they required an indicator that tracks the innovation activity of various countries over a long period and encompasses various types of innovative activity. Conversely, Study 2 was focused on the European region, and an indicator measured at a regional level had to be found. Consequently, for Study 2, European Patent Register data were utilised, as the focus of the study was on a specific type of innovative activity. For Studies 1 and 3, GII data sourced by Cornell University, INSEAD, and WIPO were selected, as the dataset provides the largest number of countries and the indicator itself is suitable as a proxy for a country's innovative activity.

**Table 3.** Sources of innovation-related data

Project or database name	Publisher	Level	National coverage	Conditions of availability for research purposes
African Science Technology and Innovation Indicators (ASTII)	NEPAD	Country	Africa	Freely available
Business Environment and Enterprise Performance Survey (BEEPS)	EBRD and the World Bank	Firm	Eastern Europe and Central Asia	Confidentiality agreement
Community Innovation Survey (CIS)	Eurostat	Firm	Europe	Limited time, confidentiality agreement, partially on-site
European Innovation Scoreboard (EIS)	European Commission	Country	Europe	Freely available
European Patent Register	European Patent Organisation	Individual and country	Europe	Paid access
Global Entrepreneurship Monitor (GEM)	Global Entrepreneurship Research Association	Individual and country	Worldwide	Freely available (after a three-year delay)
Global Innovation Index (GII)	Cornell University, INSEAD, and WIPO	Country	Worldwide	Freely available
Regional Innovation Scoreboard	European Commission	Regional	Europe	Freely available
Innovation Statistics Database	OECD	Country	Worldwide	Freely available
Institute for Statistics (UIS) Innovation Data	UNESCO UIS	Country	Worldwide	Freely available
Ibero-American/Inter-American Network of Science and Technology Indicators (RICYT)	RICYT	Country	Americas	Freely available

Source: Compiled by the author

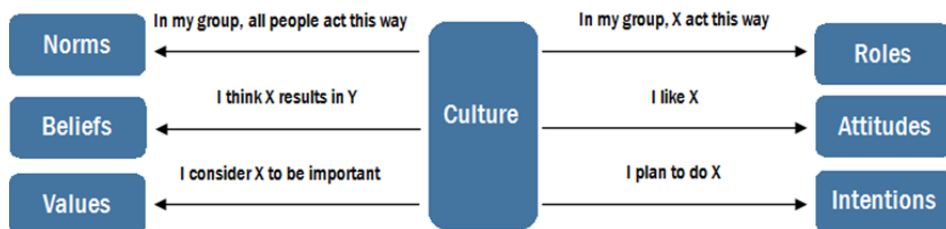
The overview presented above provides some insight into the complex and multifaceted nature of innovation. Understanding of what constitutes innovative activity constantly changes, with the GII employed in Studies 1 and 3 utilising creative outputs as an additional source of innovation at the country level. Having discussed definitions, sources and types of innovation, it reasonable to proceed to analysing culture in a similar manner.

## 1.2. Culture

### Definitions and approaches

While culture has existed for as long as humanity, there is no consensus on its definition. The number of definitions proposed by researchers in the social sciences was calculated to be over 150 over half a century ago (Kluckhohn, Strodbeck, 1961), and it is still growing to accommodate different areas of research. As everyone who studies culture belongs to a particular culture as well, it is virtually impossible to create a uniform theory or definition that would encapsulate all different views. As a result, a perception of culture is always subjective and centred on the observer. Aspects of society-level culture that differ between several cultures are perceived much more clearly because the shared cultural aspects tend to blend in and remain as “background” to a particular observer if they have been consistently exposed to them during their lives. As a result, while societies might not differ significantly on a particular cultural aspect, they can perceive each other as such. It can be said, therefore, that culture as a concept is measured at the averages but is observed and stereotyped at the extremes (Trompenaars, 1998).

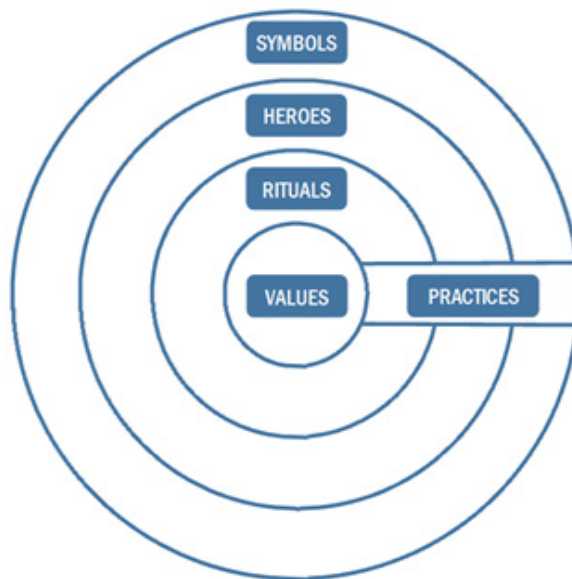
Cultural influence exists at many levels – from family and social group to region and country, and at each level it conditions individuals to behave like members of their group and unlike members of other groups. Therefore, culture can be defined as a set of values, norms, beliefs and attitudes that distinguish different social groups (Hofstede, 2001). Culture can be seen in many behavioural aspects shared by a specific group; examples are displayed in Figure 3.



**Figure 3.** Elements of culture  
Source: Created by author

In the figure, no type of cultural element dominates another, and there is no significant meaning between the elements depicted on the left from the elements depicted on the right.

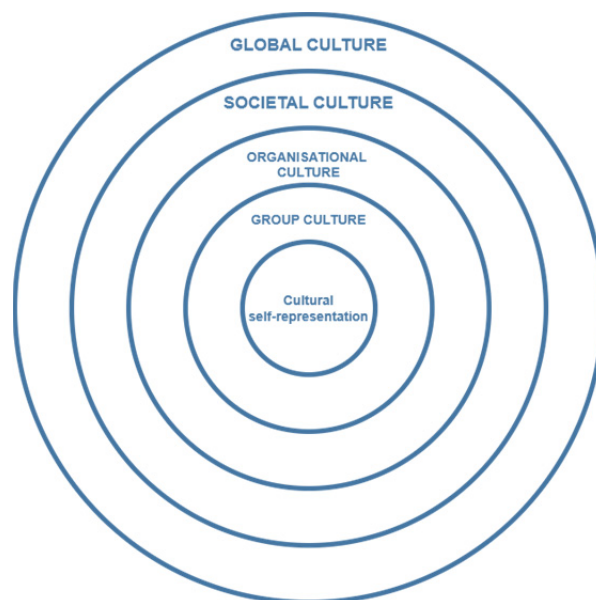
A wider approach to culture also covers practices, rituals, heroes, and symbols, all internalised by members of a particular society to different degrees, as shown in Figure 4. Those closer to the centre form the core of the cultural model, while the outside layers are more visible and explicit in individual behaviour. This understanding is referred to as the layered model of culture, or the “onion”, because of its structure and because it is much harder for an individual to change internalised cultural aspects if they lie closer to the centre of the model. One commonly discussed layered model of culture is presented in Figure 4.



**Figure 4.** The layered model of culture in Hofstede’s interpretation  
Source: Adapted from Hofstede et al. (1990)

Hofstede’s layered model of culture is one of the most popular among various researchers. It splits culture into values, or those aspects internalised by an individual, and practices, or those he or she exhibits in the world (Hofstede et al., 1990). His model is also commonly used in the business environment to describe culture when entering a new market or advertising products to a specific society, with the assumption that a company should adapt to significant differences in the culture of its consumers or business partners. In this model, values are taken as the most implicit layer of culture. In this thesis, culture is understood in the narrower sense, covering the norms, beliefs and attitudes that distinguish social groups.

Culture can also be perceived and analysed at different levels, as depicted in Figure 5, ranging from cultural self-representation to elements of global culture that are common in different societies. This research focuses on societal culture, which belongs to one of the outermost layers. While it should be noted that culture is exclusively a group phenomenon and is measured as such, culture is internalised and is acted upon by individuals through their personal values and is reflected in their personality traits. Cultural self-representation is, therefore, a reflection of the individual of the culture of the social groups they belong to, but the research on these reflections lies outside the scope of the cultural research reported here.



**Figure 5.** Multilevel nature of culture

Sources: Adapted from Erez, Gati (2004); Karahanna et al. (2005)

After defining what culture is, it is useful to briefly state what culture is not, in order to outline the extent of a field of culture. A set of personality traits is not culture, as in order to distinguish cultural traits, we need to compare groups. Furthermore, the same data analysed at the individual and societal levels can have vastly different interpretations and require different approaches to analyse (Hofstede, 2011). Society-level measurements of culture represent average beliefs and values of different cultural groups. As such, they cannot be assigned to represent the beliefs of any particular individual in this group because of the (unexplained) variation of views within a society (Kirkman et al., 2016). The practice of assigning national-level scores of cultural dimensions to individuals

is referred to as “the passport approach” (Taras et al., 2011) and generally leads to misleading results.

Religion is not culture, even though they share many fundamental elements and traits. Indeed, groups that share a common religion tend to exhibit similar beliefs and attitudes and adhere to the common norms similarly to groups sharing the same culture. Additionally, there is evidence that nations with similar religions exhibit similar cultural behaviour (Inglehart, 2007). However, it has to be considered that national culture as a concept predates all presently widespread religions. A certain culture can be found in groups that adhere to a specific religion, as well as in groups with spiritual views that do not align with a specific religion (e.g., nonspecific belief in a higher power, agnosticism) and largely secular groups. When analysing groups separated by religion or by country borders, researchers have concluded that the latter are largely responsible for most of the variation in group behaviour (Schwarz, 1994; Minkov, Hofstede, 2014). Therefore, while religion might be employed as a proxy for analysing the relationship of culture with different socioeconomic phenomena in a model, it cannot account for all facets of culture.

Finally, culture is not laws, legal practices or political systems, although the form and changes in these are undeniably shaped by national and regional culture. Culture contributes to a country’s development as an informal institution. Institutions are comprised of established social rules that govern interactions inside a society (Hodgson, 2006). There are two main groups of institutions. Formal institutions set rules openly, codify them by means of laws and regulations and enforce them through bureaucratic structures that are regarded as official (Helmke, Levitsky, 2004). In contrast, informal institutions present a set of self-imposed, unwritten restrictions on individual behaviour and social interactions (Lauth, 2000). This does not mean that the institutional role is limited to constraining individuals; in fact, such rules may also encourage or enable certain behaviours, acting as a permissive catalyst of prescribed behaviour, much like traffic laws restrict the actions of drivers in order to increase their safety and allow for a faster commute (Hodgson, 2006).

Formal and informal institutions are always closely related, but the relative strength of their impact differs from one country to another. Generally, the weaker formal institutions are in the enforcement of rules, the stronger is the reliance on unwritten codes of conduct, agreements and morals. Informal institutions have been proven to interact with, influence, compete with and even substitute formal institutions in developing constant, long-term impacts on the development of individuals and countries (Unsworth, 2010).

Culture is viewed as an informal institution as it encapsulates the major source of differences in the unwritten rules of behaviour between different nations. One view, therefore, is that culture and informal institutions are exactly the same, while a more cautious approach places culture as an integral part of informal institutions. In both cases, the impact of national culture on national political and socioeconomic systems is hard to overstate.

Another point of contention between researchers concerns shifts in culture over time. Some researchers (Kluckhohn, Strodtbeck, 1961; Hofstede, 2001) claim that culture remains largely stable and does not significantly change unless measured over a large time interval. The main argument given in favour of this approach is the prominence of cultural differences; when a difference between particular groups can be traced back several hundred years, there is no reason to believe that any major shift should occur in the following years in the absence of strong external stimuli (Hofstede, 2011). The other reason is that as culture represents effective means of coexisting of individuals in a group, it is unlikely that the group will look for other means, instead opting either for an exclusionary identity or loosening the rules of behaviour (Triandis, 1989).

Other researchers view culture as a less rigid construct, claiming the increased interaction between cultures in recent years has diluted their differences and increased the number of similarities (Taras et al., 2011; Minkov, 2018). Scholars that employ this approach present evidence of large-scale, complex shifts in Western values in the post-industrial age (Inglehart, 1977; Inglehart, 1997), as well as convergent shifts in the cultural profiles of countries previously recognised as radically different in most cultural theories (Bergiel, 2012).

There exist several compromise approaches as well. One, backed by empirical evidence, confirms the changes but attributes them to, among other factors, economic growth and increased quality of life, as well as individual mobility and other internationalisation processes. It states that while some scores of cultural dimensions are changing over time as absolute measurements, they remain largely stable when measured at a relative scale (Tarabar, 2018; Beugelsdijk et al., 2015). This would mean that cultural distances between countries remain stable even as the scores they are based upon change as time passes. The other approach attributes changes to internal group processes. Because culture encompasses those aspects of group identity that have been proven by time, it becomes increasingly complex the longer it exists. At some point, an opposite process of reducing norms and behaviours deemed redundant or no longer useful starts to dominate, which would cause the culture to simplify (Triandis, 1989). All cultures can, therefore, be viewed as stable relative to each other but as varying over time around the complexity of existing norms.

While some cultural theories, like Hofstede's (2001, 2011), favour the expanding approach, where previously unaccounted for variance in the cultures of different societies is conceptualised into a new cultural dimension, many newer sets of cultural dimensions focus on reducing their number. As discussed above, Beugelsdijk and Welzel (2018) reduce Hofstede's six cultural dimensions to three, and Minkov et al. (2017, 2018a, 2018b) present two refocused dimensions that aim to solve the problems of Hofstede's original theory. Limiting the number of dimensions has both benefits and shortcomings. Just as the sets of cultural dimensions which were originally operationalised with two or three dimensions, the reductions provide more focused dimensions that capture most of the variation in culture. These sets of cultural dimensions are generally easier to replicate and to display. It is also easier to produce a set of two

cultural dimensions that are uncorrelated than in the case of a higher number. On the other hand, there is no guarantee that limiting the number of dimensions still enables capture of aspects that are significantly linked to other researched phenomena. Indeed, while problems exist with Hofstede's individualism–collectivism and power–distance dimensions, the grouping of these dimensions into one does not fully absolve the resulting dimension of the problems that were present in the initial two. Moreover, there is no guarantee that the resulting dimension will capture the same variance as the other two. For example, countries with both high individualism and high power distance would not be adequately represented by the new dimension.

### **Cultural theories and measuring culture**

Because of the differences in how sociology, psychology and anthropology have approached culture in the last fifty years, a large number of quantitative and qualitative cultural theories exist. Quantitative approaches assume that different elements of culture (values, beliefs, attitudes, norms, etc.) or groups of them are measurable. They present a set of continuous variables – dimensions – that compromise between capturing the most possible variance related to culture and minimising the number of such variables. Qualitative theories, on the other hand, do not assume that it is possible to quantify culture and instead rely on one of two approaches: a nominal scale, where elements of culture are mapped together and labelled, or a descriptive approach, which assumes that every society has to have a unique set of such labels.

In many cultural theories, the elements of culture are grouped and can be collectively named dimensions of culture. With the increasing number of studies researching culture employing their own cultural dimensions, a question arises regarding the necessity of developing and using many different cultural theories. Of course, cultural dimensions obtained from an analysis of social surveys can be used to describe a specific group's cultural aspects with a chosen array of dimensions. Meanwhile, the general theoretical approach behind such analysis explains where culture comes from and how it changes over time.

However, this is hardly the extent of the usefulness of cultural theories. In the last several decades, research papers in the field of culture have examined the similarities and differences of various cultures at different levels. In multi-disciplinary studies, researchers have explored cultural variables as predictors and mediators for their dynamics of socioeconomic indicators. Finally, the interactions of different cultural dimensions – and the interactions of cultural dimensions and other socioeconomic variables – remain a less frequently investigated but prospective area of research (Kirkman et al., 2006; Kirkman et al., 2016).

A quantitative cultural theory combines a theoretical approach with a set of variables obtained primarily on the basis of surveys. The abundance of different theories presents a clear benefit for any interdisciplinary research, as it allows one to pick an approach that aligns best with the primary research field.

Different cultural theories not only yield different dimensions of culture but also vary in a chosen definition of culture, the time of collecting and analysing data, the scope, and the number of countries involved. The most prominent quantitative cultural theories featured in such research along with their dimensions are listed in Table 5.

**Table 5.** Selected cultural theories and their respective dimensions

Cultural theory by main contributors	Dimensions
Parsons, Shils (1951)	Affectivity–affective neutrality, self-orientation–collectivity-orientation, universalism–particularism, ascription–achievement, specificity–diffuseness
Kluckhohn, Strodtbeck (1961)	Nature of humanity, relationship of humans to nature, relationship between humans, personality, orientation to time
Hofstede (1980, 2001, 2011)	Individualism–collectivism, power distance, masculinity–femininity, uncertainty avoidance, long-term orientation, indulgence–restraint
Triandis (1989)	Vertical–horizontal (tight–loose), individualism–collectivism
Schwartz (1994, 2006); Schwartz, Sagiv (1995)	Embeddedness–autonomy, harmony–mastery, egalitarianism–hierarchy
Inglehart (1997)	Survival–self-expression, traditional–secular values
Trompenaars, Hampden-Turner (1998)	Universalism–particularism, individualism–communitarianism, neutral–emotive, specific–diffuse, achievement–ascription, sequential–synchronous, internal–external
House, Javidan (2004)	Performance orientation, humane orientation, uncertainty avoidance, in-group collectivism, power distance, gender egalitarianism, future orientation, assertiveness, institutional collectivism
Gelfand et al. (2011)	Tight–loose cultures
Minkov et al. (2017; 2018a, 2018b)	Individualism–collectivism, flexibility–monumentalism
Beugelsdijk, Welzel (2018)	Individualism–collectivism, joy–duty, trust–distrust

Source: Compiled by the author

The majority of these cultural theories are quantitative, as they form a good basis for empirical studies and allow cross-cultural comparison. The three present studies used quantitative theories and their respective scores of cultural dimensions for empirical analysis. In the studies, I opted to introduce the actual measurements, or scores of cultural dimensions, simply as cultural dimensions. This was done strictly for brevity’s sake and without the intention to conflate these two terms. The distinction is clearly labelled in cases where both the phenomena and their measurements are introduced.

Quantitative theories were not always extensively used in cultural studies. Until the 1970s, social sciences focused on developing tools and methods to measure culture but would only apply them for small-scale comparisons of countries. This fact does not deduct from the usefulness of such instruments in a methodological context, as standardised cognitive characteristics and analytical issues developed in psychology in the 1950s and 1960s were used as references point in a number of cross-cultural studies several decades later (Hofstede, 2011). As an example of early cultural theory, Parsons and Shils (1951) suggest five basic binary indicators of human behaviour: affectivity versus affective neutrality, self-orientation versus collectivity-orientation, universalism versus particularism, ascription versus achievement and specificity versus diffuseness. Kluckhohn and Strodtbeck (1961) contrast this with their own set of indicators, namely the nature of humanity, the relationship of humans to nature, relationships between humans, personality, and orientation to time.

However, a large-scale, cross-culture analysis providing a unified reference point for the social sciences was lacking until the publishing of Hofstede's (1980) theory of cultural dimensions. His initial analysis focused on representing cultural differences by analysing the results of a 150-question corporate survey taken over several periods from 1967 to 1973 with over 116 000 respondents over 40 countries. Hofstede pointed out that despite the differences in social status, position inside the company and personal beliefs, a number of responses to 60 of the questions in the dataset could be attributed solely to differences in national culture.

The result of his study is a dataset of four initial cultural dimensions at the national level, namely power distance, uncertainty avoidance, individualism–collectivism and masculinity–femininity. The power distance dimension measures the degree of society's acceptance of inequality in income and social status and the difficulty of moving in the social hierarchy. The uncertainty avoidance dimension corresponds to the degree of a society's anxiety over the future and an internal struggle to prevent uncertainty through hard work and established rules. The individualism–collectivism dimension represents the type of social framework in the society and whether personal identity matters over group identity and the emotional dependence on groups. Finally, the masculinity–femininity dimension encompasses the degree to which a society emphasises masculine values: achievement, assertiveness, ambition and low importance of interdependence and support (Hofstede, 1980, 2001, 2011).

Hofstede's set of cultural dimensions was expanded twice to accommodate for dimensions not included in the original research. To account for differences between Western and Eastern cultural beliefs and values, a fifth dimension was proposed by Hofstede (1991) on the basis of Bond's value survey (Chinese Culture Connection, 1987; Bond, 1988) conducted in East Asia: long-term orientation. It separates present-oriented cultures with rigid traditions, national pride and fixed social structure from future-oriented cultures with fluid approach to situations, lower attachment to traditions and a higher openness to learn from other cultures. Long-term orientation was later revised by Minkov

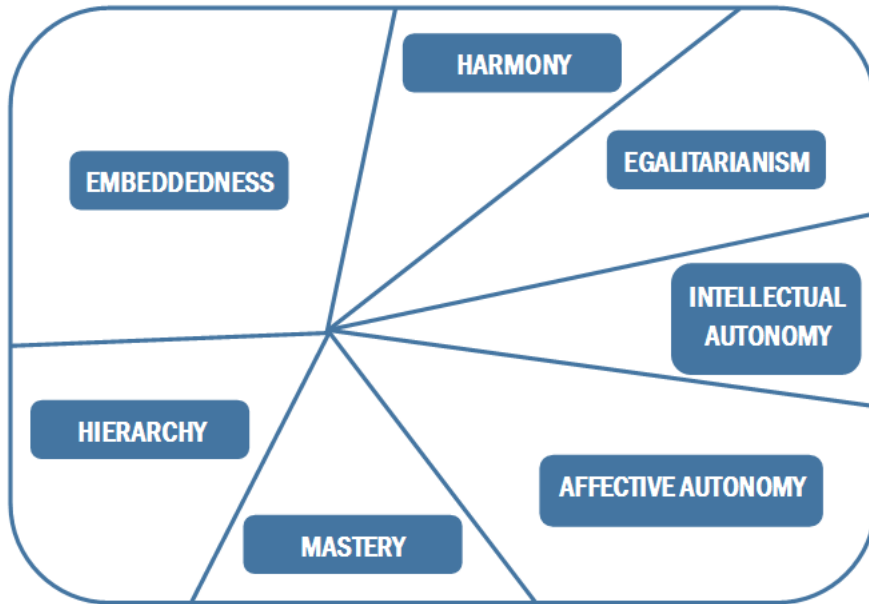
(2007) on the basis of the World Values Survey to include scores from over 80 countries.

The extensive work on the primary data allowed Minkov to add another dimension on the basis of the variance in the survey answers unexplained by the first five dimensions (Hofstede et al., 2010). He proposed naming the indicator “indulgence–restraint”, as it encompassed differences between more optimistic cultures with higher importance of leisure and happiness, and more pessimistic cultures with a strict work ethic, increased importance of job and fatalistic worldview (Hofstede, 2011).

Hofstede’s approach deserves an in-depth description not only because it served as a reference point for future cultural theories. In the several decades after the first published study on cultural dimensions by Hofstede, these dimensions were linked with a number of economic concepts on national, organisational and individual levels, including human resource management, conflict management, decision making, entrepreneurship, FDI and innovation (see Kirkman et al., 2006; Taras et al., 2010; Kirkman et al., 2016). Despite this fact, Hofstede’s initial framework contained a number of limitations. The data were collected from the employees of a single company; the resulting dimensions had weak internal consistency, with some questions not reflecting the dimension they were attributed to; and the majority of the dimensions could not be replicated by other researchers (Gelfand et al., 2004; Taras, Steel, 2009; Minkov, 2018, Minkov, Kaasa, 2020). While Hofstede’s theory serves as a useful reference point, the original dimensions should likely not be used in the presence of more contemporary alternatives outside of studies involving direct comparison with Hofstede’s dimensions.

One approach that sought to mitigate issues with Hofstede’s cultural dimensions was suggested by Schwarz (1994). He proposed deriving dimensions of national culture based on differences between the values of individuals aggregated at the national level. The aggregation was hypothesised to produce dimensions similar in structure to those Hofstede initially discovered. The added benefit of Schwarz’s approach, however, is the greater consistency of meaning of human values, which allows for the equivalent meaning of dimensions obtained using data from different periods – even when values do change, the explanation underlying them largely does not (Schwarz, 2006).

Schwarz first hypothesised obtaining two broad cultural dimensions: a broader version of the individualism–collectivism dimension that encompasses the interdependence of individuals in a group as well as the importance of individual identity, and a group orientation towards hierarchical structures and changing the world versus flat, egalitarian structures and a harmonious coexistence with the world. The empirical results, however, allowed him to further split the second indicator into two, obtaining the cultural dimensions of autonomy–embeddedness, hierarchy–egalitarianism and mastery–harmony. These dimensions stem from seven nation-level cultural value orientations: intellectual autonomy, affective autonomy, mastery, hierarchy, embeddedness, harmony and egalitarianism, which are related to each other as shown in Figure 6.



**Figure 6.** Cultural value orientations  
 Source: Adapted from Schwarz (2006)

Schwarz (2006) linked these value orientations to differences in socioeconomic development, democratisation and household size. In the following years, the cultural value orientations proposed by Schwartz were used in social sciences to explain a variety of differences in the culture of various groups, including earnings management (Desender et al., 2011), organisational commitment (Glazer et al., 2004) and attitudes towards war (Cohrs et al., 2005).

Despite the similarities in the structure of the resulting dimensions, Hofstede’s and Schwarz’s approaches present a significantly different structure when assessing the differences between cultures of different countries (Ng et al., 2006). The only dimension highly correlated between these radically different approaches to instrumenting culture is the individualism–collectivism dimension, which was also the one that ended up being the easiest to replicate in following studies (Hofstede, 2011). Consequently, it also became the focal point for several studies unpacking its meaning and expanding on its significance.

Triandis (1989), for instance, observed the differences in behaviour and norms of societies that score similarly on the individualism–collectivism dimension. He posited that an additional dimension is needed to capture the response bias of different groups and their internal variation. As a result, two types of groups were observed on the basis of their exclusionary policies: tight, where the group has a homogeneous structure and forces individuals to strictly follow the norms, and loose, in which a group cannot easily exclude those who behave

differently because of internal heterogeneity and, as such, has to allow for a higher diversity of norms and attitudes (Triandis, 1989).

Gelfand et al. (2011) confirmed these differences existing at a country level by conducting a large-scale study using primary data collected from 7 000 respondents in thirty-three countries. They linked these differences to a multitude of factors, including socio-political institutions, national history and recurring external threats and conflicts – all together forming a basis for a different culture – and encompassed these factors in a single tightness–looseness dimension. Unsurprisingly, the strongest predictors of the score on this scale date back at least several centuries.

Schwarz's bottom-up approach of analysing culture with the help of individual-level values in addition to survey data was used in several other cultural theories. One of these, named the Culture and Leadership Study, was initially started as a part of Global Leadership and Organisational Behaviour Effectiveness (GLOBE), which aimed to identify the attributes of leadership and analyse the differences between effective leaders in different societies. It was later established as an integral part of a project with broader goals (House, Javidan, 2004). The project used a questionnaire consisting of several major parts. The respondent was asked to either rate their agreement with the given statement or choose a position on an ordinary scale that best represents their views on the aspect of their organisation specified in the question. One part of the questionnaire asked the respondent to reflect on the current state of things, while another questioned on the way things should be in a given organisation, as believed by the respondent (House, Javidan, 2004).

These questions were later used in a similar survey, where the organisation level was replaced by a society level, and aggregated to create nine cultural dimensions connected with six leadership dimensions at the organisational level. Each country received two scores for each of the dimensions: the practice score, obtained from the questions of the “what is” type, and the values score, obtained from the “what should be” type of questions. The nine dimensions obtained by the Culture and Leadership Study were performance orientation, future orientation, humane orientation, uncertainty avoidance, power distance, in-group collectivism, institutional collectivism, gender egalitarianism and assertiveness (Dorfman, House, 2004). These scores were then utilised to separate the initial set of countries where surveys were conducted into several clusters with similar scores of cultural dimensions, including Nordic (Finland and Sweden), Germanic (Germany, Austria, Switzerland and the Netherlands) Anglo (England, Ireland, Australia, New Zealand, USA, South Africa), Latin Europe (France, Spain and Portugal), Eastern Europe (Greece, Russia), Latin America (Mexico, Argentina, Colombia), Middle East (Turkey), Confucian Asia (China, Hong Kong, Singapore) and Southern Asia (India) (Chhokar et al., 2007), producing clear cultural distinctions between the observed clusters.

Many cultural theories after Hofstede were focused on expanding rather than reducing his initial dimensions. This approach is beneficial from the theoretical perspective, as the higher the number of dimensions is, the easier it is to pre-

cisely classify any pattern of group behaviour. However, the increase in the number of dimensions provides diminishing returns in explained variance of the explanatory variable and is more likely to face replicability issues. It also becomes significantly more difficult to divide countries into groups, as the number of possible clusters increases exponentially with each new cultural dimension. These reasons prompted Inglehart (1997) to propose a cultural map of the world based on just two dimensions: traditional versus secular values and survival versus self-expression values. The first indicator bears a close resemblance to the revised individualism–collectivism dimension, while the second represents a rather novel contribution bearing a positive correlation with the long-term orientation dimension. Inglehart’s two dimensions were derived from the World Values Survey questionnaire by selecting 10–12 questions for each dimension from an overall dataset of almost 300 questions divided into fourteen major categories and conducted in around 100 countries. The two-dimensional approach is fairly easy to graph while at the same time providing a reasonably high degree of explained variance in questionnaire responses of approximately 70% in society-level culture (Inglehart, Welzel, 2010).

As an additional benefit, as the World Values Survey is conducted every five to ten years with a four-year data collection period, it becomes possible not only to cluster countries according to their cultural dimensions and analyse the differences between cultural scores of countries in that particular period but also to trace their movement across both axes of the cultural map, with the possible creation of new clusters and merging of old ones – which is what was eventually observed in the results of analysis of the survey’s following rounds. Initially, Inglehart (1997) grouped the countries into nine clusters: English-speaking, Catholic Europe, Protestant Europe, Confucian, Ex-Communist, South Asia, African, Islamic and Latin America. The later revision (Inglehart, 2018) saw a merger of African and Islamic clusters while simultaneously splitting the Ex-Communist cluster into Orthodox and Baltic, as well as providing an alternative name for these cultural findings, namely “Cultural Evolution”. A fairly recent approach, one focused on revising Hofstede’s model, was proposed by Minkov et al. (2017; 2018a), who reduced the number of significant cultural dimensions to two: individualism–collectivism and flexibility–monumentalism. The first is a revision of Hofstede’s individualism–collectivism dimension, using more focused questionnaire items. Compared to measurements of individualism–collectivism from various other cultural theories, this dimension has better predictive power, survey questions have higher factor loadings, and it is a better predictor for differences in the rule of law, political freedom and inequality (Minkov et al., 2018a). The second dimension is a more coherent and focused re-evaluation of Hofstede’s long-term orientation dimension. This measurement is a strong predictor of national achievements in mathematics and reading, and, as a result, is strongly correlated with general national education achievements (Minkov et al., 2017).

In recent years, an effort has been made to link dimensions of cultural theories. Fog (2021) analysed a variety of sets of cultural dimensions, con-

cluding that two factors consistently emerge in all of them under different names. The first factor is a combination of modernisation and sociopsychological effects and is most often represented as individualism–collectivism. The second factor pertains to differences between Western and Eastern values and encompasses differences in response style. This allows hypothesising that different cultural dimensions that represent similar values, attitudes, beliefs, or norms can be seen as rotations of each other. Kaasa (2021) provided an arrangement of Hofstede’s (2011), Inglehart’s (1997), and Schwartz’s (1994) dimensions of culture into a single system. Later, Kaasa and Minkov (2022) tested the hypothesis about different two-dimensional models of culture being related to each other through factor rotations.

The original cultural theories faced increased criticism throughout the years, but because of the several decades’ worth of empirical results in cultural research, they still serve as a reference point for new approaches and measurements.

### **1.3. Studies on culture and innovation**

Society-level culture was highly relevant in the economic field long before its empirical formalisation, with a notable mention being Max Weber’s “The Protestant Ethic and the Spirit of Capitalism” (1904/1958) in the early XX century. Weber’s work set out to explain how differences in national culture (in this context – religion-based) led to a significant difference in the economic development of different European countries. Hofstede’s breakthrough in 1980 led to a rapid increase in the number of published interdisciplinary studies during the next decades in which society-level culture was linked with a number of economic concepts, including human resource and conflict management, group processes behaviour, FDI, entrepreneurship and innovation (Kirkman et al., 2006, 2016).

While both culture and innovation remain highly relevant in their respective research fields, the number of interdisciplinary studies that analyse both areas remains comparatively low. The main reasons for this are the required knowledge in both fields and access to both cultural and innovation data or the means to collect primary data. These barriers serve as an explanation for the relatively slow rate of answers to most of the questions posed by this field. However, insights can be obtained from current studies.

A significant part of the interdisciplinary research on society-level culture and innovation still relies on Hofstede’s cultural dimensions, although Schwartz’s value orientations are sometimes used instead. Shane was among the first major contributors to the question of cultural impact on innovation (see, Shane, 1992, 1993; Shane et al., 1995), proving that cultural conditions and circumstances, more so than simply economic conditions and infrastructure, play a significant role in encouraging innovation in a country. In particular, he specified that three of Hofstede’s dimensions are significantly correlated with national rates of

innovation: high individualism as a prerequisite for the desire to innovate, low power distance as a lack of barriers to innovative activity and low uncertainty avoidance for accepting risk linked with the result of innovative activity. More generally, societies that place smaller importance on hierarchical structures tend to innovate more effectively and more often.

As a general rule, innovative activity has a greater degree of success in less rigid and hierarchical societies with greater personal autonomy and tolerance for risks and fewer enforced rules and procedures. Such societies reward personal contributions and initiative and provide broader tolerance for a new way of doing things. Innovative individuals in such societies, in turn, must be internally, rather than externally, motivated but also constantly challenged in order to maximise their efforts and be hard-working, flexible, honest and accepting of criticism (Ahmed, 1998). Such conclusions fall in line with an earlier study (1993) of Shane's.

Studies that followed have employed correlation and regression analysis with data from different groups of countries. In these studies, a direct link is established between national culture and different aspects of innovation depending on the research question and the definition chosen by the authors. Some of the notable contributions that utilise new methodology or produce a novel result are presented below.

Van Everdingen and Waarts (2003) follow Hofstede's framework to show a significant link between national culture and the rate of adoption of innovation in Europe, outlining significant differences between the cultural effect in Nordic versus Southern countries. Their results largely align with Shane's initial (1992) study, but they also note a significant positive link between the long-term orientation and innovation. A recent study by Bukovski and Rudnicki (2019) analysed the link between all six of Hofstede's dimensions and the level of innovation with the help of a number of control variables that represent the elements of the NSI. The results suggest a positive relationship between individualism and innovation and between long-term orientation and innovation and a negative relationship between power distance and innovation. The authors also compare Hofstede's and Minkov's individualism scores, concluding that the latter have the higher predictive value. The overall results also largely support the idea of a small number of cultural dimensions significantly related to innovative activity.

Efrat (2014) examined the impact of cultural dimensions on innovation in OECD countries. Using the NSI framework and analysing the effect of R&D investments, she found a negative correlation between power distance and innovation measured as patents, high-tech exports and published articles. A similar conclusion was reached by Kaasa and Vadi (2010) in a study that used cultural factors constructed on the basis of the European Social Survey. The authors show that the ability to initiate innovation is negatively related with power distance and uncertainty avoidance, and they find evidence indicating that the relationship between cultural dimensions and patenting intensity may be nonlinear.

While the mentioned studies do not represent an exhaustive list, they allow for generalisations on methods and results. Such studies largely focus on the direct noncausal link between national culture and innovation, although an indirect impact on innovation, such as through investments, academic influence or the institutional framework, is often proven to be significant. They are also generally performed at the country level.

The links between cultural dimensions and innovation can be generalised as follows. The most stable dimension with regard to its link to innovative activity is undoubtedly individualism–collectivism. It emerges as a robust and significant predictor of innovative activity for different measurements of innovation in all studies. Other dimensions are less uniform in their significance. Long-term orientation is positively linked with innovation, but the number of studies utilising it is rather low. Similarly, the limited number of studies on the new indulgence versus restraint dimension deem it largely insignificant for the innovative process, and uncertainty avoidance’s relationship with innovation, while negative in most studies, is less significant in others (Vecchi, Brennan, 2009; Bukovski, Rudnicki, 2019). Power distance and uncertainty avoidance seem to be significantly negatively correlated with innovation but also with individualism, with uncertainty avoidance additionally failing to replicate (Minkov, 2018).

The most disputed dimension of Hofstede’s original four regarding the link with innovation remains the masculinity–femininity one. While Shane’s initial findings (1992, 1993; Shane et al., 1995) did not suggest any significant link between the masculinity dimension and innovative activity, this later became a disputed conclusion, with evidence both in favour of Shane’s original claim (Bukovski, Rudnicki, 2019) and to the contrary (Van Everdingen, Waarts, 2003; Kaasa, Vadi, 2010). As with uncertainty avoidance, masculinity–femininity could not be replicated and is thus not useful as a robust measurement of culture (Minkov, 2018).

Schwartz’s value-orientation dimensions, while a less popular choice, present a valuable alternative for interdisciplinary studies. Despite an overall smaller number of studies, it is still possible to hypothesise the link between value orientations and innovation by using the similarities between Hofstede’s and Schwartz’s approaches and the previous studies.

A high level of embeddedness can be expected to be negatively related with creative processes much like high levels of collectivism, and its opposite end, autonomy (specifically intellectual), positively related with innovative activity. It is likely that a high level of hierarchy, similar to power distance, is negatively associated with innovation. However, some evidence (Taylor, Wilson, 2012) might suggest that the optimal value of this orientation might lie closer to the median level than to the extreme values of egalitarianism. A possible explanation for this is that a moderate level of constraints caused by a hierarchical structure is beneficial for innovation, while a high level hinders its development (Ahmed, 1998). Lastly, mastery is likely to be positively related with innovative

activity as it represents active change rather than the passive need for coexistence (Moonen, 2017).

A short summary of the links between the cultural dimensions in these theories and innovation is presented in Table 6.

**Table 6.** Hypothesised relationships between cultural dimensions and innovation

Theory	Dimension	Sign of the relationship
Hofstede (1980, 2011)	Collectivism	Negative <sup>2,6</sup>
	Power distance	Negative <sup>1,2,3,5</sup>
	Uncertainty avoidance	Negative <sup>1,2,3,5</sup>
	Masculinity	Results vary <sup>1,2,3,6,7</sup>
	Long-term orientation	Positive <sup>2,6</sup>
Schwartz (1994, 2006)	Indulgence	No link <sup>6</sup>
	Affective autonomy	Positive <sup>9</sup>
	Mastery	Positive <sup>10</sup>
	Hierarchy	Inverted U-shape <sup>8,11</sup>

Sources: <sup>1</sup>Shane (1992); <sup>2</sup>Van Everdingen, Waarts (2003); <sup>3</sup>Kaasa, Vadi (2010); <sup>4</sup>McGrath et al. (1992); <sup>5</sup>Efrat (2014); <sup>6</sup>Bukovski, Rudnicki (2019); <sup>7</sup>Vecchi, Brennan (2009); <sup>8</sup>Ahmed (1998); <sup>9</sup>Taylor, Wilson (2012); <sup>10</sup>Moonen (2017); <sup>11</sup>Dickson et al. (2003)

It is clear that some dimensions are strongly and significantly related to innovation, regardless of the cultural theory used. For instance, individualism plays a strong role in the innovative activity of a society. People in individualistic societies are more likely to possess qualities beneficial for innovation, such as creativity and persistence. They are also motivated by both internal and external factors: recognition, remuneration and self-improvement. Individualism emerges consistently regardless of the cultural theory and set of cultural dimensions. While Hofstede and Minkov have individualism as a separate cultural dimension, all of Schwartz's and Inglehart's dimensions could be seen as representing different facets of individualism.

Hofstede's long-term orientation is the one describing the societal differences not captured by his original dimensions. Even though it is not present as a separate dimension in the majority of cultural theories, Minkov presents a refocused variable intended to describe a similar aspect under the name of flexibility–monumentalism. Much like individualism, it emerges in many studies as a significant predictor of innovative activity, if with a smaller effect than the former.

It can therefore be concluded that different cultural theories can be used for different studies, with no clear best option. Because all cultural dimensions explain the same underlying phenomenon, different cultural theories can be seen as different ways of describing it. Provided these dimensions are replicable and relatively recent, there is no clear set of cultural dimensions which is guaranteed to group elements of culture in a way most relevant to the analysed

socioeconomic variables it impacts. Combined with evidence of a slow change in national cultures themselves (Beugelsdijk, Welzel, 2018), there exists a strong possibility that conclusions achieved in research based on traditional methodology and data might be outdated, imprecise or simply wrong. This warrants a detailed exploration of possibilities to modernise quantitative cultural studies and their methodology.

An example of the above-mentioned limitation of contemporary studies on culture and innovation is their frequent exclusive usage of Hofstede's theory and the corresponding set of cultural dimensions. While alternative sets of cultural dimensions have been available since the 1990s (Schwartz, 1994; Inglehart, 1997), these saw limited use in the social sciences (Kirkman et al., 2016). It should be noted that Hofstede's initial measurements have been criticised extensively for issues such as poor replicability and their not corresponding to the concepts they are meant to measure (Gelfand et al., 2004; Minkov et al., 2017; Beugelsdijk, Welzel, 2018). However, progress has been made in creating contemporary cultural dimensions that address the shortcomings of Hofstede's dimensions (Beugelsdijk, Welzel, 2018; Minkov et al., 2017; 2018a, 2018b), and one of the goals of this thesis is to utilise these sets of dimensions in future research to check their validity.

There are other limitations of the studies produced in recent decades. For example, culture in these studies is often taken as unchanging. While this is a reasonable assumption for cross-section analysis or short-term panel data, it only works when cultural dimensions have been constructed based on relatively recent data. More often than not, this is not the case. Briefly, culture is often operationalised using a single set of outdated dimensions at a country level with no regard for interaction variables or possible mediators. This warrants a series of studies that analyse cultural dimensions from more recent datasets and tackling the issue of mediators of culture and various levels of analysis.

The analysed studies did not utilise the more modern models of innovation discussed above, largely focusing on a linear model of innovation or simply using innovation indicators as an output variable for the empirical analysis. This reveals a major gap in understanding how culture and innovation are connected beyond simple linear links. Study 1 provides a model of the link between culture and innovation within a system of other factors.



## **2. EMPIRICAL STUDIES**

## 3. DISCUSSION

### 3.1. Discussion and implications of the empirical research

In a series of retrospectives on studies involving culture, Kirkman et al. (2016) note that significant progress has been made in the cross-cultural field in the last decades. Despite this, a number of questions remain unanswered or not sufficiently investigated. The overarching question of the role culture plays in the innovative activity of different countries and, by extension, the place of culture in national innovation systems have received less attention in the research community than specific issues of methodology and data for culture and innovation separately. That said, these issues can be investigated to enhance understanding of the link between culture and innovation.

The goal of this research was to provide better understanding of the role of culture in innovative activity, to turn attention to the research gap in understanding the mechanism behind the link between culture and innovation, and to offer insights and tools for future research. In the course of three studies, I posited a theoretical model and conducted an empirical analysis that links culture, innovation, and select socioeconomic factors as a tool to better understand the mechanism through which culture impacts innovation. In a series of empirical studies, I analysed some of the above-mentioned issues to provide evidence of the validity of the usage of newer measurements of culture. I highlighted the importance of linking culture with innovation at a regional level and provided the differences between the results of the analysis at country and at regional levels. In the course of these studies, I utilised updated methodology and data, providing a reference point for future research. I also posited the possibility of creating newer dimensions of culture using existing primary data and utilised this approach to provide validity to this claim.

The specific application for the investigated issues lies in a **better understanding** of the role culture plays in the innovative activity of different societies. The results of the three presented studies **provide insights** into cultural dimensions that are consistently significantly linked with innovative activity. The studies **serve as evidence** that the new sets of cultural dimensions can serve as valid alternatives to older ones. They also **update the methodology** of interdisciplinary studies on culture and innovation, allowing for more precise and consistent research results. Finally, the studies **provide a basis** for a number of future research papers investigating specifics of the relationships and answering the new questions raised in these studies. A short summary of the results of the empirical research is given in Table 7.

**Table 7.** Results of the empirical research by research question

Research question	Results
1. What is the role of culture within a national innovation system?	Culture has a direct effect on the innovative output of a country. Culture is indirectly linked with innovative activity through a number of socioeconomic mediators within the national innovation system. <sup>1</sup>
2. Are the indirect effects of culture on innovative activity stronger than the direct effects?	The indirect effect of culture on innovative activity through mediators is oftentimes stronger than the direct effect. <sup>1</sup>
3. Can culture be investigated at a level other than the country?	Cultural dimensions at a regional level provide robust measurements that perform better than country-level ones, provided there is a theoretical justification for within-country cultural heterogeneity. <sup>2</sup>
4. Can original measurements of culture be constructed from the primary data and used in an empirical analysis?	It is possible to construct original dimensions of culture based on existing cultural theories and questionnaire data to better reflect the demands imposed by a particular research question. <sup>2</sup>
5. What is the role of individualism in explaining innovation?	Individualism–collectivism and its various facets remain the strongest predictor of a high level of innovative activity regardless of the sets of cultural dimensions used. <sup>1,2,3</sup>
6. Are the new cultural dimensions appropriate as replacements for the old ones?	Several sets of cultural dimensions, including Minkov et al.'s (2017; 2018a, 2018b) and Beugelsdijk & Welzel's (2018), perform better than Hofstede's four original dimensions, have better internal consistency, benefit from being constructed from newer primary data and have better replicability. <sup>3</sup>

Sources: <sup>1</sup>Soloviov, Kaasa (2023); <sup>2</sup>Soloviov (2022a); <sup>3</sup>Soloviov (2022b)

The important question investigated by these studies involves the link between culture and innovation that goes beyond direct links. The results highlight that theoretical understanding of the impact culture has on innovation is critical for providing explanation for the beneficiaries of such studies, such as policy-makers, governments, businesses and academia. To prove the integral role of the theoretical framework, it is worth looking at the results of the corresponding empirical studies once again.

First, the three studies analysed the issue of which cultural dimensions play a role in higher innovative activity in different countries and regions. A noteworthy conclusion that the studies reach in this regard is **the strong role of individualism–collectivism** as either the main or one of the main drivers of innovative activity. The fact that this conclusion is consistent regardless of the cultural dataset employed has important implications for future research. As hypothesised by Fog (2021), individualism–collectivism is a common factor for

the majority of sets of cultural dimensions, where it often represents similar values, attitudes, beliefs, and norms under different names. Individualism–collectivism’s strong effect on innovation has been known since Shane (1992, 1994), however, this impact has been almost exclusively studied using Hofstede’s (1980, 2001) cultural dimensions. The results of the present studies, therefore, serve as additional evidence of the validity of alternative cultural dimensions. They also provide additional evidence of Kaasa’s (2021) and Kaasa and Minkov’s (2022) claim that cultural dimensions for different investigated theories could be seen as rotations of each other. This means that contemporary cultural theories, while employing different methods and data sources, produce cultural dimensions that cover similar aspects and have a similar effect on innovative activity.

Evidence of the consistent role of individualism–collectivism regardless of the cultural theory is present in all three studies of this thesis. Study 1, where mediators of the relationship between culture and innovation are used, produces a strong effect of Minkov et al.’s (2017; 2018a; 2018b) individualism–collectivism cultural dimension and Inglehart’s (1997) survival–self-expression, Beugelsdijk and Welzel’s (2018) individualism–collectivism and Kaasa and Minkov’s (2022) freedom–concern cultural dimensions. In Study 2, the autonomy–embeddedness value orientation is significantly linked with innovative activity, with the normalised strength of the effect being greater than any other cultural dimension or noncultural covariate. Autonomy–embeddedness is the Schwartz value orientation most strongly resembling Hofstede’s individualism–collectivism, both in definition and in correlation analysis (Ng et al., 2006). I obtained exactly the same conclusion in Study 3, where autonomy–embeddedness once again has the strongest normalised effect on innovative activity. In addition, measurements representing individualism–collectivism from other theories, such as Minkov et al.’s (2017; 2018a; 2018b) individualism–collectivism or Inglehart’s (1997) secular–traditional cultural dimension, have the strongest effect on innovative activity.

In Study 1, we investigated the possibility of explaining the impact of culture on innovative activity through various socioeconomic factors. As the results show, both R&D investments and various aspects of governance can mediate the relationship between culture and innovation. Study 1 provides evidence that investigating this link by using mediators enhances understanding of the mechanism underlying the way culture impacts innovative activity. The indirect link between culture and innovation is consistently stronger than the direct one. This allows positing the **dominant role of the indirect links between culture and innovation** when explaining the mechanism of their interaction. While some dimensions of culture are directly beneficial for innovative processes, they can also affect a country’s political and economic system, influencing policy decisions that themselves have an effect on innovative activity. The results of Study 1 suggest that the effect of the latter is more apparent regardless of the cultural theory used.

Study 2 provides an analysis of culture at a level other than the national one and of its link with innovative activity at that level. The results suggest that analysing culture at a regional level **yields more precise results and additional insight** into the role of culture at a regional level for innovative activity. For sufficiently large European countries, such as Germany or Poland, it is reasonable to assume that the cultures of border regions share strong resemblances with the cultures of the neighbouring countries. As a result, attempting to analyse the impact of culture on innovation by using country-level scores of cultural dimensions might produce skewed results which do not adequately represent the actual link between culture and innovation in these regions.

Study 2 provides additional tools to analyse the links between culture and innovation in the form of the dimensions of culture created by the researcher using primary data, rather than existing sets of cultural dimensions. This technique can be used when the underlying methodology has proven to reliably produce accurate measurements of cultural phenomena, but the actual measurements of culture are unsuitable for the research at hand – because they represent a different level of aggregation or have become outdated, for instance. If the initially constructed cultural dimensions are internally consistent and represent distinct groups of cultural phenomena, then in order to update them, it is sufficient to collect the data again using the same questionnaire employed in the initial research. If the dimensions are constructed based on a questionnaire that is publicly available and updated regularly, then the newest data could be used in updating the dimension scores.

For Study 3, I conducted a comparative analysis of several contemporary sets of the dimensions of culture. As a notable result of this study, the contemporary cultural theories utilised in the studies produced similar results when related to innovative activity. This leads to the conclusion that the **newer cultural dimensions can serve as a valid alternative** to the classic dimensions of culture used by the majority of the scientific community in recent decades. In particular, using Minkov et al.'s (2017; 2018a; 2018b) cultural dimensions produces more robust models with greater explanatory power than using Hofstede's (1980, 2001) dimensions. A similar robust result could be reached using Beugelsdijk and Welzel's (2018) cultural dimensions or, indeed, any two-dimensional set of cultural dimensions that can be proven to be a rotation of the cultural dimensions investigated in the studies of this thesis.

The empirical analysis focuses on several methodological topics that pertain to the use of different sets of cultural dimensions, the better model to reflect the role of mediators of the relationship between culture and innovation, and analysis of culture at a level different from the national one. It should be noted, however, that these objectives are not self-serving. Analysis of the mediators of culture allows one to better understand the interconnectedness of the researched phenomena. Analysis of culture and innovation at a regional level enables better recommendations to government and local businesses on implementing policies that facilitate innovative activity. Better measurements of culture produce more precise and replicable results. In other words, the methodological aspects and

data issues pertaining to the selection of the set of cultural dimensions, while important, are significantly less crucial than the theoretical basis of such theories and the understanding of the mechanism underlying the links between culture and innovation. While it is inevitable that some concessions were and will be made in the course of interdisciplinary studies, care should be taken to ensure these are not handwaving important theoretical aspects of the link. If several sets of cultural dimensions used separately provide similar conclusions, the focus of future research should be on understanding the results, not further narrowing the data selection. In other words, the frequently discussed **methodological issues of multidisciplinary studies** on culture and innovation **are subordinate to the theories, mechanisms and links** they intend to explain or represent.

The generalised result of the studies is that culture **has a consistent and multifaceted effect** on the innovative activity of a given society at **different levels, both directly and through various mediators**. For the last several decades, papers on culture and its role in multidisciplinary studies have largely avoided questions regarding the mechanism through which culture and innovation are related, particularly indirectly, as noted by Kirkman et al. (2016), who placed discussion of the moderators and mediators of cultural effects as an unexplored research area. The studies that form the basis of this thesis provide a **thorough investigation** of these issues and **advance understanding** of the role and ways culture is linked with innovation. They create a strong case arguing for a **shift of focus in future research** from investigating methodological issues to better understanding the exact role of culture in the system of factors that impact innovation.

The conclusions of these studies provide better understanding of both the role culture plays in the innovative activity of different countries as well as culture itself as a multifaceted phenomenon that retains its meaning regardless of the system through which it is operationalised. The research results are immediately useful for governments aiming to create more focused policies aimed at improving innovative activity, businesses to correctly assess the capabilities of their competitors and the workforce, the general public to provide better understanding of the way culture affects their lives, and academia as a basis for research that uncovers the complex role of culture within national innovation systems. While culture lies outside governmental control, it has agency in the decision-making process of formal institutions. Knowing that culture's impact on innovation is in large part caused by factors that can be altered provides an opportunity for national governments to alter this effect by, e.g., improving legal protection of businesses, altering trade policies, decreasing bureaucracy or increasing the quality of public administration. For businesses, knowing about the cultural heterogeneity within the country they operate in allows for better incentives to motivate their workforce. When combined with analysis of the impact culture has on innovative activity, the studies provide firms with more information should they decide to facilitate innovative activity abroad. For the general public, a better understanding of within-country cultural differences can

provide better tools for solving conflicts, improving the community's security and reducing problems in interpersonal communication. Opportunities for future research, as well as the limitations of the current studies, are presented below.

### 3.2. Limitations of the thesis and future research directions

The limitations of the research stem from the methodological approaches and data used. All three studies utilised quantitative cultural theories for empirical analysis. Quantitative theories create a set of dimension scores for societies where each score represents a country's relative position on a dimension scale, closer to one or another end. This has been the most commonly used approach for cultural studies in the last decades (Kirkman et al., 2016), allowing easy comparison of the dimension scores between countries or regions as well as a defined value for use in regression analysis. They rely on existing datasets of cultural data or questionnaires in order to produce scores of cultural dimensions for future analysis. While no method of analysis can be considered perfect, the limitations of utilising quantitative cultural theories are largely offset by data availability from multiple cultural theories and a plethora of classic and novel methodological methods, some of which were explored in the studies of this thesis.

The three studies examined issues that allow for better understanding of the link between culture and innovative activity. At the same time, they are necessarily limited in their goals and research questions. A number of important questions on several topics could be further investigated using the current research. The model presented in Study 1 could be expanded to include more factors from the national innovation system and present evidence of a more complex interaction of the components within the system. An analysis of culture at a level other from the national following the example from Study 2 could turn out to be crucial in understanding the differences in the innovative activity of different regions within a country. Following the results of Study 3, contemporary dimensions of culture could be used when appropriate or when the classic dimensions are deemed insufficient or inadequate. Utilising better tools to analyse culture and innovation not only produces models with better predictive power but, more importantly, creates models that **allow for better understanding of the underlying processes** with fewer factors simplified or removed from the empirical research. More generally, an **effort should be made to move beyond direct links** between the two phenomena and towards more complex models that explain the nature of the links.

While various dimensions of culture were discussed and analysed in these studies, more insights can be found by analysing the link between various aspects of innovation and culture. For instance, it is possible to **focus on a specific type of innovation** rather than the total product of the innovative activity of a single country. One possible hypothesis is that the number of incremental and

radical innovations will vary in response to the same culture, as will the product and the process ones. At present, it is not possible to say whether culture influences technological, business, and product innovations in the same way.

From the methodological perspective, the models provided in the studies should be viewed as a non-exhaustive basis for more specific research questions. Study 1 uses structural equation models, while Studies 2 and 3 utilise mixed-effect multilevel models to estimate the link between the cultural dimensions and innovative activity of different countries. Multivariate statistics methods, such as factor analysis and principal component analysis, were also used in the studies to create cultural dimensions from existing primary data or to reduce the number of variables in order to reduce multicollinearity. It is always possible to **strengthen the results** provided by the current studies by **expanding existing models**. For example, exploring newer sets of cultural dimensions provides additional validity to the usage of contemporary data in general. Structural equation models could be expanded to include more stages and more socioeconomic variables to allow for better fit and predictive accuracy.

While the studies of this thesis were aimed at improving analysis of the role culture plays in innovative activity, much can still be improved in future research. Possible directions of future studies in order to further investigate cultural dimensions and their effect on innovation are described below.

First, cultural variables are assumed to have an independent effect on the dependent variable in the studies. Therefore, one possible avenue of future research lies in **investigating a potential synergetic effect** of a country exhibiting a specific combination of dimensions of culture and that combination having a significant effect on the country's innovative activity. One possible way to analyse this is through introduction of the interaction variable, calculated as the product of the scores for different cultural dimensions. Another would be the addition of an indicator variable representing whether a variable is close to one of the dimension poles, representing, for instance, highly individualistic or highly collectivist societies with a dummy variable. The product of such variables would produce a generalised effect a nation that combines closeness to several ends of a particular dimension.

Second, in each of the studies, cultural dimensions are presumed to have an independent effect on innovative activity. Thus, a possible area of investigation might be **the synergistic effect of different cultural dimensions** from different cultural sets on innovation. It is possible that a combination of select values of cultural dimensions provides an additional effect on the innovative activity of a particular country that is not reflected as the size of each individual effect might suggest.

Third, the effect of culture on innovative activity is presumed to be linear for all the models. A notable exception to this is Schwartz's set of cultural dimensions in Study 2, where I explore the hypothesised nonlinear effect of the egalitarianism–hierarchy variable. Some **degree of nonlinearity** in the effect of any cultural variable on innovation can be assumed, and, if theoretically justified, can also be explored in future empirical studies.

Fourth, as shown in Study 1, cultural dimensions can have both direct and indirect effects on innovative activity. The study discusses two such possible mediators, namely, R&D investments and governance quality. At the moment, however, there is a lack of studies on other possible mediators of the relationship between culture and innovative activity. As a result, investigation of additional **phenomena through which culture indirectly impacts innovation** remains a possible area for future research. When specifically discussing aspects of governance as separate mediators of the relationship between culture and innovation, Study 1 reveals that the components of the governance quality indicator align as a single factor with little loss of explanatory power, so in that specific case, it is unlikely that such analysis will change the results.

Fifth, throughout the studies of this thesis, cultural variables are utilised as time-invariant. Each model investigates a short period, usually up to five years, and cultural variables are always taken from the most recent datasets or created from the most recently available data, as done in Study 2. Over the long term, it is possible that the cultures of countries could change significantly, changing the resulting strength and significance of the observed effect. As discussed in the studies, the important component for comparisons between countries is their dimension scores relative to other countries, rather than the dimensions' absolute values. Because these relative positions tend to remain stable even as the absolute value of a dimension for each country shifts, usually in the same direction (Beugelsdijk et al., 2015; Beugelsdijk, Welzel, 2018), it could be argued that this change does not significantly affect the results of the current research. Yet, the question of **the role of time in the significance and strength of the link between culture and innovative activity** remains open for future studies.

Sixth, a possible area of future research remains **investigation of the link between cultural dimensions and innovation at a regional level**. While Study 2 provides evidence for using cultural dimensions at a regional level at least for the European Union, more research is necessary to establish this conclusion for other groups of countries or worldwide. Multilevel analysis that compares the effects of cultural dimensions on innovation at a country and a regional level, as well as the theoretical rationale for the differences between these effects, as proposed by Kirkman et al. (2016), remains a valid area of research.

Of course, the list provided above presents a non-exhaustive selection for future studies. However, in all these cases, the studies of this thesis can serve as a useful basis, which would further their contribution to our understanding of the role culture plays in innovative activity.

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## SUMMARY IN ESTONIAN

### Kultuuri roll innovatsiooniprotsessides

#### Uurimistöö motivatsioon

Viimase 50 aasta jooksul on innovatsioon muutunud üksikisiku püüdlustest alaliseks protsessiks, millega tegelevad peaaegu kõik era- ja avaliku sektori ettevõtted. Innovatsiooniprotsesside roll on muutunud: kui varem kasutati seda konkurentsieelise tagamiseks, siis nüüd võimaldab see ettevõtetel ellu jääda ja oma olulisust säilitada. Nii riik kui akadeemia on nüüd aktiivselt kaasatud innovatsioonitegevusse rahaliste kulutuste, poliitika, teadustöö ja pikaajalise koostöö kaudu. See protsess võimendub kaasaegsetes teadmismahukates ühiskondades, kus selle tulemuseks, et ettevõtjatel on lihtsam informatsioonile ligi pääseda ja suurem võime võimaluste ja väljakutsete tuvastamiseks ning neile reageerimiseks, on ettevõtete suurenenud konkurentsivõime (Malerba, McKelvey, 2019). Koos riigi ja akadeemia suurenenud rollidega on firmad sunnitud olema innovatiivsed selleks, et pikemas perspektiivis olla konkurentsivõimelised ja elujõulised. Sellest tulenevalt on akadeemiline huvi innovatsiooniprotsesside mehhanismide ja nende käivitajate vastu samuti märkimisväärselt suurenenud.

Alates Weberist (1904/1958) on kultuuri peetud innovatsioonitegevuse oluliseks ennustajaks, kuid enamus laiaulatuslikke empiirilisi uurimusi sai alguse pärast Hofstede (1980) uurimistööd, mis mõõtis esimest korda kultuuri kvantitatiivselt. Pärast seda on tehtud arvukalt uurimusi, milles on loodud seoseid kultuuri ja innovatsioonitegevuse vahel (Shane, 1992; Kaasa, Vadi, 2010; Efrat, 2014; Bukovski, Rudnicki, 2019). Just individualism on esile kerkinud kui rohke innovatsioonitegevuse ja pikaajalise majanduskasvu tugev ja oluline ennustaja (Gorodnichenko, Roland, 2011).

Kirkmani jt. (2006, 2016) algatatud diskussioonidest kultuuri kaasavatest multidistsiplinaarsetest uurimustest lähtuv üks ühine seisukoht on see, et puudu on uurimused kultuuri ja teiste uuritud nähtuste vahelise seose vahendajate kohta. Selle tulemusena on seos kultuuri ja innovatsiooni vahel sageli liigselt lihtsustatud statistiliseks koefitsiendiks arvestamata taustprotsesse või võimalikke vahendajaid. Innovatsioonisüsteemide üldises raamistikus (Rothwell, 1994; Arnold, Kuhlmann, 2011) on süsteemi komponendid omavahel seotud, mõjutades üksteist innovatsioonitegevuse käigus. On alust arvata, et kultuur kui mitteformaalne institutsioon võib mõjutada mitmeid selliseid komponente lisaks oma otsesele mõjule innovatsioonitegevusele. Seetõttu on käesoleva doktoritöö üks eesmärk laiendada teoreetilist arusaama kultuuri ja innovatsiooni vahelise seose kohta uurides selle seose vahendajaid empiiriliselt. Vahendajate analüüs võiks võimaldada kitsendada suurt hulka nähtusi, mille kaudu kultuuril on kaudne mõju innovatsioonile ning selle tulemusena pakkuda üldine tugevam arusaam kultuuri rollist innovatsioonitegevusele erinevates ühiskondades. Uurimuses 1 analüüsin mõnda võimalikku kultuuri ja innovatsiooni vahelise seose vahendajat.

Minu eesmärk on analüüsida veel mitmeid teisi kultuuri ja innovatsiooni interdistsiplinaarse uurimistöö eripärasid kultuuri valdkonnast. Näiteks riikide kasutamine ühiskondliku kultuuri mõõtmise ühikutena on saanud teadlaste seas normiks. Seetõttu kasutatakse kultuuridimensioone muudel tasanditel peale riigi tasandi harva; veelgi vähem uurimusi täiendavad analüüsi tulemustega, mis saadakse seostades kultuuri ja innovatsiooni erinevatel tasanditel. Erinevate analüüsitasandite rakendamine kultuuriga seotud uurimistöodes võib anda täiendavat informatsiooni riigisiseste kultuuriliste erinevuste kohta ja võimaldada kultuuri rolli erinevates protsessides terviklikumalt mõista (Kirkman jt., 2016). Neid võimalusi uurin lähemalt Uurimuses 2.

Metodoloogia ja andmete seisukohalt tuleb ära märkida, et paljud viimastel kümnenditel läbi viidud uurimused kasutavad peamiselt kultuuridimensioonide komplekte vaid ühest kultuuriteooriast ja andmete empiiriline analüüs piirdub korrelatsioonianalüüsi ja OLS regressioonanalüüsiga (Kirkman jt., 2016). Kuna alternatiivsed kultuuridimensioonide komplektid muutusid kättesaadavaks (Beugelsdijk, Welzel, 2018; Minkov jt., 2017; 2018a, 2018b) ja avaldati rohkem kriitikat seni laialdaselt levinud praktikate kohta (Beugelsdijk, Welzel, 2018; Minkov, 2018, Minkov, Kaasa, 2020), oli mu eesmärgiks rakendada käesoleva doktoritöö uurimustes kaasaegsemaid kultuuri mõõdikuid ja metodoloogiat. Uurimuses 3 analüüsisin võrdlevalt mitmeid kultuuridimensioonide komplekte kultuuri ja innovatsiooni seoste analüüsimise käigus.

## **Eesmärk ja uurimisülesanded**

Käesoleva doktoritöö eesmärk on uurida kultuuri rolli erinevate ühiskondade innovatsioonitegevuses kasutades kaasaegseid teoreetilisi ja metodoloogilisi käsitlusi ning andmeid. Sellest tulenevalt püstitati eesmärgi täitmiseks järgmised uurimisülesanded:

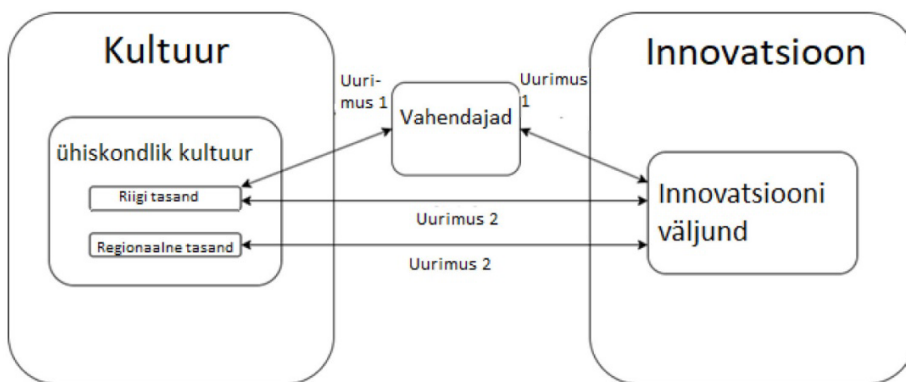
1. Anda ülevaade kultuurist ja innovatsioonist (Peatükk 1).
2. Käsitleda kultuuri ja innovatsiooni kvantitatiivset mõõtmist, mõõtmise metodoloogiat ja erinevate lähenemisviiside nõrkusi (Peatükk 1).
3. Esitada kriitiline analüüs kultuuri ja innovatsioonitegevuse vahelisi seoseid käsitletavate uurimuste peamiste lähenemisviiside, meetodite ja tulemuste kohta, tuues välja seniste uurimuste peamised eeldused ja piirangud (Peatükk 1).
4. Uurida kultuuri ja innovatsiooni kaudse seose vahendajaid, loetleda võimalikke vahendajaid ja seletada selliste seoste mehhanisme (Peatükk 2, Uurimus 1).
5. Võrrelda kultuuri kaudseid ja otseseid mõjusid innovatsioonitegevusele vahendajate kaudu (Peatükk 2, Uurimus 1).
6. Analüüsida kultuuri ja innovatsioonitegevuse vahelise seose uurimise võimalikkust muul kui riigi tasandil ning tulevikus selle tasandi uurimise võimalikke kasutegureid (Peatükk 2, Uurimus 2).

7. Tuletada kultuuridimensioonid kasutades uusi lähteandmeid ja esialgset kultuuriteoorias pakutud metodoloogiat ning hinnata selle käsitlemise kasutamise võimalikkust empiirilistes uurimustes (Peatükk 2, Uurimus 2).
8. Viia läbi võrdlev analüüs kultuuri ja innovatsiooni vahelise seose kohta kasutades uurimustes erinevaid vanemaid ja uuemaid kultuuridimensioonide komplekte (Peatükk 2, Uurimus 3).
9. Esitada tõendeid uuemate kultuuridimensioonide kasutamise võimalikkuse kohta uurimustes, mis seovad kultuuri ja innovatsiooni, ning tuua välja selise käsitlemise eelised (Peatükk 2, Uurimused 1, 2 ja 3).
10. Teha kokkuvõtte saadud tulemustest, anda ülevaade välja pakutud käsitluste positiivsetest külgedest ning piirangutest (Peatükk 3).
11. Anda suuniseid tulevasteks uurimusteks ning arutleda käesolevaga saadud tulemuste rolli üle tulevikus tehtavates uurimistöodes (Peatükk 3).

### Doktoritöö struktuur ja uurimistöö skeem

See doktoritöö koosneb sissejuhatausest ja kolmest peatükist. Esimeses peatükis annan doktoritöö teemast teoreetilise ülevaate, kirjeldan metodoloogiat ja andmeallikaid. Selle peatüki alapeatükid sisaldavad innovatsiooni ja kultuuri definitsioone, klassifitseerimist ja mõõtmist kui ka kultuuri ja innovatsiooni siduvate uurimuste tulemusi. Teine peatükk koosneb kolmest eelretsenseeritud ja avaldatud empiirilisest uurimusest. Need artiklid käsitlevad võimalusi parandada arusaamist kultuuri rolli kohta innovatsioonitegevuses. Kolmandas peatükis esitan empiiriliste uurimuste tulemuste kokkuvõtte ja arutlen doktoritöö võimalike piirangute üle.

Uurimistöö struktuur on esitatud Joonisel 1.



**Joonis 1.** Uurimistöö skeem.

Allikas: autori koostatud

Käesolev doktoritöö käsitleb järgmisi uurimisküsimusi:

1. Mis on kultuuri roll riiklikus innovatsioonisüsteemis? (Uurimus 1).
2. Kas kultuuri kaudsed mõjud innovatsioonitegevusele on tugevamad kui otsesed mõjud? (Uurimus 1).
3. Kas kultuuri saab uurida mõnel muul kui riigi tasandil? (Uurimus 2).
4. Kas esmastest andmetest saab tuletada originaalseid kultuurimõõdikuid ja neid kasutada empiirilises analüüsis? (Uurimus 2).
5. Mis on individualism roll innovatsiooni selgitamises? (Uurimused 1, 2 ja 3).
6. Kas uued kultuuridimensioonid sobivad vanu asendama? (Uurimus 3).

## **Andmed ja metodoloogia**

Uurimused 1 ja 3 kasutavad Ülemaailmse Innovatsiooniindeksi väljundi mõõdet antud aastal riigi innovatsioonitegevuse üldistatud mõõtmiseks (Cornell University, INSEAD, & WIPO, 2020). Uurimus 2 kasutab Euroopa Patendiregistri indikaatorit igal aastal väljastatud patentide arvu kohta, et mõõta innovatsioonitegevust regiooni tasandil.

Käesoleva doktoritöö uurimustes kasutatakse Hofstede (1980; 2001; 2011), Schwartzi (2006) ja Ingleharti kultuuridimensioonide komplekte, millest viimased tuletati Maailma väärtuste uuringu 7. lainest (2022), kui ka originaalseid Beugelsdijk-Welzeli (2018), Minkovi jt. (2017; 2018) ning Kaasa ja Minkovi (2022) kultuuridimensioonide komplekte.

Korrelatsioonianalüüsi kasutati kõikides uurimustes, et teha võimalike lihtsate otseste lineaarsete seoste esialgne analüüs uuritud muutujate vahel. Regressioonanalüüsi kasutati erinevate mudelite loomiseks, et täita uurimisülesanded 4–9. Struktuurvõrrandite mudelit, eriti teeanalüüsi, kasutati Uurimuses 1 mudeli loomiseks, mis ühendaks kultuuri, innovatsiooni ja valitud vahendajad (uurimisülesanne 4). Mitmetasandilisi segaefektidega mudeleid kasutati Uurimustes 2 ja 3 kultuuri ja innovatsiooni sidumiseks riigi ja regiooni tasandil (uurimisülesanded 6, 8 ja 9).

Peakomponentide analüüsi kasutati Uurimuses 1, et kombineerida valitsemise kvaliteedi erinevaid tahke üheks muutujaks (uurimisülesanne 4) ja Uurimuses 2 loomaks kultuuridimensioone regiooni tasandil (uurimisülesanne 7). Sellel eesmärgil kasutati ka lähteandmete ipsatiseerimist. Statistilisi teste ja mõõdikuid, näiteks F-testi ja Cronbachi kordajat ning Kaiser-Meyer-Olkini testi valimi sobivuse kohta kasutati selleks, et kontrollida tulemuste statistilist olulisust ning andmete sobivust analüüsiks (uurimisülesanded 4–9). Erinevaid statistilisi mõõdikuid, näiteks Akaike informatsioonikriteeriumit ja võrdlevat sobivusindeksit (uurimisülesanded 5, 8 ja 9), kasutati saadud mudelite võrdlemiseks.

## **Kokkuvõte**

Uuritud teemade konkreetne rakendus on parema arusaama loomine sellest, milline on kultuuri mõju innovatsioonitegevusele erinevates ühiskondades. Kolme esitletud uurimuse tulemused avavad kultuuridimensioone, mis on järjepidevalt

märkimisväärselt seotud innovatsioonitegevusega. Need uurimused tõestavad, et uued kultuuridimensioonide komplektid võivad olla valiidsed alternatiivid vanadele. Need ajakohastavad ka interdistsiplinaarsete uurimuste metodoloogiat kultuuri ja innovatsiooni osas, võimaldades saada täpsemaid ja ühtlasemaid uurimistulemusi. Ühtlasi on need uurimused edaspidi aluseks mitmetele teadusartiklitele, mis uurivad nende seoste täpsemaid mehhanisme ja vastavad uutele küsimustele, mis tõstasid neis uurimustes. Uurimisküsimused ja analüüsi tulemused on kokku võetud järgnevalt (Tabel 1).

**Tabel 1.** Empiirilise uurimistöö tulemused uurimisküsimuste kaupa

Uurimisküsimus	Tulemus
1. Mis on kultuuri roll riiklikus innovatsioonistüsteemis?	Kultuuril on otsene mõju riikide innovatsiooni väljunditele. Kultuur on kaudselt seotud innovatsioonitegevusega mitmete sotsiaalmajanduslike vahendajate kaudu riikliku innovatsioonistüsteemi sees <sup>1</sup> .
2. Kas kultuuri kaudsed mõjud innovatsioonitegevusele on tugevamad kui otsesed mõjud?	Kultuuri kaudsed mõjud innovatsioonitegevusele vahendajate kaudu on sageli suurem kui otsesed mõjud <sup>1</sup> .
3. Kas kultuuri saab uurida mõnel muul kui riigi tasandil?	Regiooni tasandil annavad kultuuridimensioonid usaldusväärsed mõõtetulemused, mis töötavad paremini kui riigi tasandi omad eeldusel, et riigisiselisel kultuurilisel heterogeensusel on teoreetiline põhjendus <sup>2</sup> .
4. Kas kultuuri esialgseid mõõtmistulemusi saab tuletada lähteandmetest ja neid kasutada empiirilises analüüsis?	Olemasolevate kultuuriteooriate ja küsimustiku andmete põhjal on võimalik tuletada kultuuri esialgsed dimensioonid, et paremini kajastada konkreetse uurimisküsimuse seatud nõudmisi <sup>2</sup> .
5. Mis on individualism roll innovatsiooni selgitamises?	Individualism-kollektivism ja selle erinevad tahud on endiselt parimad kõrge innovatsioonitegevuse taseme ennustajad hoolimata kasutatud kultuuridimensioonide komplektist <sup>1,2,3</sup> .
6. Kas uued kultuuridimensioonid sobivad vanu asendada?	Paljud kultuuridimensioonide komplektid, sealhulgas Minkov jt. (2017; 2018a, 2018b) ja Beugelsdijk & Welzel (2018), töötavad paremini kui Hofstede neli esialgset dimensiooni, neil on parem sisemine ühtivus, neile mõjub positiivselt uuematest lähteandmetest tuletamine, ja need on paremini replitseeritavad <sup>3</sup> .

Allikas: <sup>1</sup>Soloviov, Kaasa (2023), <sup>2</sup>Soloviov (2022a); <sup>3</sup>Soloviov (2022b).

Uurimuste üldistatud tulemus on see, et kultuuril on pidev ja mitmetahuline mõju innovatsioonitegevusele igas ühiskonnas erinevatel tasanditel nii otseselt kui ka erinevate vahendajate kaudu. Viimastel kümnenditel on kultuuriuuringud ja nende roll multidistsiplinaarsetes uurimustes suuresti vältinud küsimusi mehhanismide kohta, mille kaudu kultuur ja innovatsioon seotud on, eriti kaudselt nagu märkis Kirkman jt. (2016), kes esitles kultuurimõjude moderaatorite ja vahendajate arutelu ühe uurimata uurimisvaldkonnana. Uurimused, millel käesolev doktoritöö põhineb, uurivad neid teemasid põhjalikult ja edendavad arusaamist nii rollist kui viisidest, kuidas kultuur on innovatsiooniga seotud. Need loovad kindla aluse väitele, et tulevaste uurimistööde fookus nihkub metodoloogiliste küsimuste analüüsimiselt sellele, et paremini mõista, mis roll kultuuril täpsemalt on selles tegurite süsteemis, mis innovatsiooni mõjutav.

### **Praktilised järeldused**

Nende kolme uurimuse järeldused annavad nii parema arusaamise kultuuri rollist erinevate riikide innovatsioonitegevuses kui ka parema arusaamise kultuurist endast kui mitmetahulisest nähtusest, mis säilitab oma tähenduse mistahes süsteemis, mida kasutatakse selle käsitlemiseks. Uurimistulemused on vahetult kasulikud valitsustele, mille eesmärgiks on luua fokuseeritumat poliitikat, mis on suunatud parandama riigi innovatsioonitegevust, ettevõtetele hindamaks õigesti oma konkurentide võimekust ning tööjõule, avalikkusele, et paremini mõista viise, kuidas kultuur mõjutab nende elusid, ning akadeemiale edaspidiste teadustööde teemadena, mis paljastaks kultuuri kompleksse rolli riiklikes innovatsioonisüsteemides. Kuigi kultuur on väljaspool valitsuse kontrolli, on sellel võimekus mõjutada formaalsete asutuste otsustamisprotsesse. Teadmine, et kultuuri mõju innovatsioonile põhjustavad suures osas tegurid, mida saab muuta, annab võimaluse riiklikele valitsustele seda mõju muuta näiteks parandades ettevõtete õiguskaitset, muutes kaubanduspoliitikat, kahandades bürokraatiat ja tõstes avaliku halduse kvaliteeti. Ettevõtete seisukohast võimaldavad teadmised kultuurilisest heterogeensusest riigis, kus nad tegutsevad, tööjõudu motiveerida paremate stiimulitega. Kombinatsioonis analüüsiga kultuuri mõjudest innovatsioonitegevusele pakuvad need uurimused ettevõtetele täiendavat informatsiooni, kui nad peaksid hakkama viljelema innovatsioonitegevust välismaal. Avalikkuse jaoks saab parem arusaamine riigisisestest kultuurilistest erinevustest pakuda paremaid tööriistu konfliktide lahendamiseks, kogukonna turvatunde suurendamiseks ja inimestevaheliste kommunikatsiooniprobleemide kahandamiseks.

### **Doktoritöö piirangud**

Mõned võimalikud uurimissuunad tuleviku tarbeks kultuuridimensioonide ja nende mõju kohta innovatsioonile on esitatud järgnevalt. Esiteks, arvatakse, et kultuurilistel muutujatel on sõltumatu mõju sõltuvatele muutujatele igas uuri-

muses. Üks võimalik viis seda analüüsida oleks kasutada interaktsiooni muutajat, kalkuleerituna erinevate kultuuridimensioonide väärtuste korrutisena. Teine võimalus oleks lisada indikaatori muutuja, mis esindaks seda, kas muutuja on dimensiooni ühe pooluse lähedal, esindades näiteks väga individualistlikke või väga kollektivistlikke ühiskondi fiktiivmuutujaga. Teiseks, kõikides läbi viidud uurimustes eeldatakse, et kultuuridimensioonidel on sõltumatu mõju innovatsioonitegevusele. Seega võib üks võimalik uurimissuund olla erinevatest innovatsiooni kohta käivatest kultuurilistest komplektidest tulenevate erinevate kultuuridimensioonide sünergiline mõju. Kolmandaks, eeldatakse, et kultuuri mõju innovatsioonitegevusele on kõikides mudelites lineaarne. Märkimisväärne erand on Schwartzi kultuuridimensioonide komplekt Uurimuses 2, kus uurin hüpoteesi kohaselt egalitarismi-hierarhia muutuja mittelineaarset mõju. Mistas kultuuri muutuja puhul võib eeldada mõningast mittelineaarset mõju innovatsioonile ja kui see on teoreetiliselt põhjendatud, saab seda ka analüüsida edasistes empiirilistes uurimustes. Neljandaks, täiendavate nähtuste uurimine, mille kaudu kultuur kaudselt innovatsiooni mõjutab, jääb tulevikus uurimiseks. Viiendaks, kõikides käesoleva doktoritöö uurimustes rakendatakse kultuuri muutujat ajas muutumatuna. Aja rolli küsimus kultuuri ja innovatsioonitegevuse vahelise seose olulisuse ja tugevuse osas jääb tulevikus uurimiseks. Kuuendaks, võimalik edasise uurimistöö teema on kultuuridimensioonide ja innovatsiooni vahelise sideme uurimine regiooni tasandil. Oluliseks edasiseks uurimisvaldkonnaks jääb ka mitmetasandiline analüüs, mis võrdleks kultuuridimensioonide mõju innovatsioonile riigi ja regiooni tasandil, samuti ka teoreetiline põhjendus erinevuste kohta nende mõjude vahel nagu Kirkman jt. (2016) välja pakkusid.

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**Keelteoskus:** ukraina, inglise, eesti

### Avaldatud artiklid:

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