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The personality and organisational constructs of systems thinking

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The personality and organisational constructs of systems thinking

Is systems thinking a God given privilege of few or can be aroused by appropriate organisational culture types?

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Abstract

Purpose

This monograph aims to identify the personality profile of the individuals owing systems thinking ability as well as to determine if and to what extent the organisational culture impacts systems thinking ability of the organisational members.

Design/Methodology/Approach

This statistical study is built on the collection of 353 questionnaires from managers from Bulgaria and the UK. The research participants were representatives of the three sectors (public, private and non-for profit) and nineteen industries. The measurement of the relationship between systems thinking, the personality traits of individuals and the organisational culture is based on Goldberg's big five personality scale and Pors's theory of organisational culture.

Findings

Results of the study revealed that only two out of the five personality dimensions have an impact on the systems thinking ability of individuals. These are the dimensions of openness and Conscientiousness. In fact, a high level of openness has been identified to positively influence systems thinking. In contrast, a high level of conscientiousness has a negative impact on systems thinking. Moreover, this monograph managed to prove that organisational culture has a significant impact on systems thinking. Whether this impact is positive or negative fully depends on the type of organisational culture.

Contributions

This monograph introduces a brand-new theory about the factors impacting the systems thinking ability of individuals by proposing the personality profile of systems thinkers as well as the type of organisational cultures which stimulate systems thinking.

Keywords: systems thinking, five-factor model of personality, organisational culture

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Chapter 1. Introduction

1.1 Research rationale

In the past several decades the business and economic environment has been characterised with a great dynamics and uncertainty.[1] However, their level has reached unknown hights since the beginning of the Covid-19 pandemic and War in Ukraine[2]. Both public and private organisations are equally challenged to adopt and implement new original strategies to handle the increasing uncertainty and unfolding economic and financial crisis. Therefore, the demand for new leaders and managers with a holistic and unconventional approach has been greater than ever before. In fact, the complex and uncertain situation requires managers and leaders to be both 'designers' and 'pilots' of the organisations[3] they are running. Thus, they need a well-developed intuition and ability to see the whole as well as the interconnections of its part. All these abilities are associated with systems thinking. Introduced by Ludwig von Bertalanffy as a general systems theory and later developed and applied to the organisational context, systems thinking has been a subject of interest of both scholars and practitioners[4]. In general, systems thinking can be described as 'a discipline for seeing wholes and a framework for seeing interrelationships rather than things, for seeing patterns of change rather than static snapshots'[5]. The significant positive impact of systems thinking on the organisational performance[6], or its ability to deal with complex problems and high level of uncertainty[7] are undeniable. Moreover, organisations of all kind use systems thinking not only

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[1] Antonakakis, N., Gabauer, D., Gupta, R., & Plakandaras, V. (2018). Dynamic connectedness of uncertainty across developed economies: A time-varying approach. *Economics Letters*, *166*, 63-75.
[2] Zięba, K. (2021). How can systems thinking help us in the COVID-19 crisis?. *Knowledge and Process Management*.
[3] Gharajedaghi, J. (2011). *Systems thinking: Managing chaos and complexity: A platform for designing business architecture*. Elsevier.
[4] Mingers, J., & White, L. (2010). A review of the recent contribution of systems thinking to operational research and management science. *European journal of operational research*, *207*(3), 1147-1161.
[5] Senge, P. M., & Sterman, J. D. (1992). Systems thinking and organizational learning: Acting locally and thinking globally in the organization of the future. *European journal of operational research*, *59*(1), 137-150.
[6] Fathabadi, H. (2020). The Impact of Systemic Thinking on Improving Organizational Performance in Military Units. *C4I Journal*, *4*(1), 70-85.
[7] Grohs, J. R., Kirk, G. R., Soledad, M. M., & Knight, D. B. (2018). Assessing systems thinking: A tool to measure complex reasoning through ill-structured problems. *Thinking Skills and Creativity*, *28*, 110-130.

to survive during crisis but also as a tool for gaining a competitive advantage.[8] The growing interest toward systems thinking by both practice and research can also be explained through its abilities to identify, understand, predict the behaviour, and prepare the systems.[9] As already discussed these skills and abilities are crucial in the times of great crisis and problems challenging the modern society. Predicting the world after the Covid-19 pandemic, the War in Ukraine and all the consequences resulting from them is an enormously complicated task. Thus, the application of the four principles of systems thinking have never been of a greater demand in the modern times. The four principles of systems thinking identified by Arnold and Wade[10] are:

- Identifying the systems
- Understanding the systems
- Predicting the behaviour of the systems
- Devising the modifications to systems to produce the desired effect

As the application of systems thinking to the field of management has been relatively new. Most of the research effort was focused on identification of the benefits that systems thinking as a problem-solving tool can offer to both private and public organisations. This is reasonable as both theory and practice is seeking alternative methods and approaches to handle the growing dynamics of the external environment. However, few research efforts were made toward understanding what influences the systems thinking ability of individuals. Thus, this study aims to identify the impact factors (both enablers and disablers) by examining the relationship between systems thinking and personality traits as well as the organisational culture. The motive behind the examination both relationships: a) between systems thinking and organisational culture; and b) systems thinking and the personality traits – is rooted to the fundamental question whether individuals need to be born with higher-order thinking skills[11] or these skills can be accumulated by the surrounding environment. Therefore, this study

[8] Shaffie, A., & Stec, T. (2014). *Gaining a competitive advantage with sustainable business– implementing inductive charging using systems thinking, A Benchmarking of EVs and PHEVs* (Master's thesis).
[9] Palmberg, I., Hofman-Bergholm, M., Jeronen, E., & Yli-Panula, E. (2017). Systems thinking for understanding sustainability? Nordic student teachers' views on the relationship between species identification, biodiversity and sustainable development. Education Sciences, 7(3), 1–18. doi: 10.3390/educsci7030072
[10] Arnold, R. D., & Wade, J. P. (2015). A definition of systems thinking: A systems approach. *Procedia computer science*, *44*, 669-678.
[11] Hitchins, D. K. (2003). *Advanced systems thinking, engineering, and management*. Artech House.

employs the Big five personality trait model firstly introduced by Goldberg, 1992. The relationship between the personality profile of individuals and its impact on the behaviour, adaptation, job performance, team-working and the overall interaction with the social environment[12]. The big five model consist of five personality dimensions and categories:

a) extraversion (vs. introversion)
b) neuroticism (emotional instability vs. stability)
c) openness (vs. closeness or unconventionality)
d) agreeableness (vs. antagonism)
e) conscientiousness (vs. disinhibition)

These dimensions were chosen as a scale of measurement of the personality profile of the individuals, because they have been recognised as a leading personality model. When it comes to the organisational culture, this monograph uses Pors's theoretical framework, which categorise organisational culture into four categories: 'the clan', 'open systems', 'market culture' and 'the hierarchical culture'. In fact, there are more types of organisational culture within the academic literature. However, this study chose to examine exactly this theoretical framework because the relationship between systems thinking, and organisational culture is not the only focus of this research. Thus, the usage of more detailed model of organisational culture would extend the length of the questionnaires and would change the research focus. In short, the subject of this study are the systems thinking, the big five personality model and organisational culture.

1.2 Research objectives, contributions and originality of the study

As already mentioned, **this monograph aims to introduce a completely new theory related to the factors that impact systems thinking**. In other words, this research examines whether systems thinking due to a higher-order thinking that some individuals are born with or can be influenced through external factors such as organisational culture. Hence, this study

[12] Roslan, S., Hasan, S., Zaremohzzabieh, Z., & Arsad, N. M. (2021). Big Five Personality Traits as Predictors of Systems Thinking Ability of Upper Secondary School Students. *Pertanika Journal of Social Sciences & Humanities*, *29*.

examines six hypotheses related to the relationship between systems thinking and the big five personality traits and organisational culture:

- **Hypothesis 1:** Neuroticism has a negative influence on systems thinking.
- **Hypothesis 2:** Extraversion has a positive impact on systems thinking.
- **Hypothesis 3:** Openness has a positive influence on systems thinking.
- **Hypothesis 4:** Agreeableness has a positive influence on systems thinking.
- **Hypothesis 5:** Conscientiousness has a negative impact on systems thinking.
- **Hypothesis 6:** A positive organisational culture positively impacts systems thinking.

In order the above hypothesis to be tested this research set the following research aims:

Research aims

- To test whether there is a link between the systems thinking ability and the personality profile of the individuals by using the Big Five Personality model.
- To test whether the organisational culture has an impact on systems thinking.
- To identify which types of organisational culture, have a positive impact on systems thinking, and which negative if a relationship between both is found.
- To identify which personality dimensions, have positive impact on systems thinking and which have negative.

Research objectives

- To introduce a new theory about the factors influencing one's systems thinking ability.
- To create a theoretical model illustrating the personality profile as well as the organisational culture typology that impact systems thinking.

Thus, quantitative research was conducted among managers in Bulgaria and the United Kingdom in 2013. As a result, 353 questionnaires were collected from representatives of the three sectors of economy and 19 industries. In terms of the demographic representation, the number of female and male is almost equal. This study is up to date and relevant due to the following reasons:

1. Data results do not depend on the time of data collection as the subject of investigation are the personality dimensions and the organisational culture.

2. There is a great interest about the subject of systems thinking, but the number of prior studies that examine the factors impacting it, are limited and not fully relevant.

The two previous academic works that studied the relationship between systems thinking and the personality profile of the individuals are those of Roslan et al., (2021)[13] and Nagahi et al., (2021)[14]. However, none of them is relevant to the field of management as in the first case the object of research are secondary school students while in the second case were engineers. **However, what is more important none of these studies are able to answer the question whether systems thinking is a highly-order way of thinking which individuals are born with or can be impacted by the external environment and factors. Moreover, there are no prior studies that investigate the relationship between the organisational culture and systems thinking. Last but not least, this monograph offers a significant contribution to both theory and practice through the introduction of a brand-new theory about the factors influencing systems thinking.** It has been identified the personality profile of people prone to systems thinking as well as the typology of organisational culture that is likely to stimulate it.

The figure below presents the research skeleton of this study upon which this monograph is built. In addition, it illustrates the research objectives, aims and hypothesis, as well as the link between them. As it can be seen from the figure below this study has two research objectives, two research aims and six hypotheses to be tested.

[13] Roslan, S., Hasan, S., Zaremohzzabieh, Z., & Arsad, N. M. (2021). Big Five Personality Traits as Predictors of Systems Thinking Ability of Upper Secondary School Students. *Pertanika Journal of Social Sciences & Humanities*, *29*.

[14] Nagahi, M., Jaradat, R., Goerger, S. R., Hamilton, M., Buchanan, R. K., Abutabenjeh, S., & Ma, J. (2021). The impact of practitioners' personality traits on their level of systems-thinking skills preferences. *Engineering Management Journal*, *33*(3), 156-173.

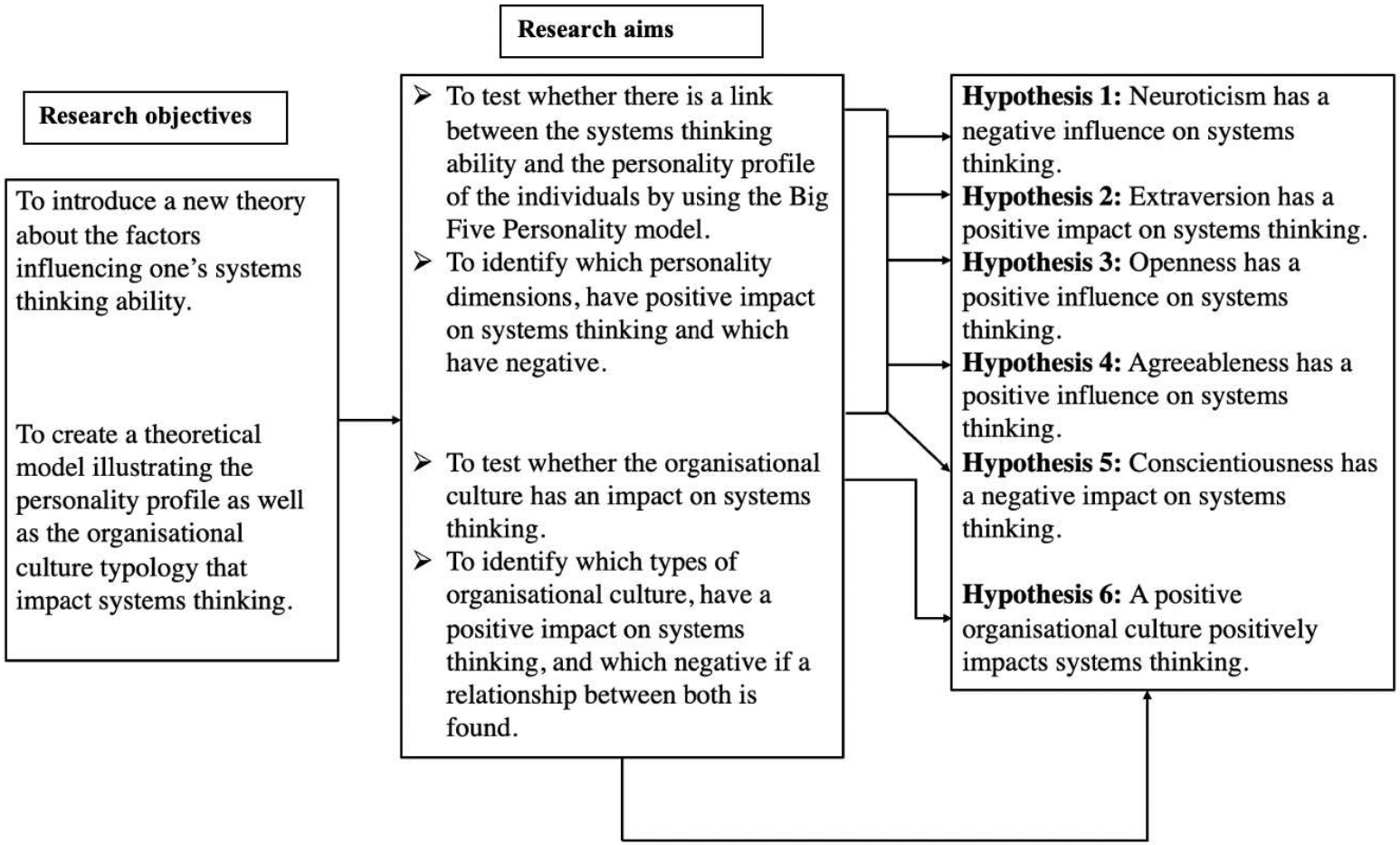

Figure 1. Research skeleton

1.4 Structure of the study

Stage 1

The first stage of the research involves a critical review of the relevant and recent academic literature. The literature review begins with a review of the systems thinking theory, its origins and application to management followed by a review of the big five personality model. As a result, five hypotheses related to the relationship between the systems thinking and the five personality dimensions. The literature review ends with a review of relevant academic work related to organisational culture and ends with the formation of the sixth hypothesis related to the relationship between systems thinking and organisational culture.

Stage 2

The second stage of the research involves the identifying of relevant methodology to fulfil the aims and objectives of the study. Therefore, a quantitative research method was employed where a regression model was used to identify the relationship between dependent and independent variables. As this study examines the relationship between the personality traits, the organisational culture and systems thinking with management and organisational context – the target audience of this research are managers representatives of the three economic sectors (public, private and non for profit). Furthermore, the group of the research participants was quite heterogenous since they were representatives from 19 industries and various age groups. Data collection was conducted in two countries – Bulgaria and the United Kingdom. The research participants had to fill research questionnaires available in both electronic and hard copies.

Stage 3

This stage of the research project illustrates and reports the research findings resulting from the cross-sectional study. In this stage the collected data is processed, analysed and then presented. In addition, in the third stage of the study the six hypotheses are tested. A theoretical framework is then created that illustrates the personality profile of the systems thinker as well as the typology of the organisational culture which are likely to impact individuals' systems thinking in either positive or negative way. Finally, the last stage also proposes the final reflections, contributions, limitations and directions for future research of this study.

Chapter 2. Systems thinking. Theoretical development, concepts and contemporary application to management.

2.1 Systems thinking

2.1.1 Definition

Although systems thinking has been a discipline and theory since 1950s, the term 'systems thinking' was not presented until 1987 by Barry Richmond[15]. Richmond argues that systems thinking as a discipline of an immense significance in regard to coping with the complexity of the 21st century[16]. His perception about the field 'systems thinking' has been accepted by a large number of scholars and practitioners (i.e. Gharajedaghi[17], Meadows[18]; Plate & Monroe[19]; Senge & Sterman[20]; Sterman[21]). Systems thinking is considered one of the most effective managerial tools to provide an understanding of systems and complexity for the general public if systems thinking leaders and researchers are right in their assumptions[22]. The term 'systems thinking' has been defined and redefined many times. Mingers and White explain that this is because systems thinking can be applied to almost any domain[23]. Meadows believes that systems thinking consists of three main components: elements, interactions and purpose (function)[24]. Likewise, Gharajedaghi suggests there are five disciplines of systems

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[15] Arnold, R. D., & Wade, J. P. (2015). A definition of systems thinking: A systems approach. *Procedia computer science*, *44*, 669-678.
[16] Richmond, B., & Peterson, S. (2001). *An introduction to systems thinking*. Lebanon, NH: High Performance Systems., Incorporated.
[17] Gharajedaghi, J. (2011). *Systems thinking: Managing chaos and complexity: A platform for designing business architecture*. Elsevier.
[18] Meadows, D. H. (2008). *Thinking in systems: A primer*. chelsea green publishing.
[19] Plate, R., & Monroe, M. (2014). A structure for assessing systems thinking. *The Creative Learning Exchange*, *23*(1), 1-3.
[20] Senge, P. M., & Sterman, J. D. (1992). Systems thinking and organizational learning: Acting locally and thinking globally in the organization of the future. *European journal of operational research*, *59*(1), 137-150
[21] Sterman, J. D. (2010). Does formal system dynamics training improve people's understanding of accumulation?. *System Dynamics Review*, *26*(4), 316-334.
[22] Arnold, R. D., & Wade, J. P. (2015). A definition of systems thinking: A systems approach. *Procedia computer science*, *44*, 669-678.
[23] Mingers, J., & White, L. (2010). A review of the recent contribution of systems thinking to operational research and management science. *European journal of operational research*, *207*(3), 1147-1161.
[24] Meadows, D. H. (2008). *Thinking in systems: A primer*. chelsea green publishing.

thinking, namely openness, purposefulness, multidimensionality, emergent property and counterintuitive behaviour[25].

Systems thinking researchers and practitioners all came to an understanding that the principle of a system is much more than a collection of elements[26]. Obedient with this view, Arnold and Wade add that systems thinking can be seen as a system. Furthermore, they define systems thinking as a '*system of thinking about systems'*. Arnold and Wade argue that the issues raised by the number of definitions of systems thinking in the literature are a result of the reductionist approach. The reductionist approach is an approach that observes the '*whole as nothing more than a sum of parts'*[27].However, it is not a systems-thinking approach, as it is not capable of providing a deep understanding of complex and dynamic scenarios[28]. For this reason, Arnold and Wade suggest that defining systems thinking as a system may not be the most appropriate way of defining it, as this is a reduction approach[29]. As there are no clear criteria of how systems thinking should be defined, this chapter presents the most frequent definitions of systems thinking found in the literature to present the big picture of what systems thinking is, and what its purpose and usage is.

Systems thinking in the literature: the most common definitions

One of the very first definitions of systems thinking is the one of Barry Richmond, who defines it as: 'the art and science of making reliable inferences about behaviour by developing an increasingly deep understanding of underlying structure'[30]. Senge introduces his own definition, in which, for the first time, systems thinking is presented as a discipline: 'Systems thinking is a discipline for seeing wholes and a framework for seeing interrelationships rather than things, for seeing patterns of change rather than static snapshots'[31].Despite the presence of many definitions of systems thinking in the literature, Senge is the only one defining it as a

[25] Gharajedaghi, J. (2011). *Systems thinking: Managing chaos and complexity: A platform for designing business architecture*. Elsevier.
[26] Gharajedaghi, J. (2011). *Systems thinking: Managing chaos and complexity: A platform for designing business architecture*. Elsevier.
[27] Wimsatt, W. C. (2006). Reductionism and its heuristics: Making methodological reductionism honest. *Synthese*, *151*(3), 445-475.
[28] Dominici, G. (2012). Why does systems thinking matter?. *Business Systems Review*, *1*(1), 1-2.
[29] Arnold, R. D., & Wade, J. P. (2015). A definition of systems thinking: A systems approach. *Procedia computer science*, *44*, 669-678.
[30] Richmond, B. (1987). *Systems thinking: Four key questions*. High Performance Systems.p.1
[31] Senge, P. M., & Sterman, J. D. (1992). Systems thinking and organizational learning: Acting locally and thinking globally in the organization of the future. *European journal of operational research*, *59*(1), 137-150.

discipline[32]. Most of the definitions of systems thinking in the literature do not define it as discipline (e.g. Richmong[33]; Arnold & Wade[34]; Monat & Gannon[35]; Skyttner[36]; Larsson et al.[37]; Sweeny & Sterman[38]; Hopper & Stave[39]; Kopainsky, Alessi & Davidsen[40]. Kopainsky, Alessi & Davidsen do not even categorise the term 'systems thinking'[41]. The most common definitions of systems thinking describe it as an art (Sweeny & Sterman, 2000); a perspective, language, set of tools (Arnold &Wade; Monat & Gannon; Skyttner,; Larsson et al.) or even as a base of systems dynamics[42]. However, although academics and practitioners define systems thinking differently, the commonality between all of them is that they all perceive it as a powerful instrument for improving the existing reality and achieving the desired results. Notwithstanding that, the existence of such a great variety of definitions creates confusion about the meaning and usage of systems thinking, the highest point of this confusion. However, as can be seen, there is no clear usage and definition of systems thinking[43].

2.1.2 Theoretical foundations

2.1.2.1 General systems theory

General systems theory consists of the integration of various sciences e.g. natural and social behaviour sciences[44]. The history of systems theories includes contributions from creative thinkers, such as Ludwig von Bertalanffy, Karl Menninger, Silvano Arieti, William

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[32] Senge, P. (1990). Peter Senge and the learning organization. *Rcuperado de*.
[33] Richmond, B. (1987). *Systems thinking: Four key questions*. High Performance Systems.
[34] Arnold, R. D., & Wade, J. P. (2015). A definition of systems thinking: A systems approach. *Procedia computer science*, *44*, 669-678.
[35] Monat, J. P., & Gannon, T. F. (2015). What is systems thinking? A review of selected literature plus recommendations. *American Journal of Systems Science*, *4*(1), 11-26.
[36] Skyttner, L. (2005). *General systems theory: Problems, perspectives, practice*. World scientific.
[37] Larsson, M. (2009). Learning Systems Thinking. *The role of semiotic and cognitive resources*, *145*.
[38] Sweeny, L. B., & Sterman, J. D. (2000, August). Bathtub dynamics: Preliminary results of a systems thinking inventory. In *International System Dynamics Conference, Bergen, Norway*.
[39] Hopper, M., & Stave, K. A. (2008, July). Assessing the effectiveness of systems thinking interventions in the classroom. In *26th international conference of the system dynamics society*.
[40] Kopainsky, B., Alessi, S. M., & Davidsen, P. I. (2011, July). Measuring knowledge acquisition in dynamic decision making tasks. In *The 29th International Conference of the System Dynamics Society* (pp. 1-31). Albany, NY: System Dynamics Society.
[41] Kopainsky, B., Alessi, S. M., & Davidsen, P. I. (2011, July). Measuring knowledge acquisition in dynamic decision making tasks. In *The 29th International Conference of the System Dynamics Society* (pp. 1-31). Albany, NY: System Dynamics Society.
[42] Hopper, M., & Stave, K. A. (2008, July). Assessing the effectiveness of systems thinking interventions in the classroom. In *26th international conference of the system dynamics society*.
[43] Forrester, J. W. (1994). System dynamics, systems thinking, and soft OR. *System dynamics review*, *10*(2-3), 245-256.
[44] Checkland, P. (1999). Systems thinking. *Rethinking management information systems*, 45-56.

Gray, Alfred North Whitehead, Paul A. Weiss, Grinker, Nicolas Rizzo, Kurt Lewin, Roy R., Anatol Rapoport, Kenneth Boulding, Kartz and Kahn and Ralph Gerard. In more recent years, it has included dynamical systems theorists and those who deal with dissipative structures and holistic paradigms. The transdisciplinary nature of the systems approach has fast spread to the humanities as well as hard science. GST grew out of organismic biology and today is part of most of the humanities. GST was recognised as a platform for the study of human and organisational behaviours, and applications in the present day are in the area of social work, mental health and all kinds of political and behavioural sciences.

Laszlo and Krippner (believe that the rise and spread of systems theory is due to the '*societal pressures on science calling for the development of theories capable of interdisciplinary application*'[45]. Systems theory is considered to provide a powerful conceptual approach for comprehending the interrelation of human beings, and the associated structures and processes specific to them in the contexts of both nature and society. The literature review recognised the key theoretical foundations and influences of systems thinking to form a principal core of how these theories have been applied to understanding and explaining the recent evolutionary form of systems thinking, and how it was formed and influenced by other relevant theories.

2.1.2.2 Systems concept in Problem Solving

In terms of its application, the systems methodology in problem solving can be hard, soft or critical. At the beginning, hard systems thinking methodology was the first introduced systems methodology, which implication was mainly related to engineering and mathematic. It was announced for a first time when Forrester introduced the industrial dynamics[46]. Checkland made a huge progress by introducing the 'soft systems thinking' methodology, designed for solving more complex problems, followed by Jackson who introduced the 'critical systems thinking' methodology[47]. The specifics, strengths and weaknesses of all systems thinking methodologies will be listed down in this section.

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[45] Laszlo, A., & Krippner, S. (1998). Systems theories: Their origins, foundations, and development. *Advances in Psychology-Amsterdam-*, *126*, 47-76.p. 76

[46] Forrester, J.W. (1958) Industrial dynamics – a major breakthrough for decision makers. Harvard Business Review, 36(4), 37–66.

[47] Jackson, M. C. (1994). Critical systems thinking: beyond the fragments. *System Dynamics Review*, *10*(2-3), 213-229.

2.1.2.3 Hard systems thinking

This methodology was majorly designed to address real-world problem solving[48]. This is why it was mostly applied in the field of engineering and technology. Moreover, systems engineering is a professional activity with an action orientation. The ultimate goal of the 'Hard systems thinking' methodology was to create a mathematical modelling. Hard systems thinking methodology was identified to be useful when to comes to the solving of routine technical problems. Mathematical approaches are not designed to solve complex problems as they can only offer a distorted view from a particular perspective [49]. Forrester adopted the hard systems thinking methodology, as well as, ideas from the control theory to design the 'systems dynamics', which aim were to overcome the limitations of the management science[50]. This was considered as a major breakthrough in the decision making, but the approach was taken in a reductionist manner rather than in a holistic one.

2.1.2.4 Soft systems thinking

The real progress in the systems theory has begun with the introduction of the soft-systems thinking methodology. The context to which this methodology was, was a sociological one where addressing complex problems requires a structuralist approach rather than a positivist approach[51]. The aim of the soft systems thinking methodology was not simply to solve problems, but also to gain deep understanding about the organisational features in order the system to be more effective overtime by reorganizing and restructuring itself[52]. The design of adaptive complex systems for surviving has become the ultimate goal of the soft systems thinking methodology. The soft systems thinking methodology introduced by Checkland adopts a subjective view, which construction is based on alternative perceptions, which are compared and contrasted[53]. Jackson argue that the purpose of the soft systems thinking methodology is the building of learning organizations[54]. Distinct to the operational research

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[48] Checkland, P. (1999). Systems thinking. *Rethinking management information systems*, 45-56.
[49] Jackson, M. C. (1994). Critical systems thinking: beyond the fragments. *System Dynamics Review*, *10*(2-3), 213-229, p.215.
[50] Forrester, J.W. (1958) Industrial dynamics – a major breakthrough for decision makers. Harvard Business Review, 36(4), 37–66.
[51] Jackson, M. C. (1994). Critical systems thinking: beyond the fragments. *System Dynamics Review*, *10*(2-3), 213-229.
[52] Checkland, P. (1999). Systems thinking. *Rethinking management information systems*, 45-56.

[53] Checkland, P. (1999). Systems thinking. *Rethinking management information systems*, 45-56.
[54] Jackson, M. C. (1994). Critical systems thinking: beyond the fragments. *System Dynamics Review*, *10*(2-3), 213-229, p.215.

methodology, the soft systems thinking methodology an approach of Interpretativism rather than Positivism. In addition, soft systems thinking do not aim to design complex adaptive systems models that can be used over and over again. The soft systems thinking methodology focuses on prevention of the problems rather than dealing with the effect and the results of the problem, when it already appeared.

Checkland's soft systems thinking methodology is designed to deal and create problem-solving techniques and approaches for human activity systems. These are systems consist of natural and social interactions between human beings. Therefore, the performances and objectives of these system can be created. The clarification of the objectives of the actors of the system is of a primary importance for the problem-solving tasks, because of the dual nature of the human behaviours. Soft systems thinking methodology was created to deal with soft, unstructured problems that are hard to be defined in contrast to the hard systems thinking methodology, it does not propose straightforward and well-defined goals and solutions. Soft systems thinking has been criticized by Rosenhead[55], Bryer[56], Thomas and Lockett[57] and Jackson [58]for basing their work on compromise view of society[59].

2.1.2.5 Critical systems thinking

Critical systems thinking was created to overcome the limitation of the soft systems thinking in the 1980s[60]. The critical systems thinking theory studies for the people, rather than studying them[61]. Unlike the soft systems thinking methodology, it focuses on helping actors to solve their problems by communicating with them and educating them, but not imposing.

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[55] Rosenhead, J. V. (1976). Some further comments on the social responsibility of operational research. *Journal of the Operational Research Society*, *27*(1), 266-272.
[56] Bryer, R. A. (1979). The status of the systems approach. *Omega*, *7*(3), 219-231.
[57] Thomas, A. R., & Lockett, M. (1979). Marxism and systems research: values in practical action. In *Improving the Human Condition: Quality and Stability in Social Systems. Proceedings of the silver anniversary international meeting of the Society for General Systems Research (SGSR)* (pp. 20-24).
[58] Jackson, M. C. (1982). The nature of soft systems thinking: The work of Churchman, Ackoff and Checkland. *Journal of applied systems analysis*, *9*(1), 17-29.
[59] Jackson, M. C. (1991). The origins and nature of critical systems thinking. *Systems practice*, *4*(2), 131-149.

[60] Flood, R. L., & Romm, N. R. (Eds.). (1997). Critical systems thinking: current research and practice.
[61] Jackson, M. C. (1994). Critical systems thinking: beyond the fragments. *System Dynamics Review*, *10*(2-3), 213-229

Furthermore, the process is no one-way only, it involves an active communication between the decision makers and the actors, which will be affected by these decisions. The critical systems thinking methodology aims to send awareness among the actors and make them involved in the decision-making process by encouraging them to debate, where the criteria of the success depend on the usefulness for the actors involved. Moreover, critical systems thinking offers critical awareness involves examining and re-examining the taken-for-granted assumptions. In terms of the methodology, critical systems thinking works with pluralistic methodology as it combines a variety of research methods in a theoretical manner to address a variety of problematic issues[62].

2.1.2.6 Cybernetics and holism

The term 'cybernetics' has a Greek origin, meaning 'helmsman' or 'steersman'. Holism theory also has Greek origins, as it was found by Aristotle. The fundamental roots of systems thinking are directly related to holism and cybernetic theories. The term cybernetic is associated with concerns about feedback[63]. There are two types of cybernetics – first order and second order cybernetics[64]. First order cybernetics focuses on what is being observed and lately has developed into a communication theory. The second order of cybernetics is a theory of the observer rather than what is being observed[65]. The epistemological and philosophical jump from first order to second order cybernetics marks a return back to the basic concept of cybernetics – 'circularity'[66].

Ison states that Forrester , like Wittgenstein before him, outlined the differences in the terms 'Am I apart from the universe?' [the first order] and 'Am I part of the universe?'[the second order]. The first one is connected to the philosophical assumption that 'whenever I look

[62] Midgley, G. (1996). What is this thing called CST?. In *Critical systems thinking* (pp. 11-24). Springer, Boston, MA.
[63] Ison, R. L. (2008). Systems thinking and practice for action research. *The Sage handbook of action research participative inquiry and practice*, *2*, 139-158.
[64] Ison, R. L., & Russell, D. B. (2000). Exploring some distinctions for the design of learning systems. *Cybernetics & human knowing*, *7*(4), 43-56.

[65] Fell, L., & Russell, D. B. (2000). 2 The human quest for understanding and. *Agricultural Extension and Rural Development: Breaking Out of Knowledge Transfer Traditions*, p.32.
[66] Fell, L., & Russell, D. B. (2000). 2 The human quest for understanding and. *Agricultural Extension and Rural Development: Breaking Out of Knowledge Transfer Traditions*

am I looking though a peephole upon an unfolding universe?'[67]. The second one is associated with the philosophical assumption 'Whenever I act, I am changing myself and the universe'[68]. Operations research is another source of influence on contemporary systems thinking and practice.

2.1.3 Theoretical influences of systems thinking

2.1.3.1 Operational Research

Operations research (OR) thrived after the Second World War as it started to be seen as a supportive tool for studying and managing complex problems. As a discipline, it has continued to develop today in the current systems community. Ormerod reminds, that advocates of systems theory have history of publishing papers in journals of operational research systems, where they present the system perspective as a superior compared to OR, which according to them is a limited management tool that supports the status quo[69]. Scholars such as Jackson aim to open a discussion about the link between systems thinking and operational research, as he lists six common elements between systems thinking and operational research[70]:

- *context - complex problems arising in public and private enterprises and organizations and (usually) involving their interactions with society and the environment;*
- *method - a synthesis of understanding, invention, analysis, design, intuition, judgement, and a scientific approach;*
- *tools - those of logic, statistics, mathematics, technology, and the sciences, employed by the multidisciplinary teams;*
- *aim - to assist finding ameliorative responses to problems through designing and evaluating programs, decisions and actions;*
- *clients - those with responsibilities for or interests in these ameliorative responses;*

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[67] Ison, R. L. (2008). Systems thinking and practice for action research. *The Sage handbook of action research participative inquiry and practice*, *2*, 139-158, 146.
[68] Ison, R. L. (2008). Systems thinking and practice for action research. *The Sage handbook of action research participative inquiry and practice*, *2*, 139-158.
[69] Ormerod, R. J. (2011). The relationship between operational research and systems thinking. *Journal of the Operational Research Society*, *62*(1), 242-245.
[70] Jackson, M. C. (2009). Fifty years of systems thinking for management. *Journal of the Operational Research Society*, *60*(1), S24-S32.

- *relation - a continuing interaction between the analysis team and the clients throughout the work*[71][72].

2.1.3.2 Complexity

The promise of systems thinking of dealing with complexity and bringing sustainability has provoked various theoretical explanations over the last few decades as complexity is constantly growing. In observing systems thinking as a supportive tool for surviving and flourishing during times of growing complexity, we need to recognise its wide application, starting from the need for supporting national and institutional structures and organizations and finishing with individuals. The contemporary set of influences on systems thinking come from the so-called complexity-sciences, as well as arising from other recent developments characterized by interdisciplinary movements mainly in science studies[73]. These movements started as a consequence of the increase in discussions and understandings about 'risk', the 'networked' society[74] and the spreading globalisation[75].

Globalisation in particular is linked to the raised awareness of situations associated with complexity, uncertainty, conflict, multiple perspectives, connectedness and multiple stake holdings[76]. In addition, Ison makes a good point by arguing that there has been a transformation of the earlier understanding of the nature of situations. It was in the past described as 'messes'[77] rather than 'difficulties'[78]; as a 'real-life swamp'[79] rather than the 'high-ground of technical rationality', and as 'wicked' and 'tame' problems[80]. The difference between 'tame' and

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[71] Miser, H. J. (1993). A foundational concept of science appropriate for validation in operational research. *European Journal of Operational Research*, *66*(2), 204-215.
[72] Miser, H. J., & Quade, E. S. (Eds.). (1985). *Handbook of systems analysis: craft issues and procedural choices* (Vol. 2). Elsevier Science Limited.p.16
[73] Ison, R. L. (2008). Systems thinking and practice for action research. *The Sage handbook of action research participative inquiry and practice*, *2*, 139-158.
[74] Beck, U. (1992) Risk Society: Towards a New Modernity. London: Sage.
[75] Castells, M. (2004) 'Informationalism, networks, and the network society: a theoretical blueprint', in Manuel Castells (ed.), The Network Society: a Crosscultural Perspective. Northampton, MA: Edward Elgar. pp. 3–48.

[76] SLIM (2004a) 'SLIM framework: social learning as a policy approach for sustainable use of water' (see http://slim.open.ac.uk).
[77] Ison, R. L. (2008). Systems thinking and practice for action research. *The Sage handbook of action research participative inquiry and practice*, *2*, 139-158.p.142.
[78] Ackoff, R.L. (1974) Redesigning the Future. New York: Wiley.
[79] Shön, D.A. (1995) 'The new scholarship requires a new epistemology', Change (November/December): 27–34.
[80] Rittel, H.W.J. and Webber, M.M. (1973) 'Dilemmas in a general theory of planning', Policy Science, 4: 155–69.

'wicked' problems is that in the former, all of the parties involved are clear about what the problem is, in contrast to the latter, which are ill defined and ill structured. Furthermore, all the parties involved in 'wicked problems' have no clear perception of what the problem is.

Theorists have identified three main aspects of systems thinking, which are directly related to dealing with complex problems: providing understanding[81], constantly changing through learning[82] and the ability to see the big picture[83]. The ability of systems thinking to provide the big picture outlook directly links it to holism theory. Historical accounts of systems thinking start with biologists, who consider that reductionist thinking loses the sense related to the phenomenon as a whole[84]. In fact, as was previously mentioned, biologists were one of the initiators of creating the multidisciplinary project known as General Systems Theory (GST). Gharajedaghi identified five principles and mental models of systems thinking which are acting together as an interactive whole: **openness**, **purposefulness, multidimensionality**, **emergent property**, and **counterintuitiveness[85]**. According to Gharajedaghi being a 'systems thinker' or 'systems designer' is something that can be obtained if individuals manage to construct the mental models mentioned above. In short, the five principles can be explained in the following way:

a) **Openness** - this principle proposes that 'the living (open) systems can be understood only in the context of their own environment'- Gharajedaghi[86]. Furthermore, Gharajedaghi perceives the world as 'one complex whole in interaction'. In other words, even issues describing the human nature such as 'lust for power', 'the love of liberty', 'quest for happiness' etc., are concepts that cannot be meaningfully understood out of the context or the culture of which they are part. The key point made by Gharajedaghi proposes that there

[81] Beckman, S. L., & Barry, M. (2007). Innovation as a learning process: Embedding design thinking. *California management review*, *50*(1), 25-56.
[82] Bianchi, J. (2011). Overborrowing and systemic externalities in the business cycle. *American Economic Review*, *101*(7), 3400-3426.
[83] Mele, C., Pels, J., & Polese, F. (2010). A brief review of systems theories and their managerial applications. *Service science*, *2*(1-2), 126-135.
[84] Bertalanffy, L. V. (1968). *General system theory: Foundations, development, applications*. G. Braziller.
[85] Gharajedaghi, J. (2011). *Systems thinking: Managing chaos and complexity: A platform for designing business architecture*. Elsevier.p.29.

[86] Gharajedaghi, J. (2011). *Systems thinking: Managing chaos and complexity: A platform for designing business architecture*. Elsevier. p.30

are variables that can be controlled, and such that cannot. A systems thinker is able to distinguish both.

b) **Purposefulness –** This principle outlines the difference between 'information' and 'knowledge' by emphasising the importance of explaining *why* something happens rather than just identifying *what happened*[87]. Managers and leaders must not only understand what is happening in the surrounding environment, but to be able to understand the reasons. In other words, this principle is related to the awareness of the cause-effect relationship. Thus, there is a hierarchy of influence consisting of information, knowledge and understanding. Last but not least, Gharajedaghi this principle proposes that there are three categories of choices: emotional, rational and cultural.

c) **Multidimensionality –** This principle suggests that everything comes in pair of opposites like collective/individual, complexity/order, science/art. modernity/tradition etc. This concept perceives the opposites and their spectrum as "separately infeasible parts making a feasible whole"[88]. Gharajedaghi points out that we live in an age of paradoxes when our understanding of even long-honoured values is somehow twisted. For instance, values like security, freedom and justice are considered as mutually exclusive. People are often afraid of freedom associating it with anarchy, or associating justice with tyranny. In fact, this principle of systems thinking promotes the idea that values like security, freedom and justice are aspect of the same thing and should not be separated.

d) **Emergent property –** These are properties of the whole, not of the parts. Emergent properties are a product of interactions, not a sum of actions of the parts[89]. These are properties like love, happiness, sadness, success, failure etc. are interdependent variables that cannot be measured directly. The only thing that can be measured is their manifestation. This principle proposes that the

[87] Gharajedaghi, J. (2011). *Systems thinking: Managing chaos and complexity: A platform for designing business architecture*. Elsevier.
[88] Ackoff, R. L. (1978). The Art of Problem Solving Accompanied by Ackoff's Fables.
[89] Gharajedaghi, J. (2011). *Systems thinking: Managing chaos and complexity: A platform for designing business architecture*. Elsevier. p.46.

quality of interactions between the elements of the system, is more important than the quality of the elements. Furthermore, this principle describes a property as a process of becoming rather just being[90]. Finally, emergent properties can be defined as the *'spontaneous outcome of ongoing processes'* (Gharajedaghi, 2011:48). If the process that generate these properties like happiness, success, failure etc. ends; they will also automatically disappear.

e) **Counterintuitiveness –** this principle examines the cause- effect relationship. There are four aspects of this principle that contribute to a better understanding of this relationship. The first one suggests that cause and effect might be separated in time and space. In other words, if an event is taking place at a given time and place, it can generate a delayed effect at different time and place. The second one proposes that cause and effect can exchange their roles, whereas an effect can become a cause and the opposite[91]. The third one states that one cause can produce multiple effects and the order of their importance changes over time. Last as argued by Gharajedaghi removing the cause will not necessarily remove the effect because the set of variables that produced the effect also change by time.

2.1.4 The new era of designing and creating

According to Gharajedaghi systems thinking is correlated to both designing and creating processes, which are vital for human beings to learn new modes of living as this offers them new ways of seeing, doing and being in the world[92]. In fact, managers are now challenged to be both designers and pilots of the organisations that are ruling. Systems cannot be controlled by individuals but can be redesigned by them this is why Gharajedaghi associates systems thinking with designing. The presence of models helping managers to pilot their organisations more effectively by using of systems dynamics are very useful but, what is more valued is

[90] Gharajedaghi, J. (2011). *Systems thinking: Managing chaos and complexity: A platform for designing business architecture*. Elsevier. p.48
[91] Gharajedaghi, J. (2011). *Systems thinking: Managing chaos and complexity: A platform for designing business architecture*. Elsevier. p.48
[92] Micheli, P., Wilner, S. J., Bhatti, S. H., Mura, M., & Beverland, M. B. (2019). Doing design thinking: Conceptual review, synthesis, and research agenda. *Journal of Product Innovation Management*, *36*(2), 124-148.

when this models are implemented to support organisational redesign. The environmental challenges and dynamics require managers and leaders to predict the situation and prepare the system, which is no longer an easy task. As explained by Gharajedaghi in the past the environment used to be predictable, but uncontrollable, while in the present it is just the opposite. Thus, the application of systems thinking is even more important as it allows managers to choose rather than to predict. Choosing rather than prediction requires a holistic leadership approach, which prioritises the 'whole over the parts.' as suggested by Chen-Levi et al.[93] Arnold and Wade argue that there are four stages of systems thinking[94]:

- identifying the systems
- understanding the systems
- prediction the behaviour of the systems
- devising modifications to systems to produce the desired effect

This study examines systems thinking as a tool that delivers skills to perceive issues and problems holistically[95]. Moreover, it also gives an ability to see connections that are barely obvious while understanding why they behave a certain way[96]. The literature review shows that the significance of systems thinking is so great that it is able to either lessened or even avoid great political, economic, social and environmental crisis and disasters[97]. Therefore, it is significantly important predetermining factors of the systems thinking to be identified. This research aims to discover whether the big five personality traits and the organisational culture influence the systems thinking ability of individuals.

2.2. The five-factor model of personality

The individuals' emotional nature, known also as temperament has long been a subject of interest dating back as far as 450 BCE when Greek scientist introduced the concept about the four "humours" (blood, black bile, yellow bile, and phlegm). Thus, it was gained an insight about the individual's characteristic emotional style (e.g., a melancholic or gloomy

[93] Chen-Levi, T., Schechter, C., & Buskila, Y. (2021). Exploring Systems Thinking in Schools: Mental Models of School Management Teams. *International Journal of Educational Reform*, *30*(2), 116-137.
[94] Arnold, R. D., & Wade, J. P. (2015). A definition of systems thinking: A systems approach. *Procedia computer science*, *44*, 669-678.
[95] Arnold, R. D., & Wade, J. P. (2017). A complete set of systems thinking skills. *Insight*, *20*(3), 9-17.
[96] Arnold, R. D., & Wade, J. P. (2017). A complete set of systems thinking skills. *Insight*, *20*(3), 9-17.
[97] Letcher, T., & Vallero, D. (Eds.). (2019). *Waste: A handbook for management*. Academic Press.

temperament resulting from high levels of black bile[98]). Modern civilisation is also giving a huge importance to the understanding one's temperament and emotional nature.[99] The interest toward the personality traits of individuals and their significancy for the field of management and organisational studies has been rapidly growing in the past decades. A great number of academic works and examination[100] are recognising that the personality profile of individuals play major role for many organisational activities such as: innovation, entrepreneurship, job performance etc. Most of the studies use the five-factor model (FFM) of personality as a universal template for understanding the personality structure of individuals. This was also proposed by Godlberg, who argue that the big five personality dimensions can provide a theoretical framework of the personality concepts that will be equally beneficial for both academics and organisations[101].

Furthermore, the application of the personality theories to the field of management has been very intense since the second half of the 20th century, combining approaches from economics, psychology, sociology, and business management[102]. According to Parks-Leduc et al. traits of personality can be defined as 'the set of psychological traits and a way of acting, thinking, or behaving within the individuals that are organised[103] and can influence his or her interactions with, or adaptation to, the intrapsychic, physical, and social environment'[104][105]. Other definitions of personality include 'personality can be defined as the collection of intrinsic and

[98] Digman, J. M. (1994). Child personality and temperament: Does the five-factor model embrace both domains. *The developing structure of temperament and personality from infancy to adulthood*, 323-338.
[99] Watson, D., Clark, L. A., & Chmielewski, M. (2008). Structures of personality and their relevance to psychopathology: II. Further articulation of a comprehensive unified trait structure. *Journal of personality*, *76*(6), 1545-1586.
[100] Patterson, F., Kerrin, M., & Gatto-Roissard, G. (2009). Characteristics and behaviours of innovative people in organisations. *Literature review prepared for the NESTA Policy & Research Unit*, 1-63.
[101] Digman, J. M. (1990). Personality structure: Emergence of the five-factor model. *Annual review of psychology*, *41*(1), 417-440.
[102] Kerr, S. P., Kerr, W. R., & Xu, T. (2018). Personality traits of entrepreneurs: A review of recent literature. *Foundations and Trends® in Entrepreneurship*, *14*(3), 279-356.
[103] Parks-Leduc, L., Feldman, G., & Bardi, A. (2015). Personality traits and personal values: A meta-analysis. *Personality and Social Psychology Review*, *19*(1), 3-29.
[104] Parks-Leduc, L., Feldman, G., & Bardi, A. (2015). Personality traits and personal values: A meta-analysis. *Personality and Social Psychology Review*, *19*(1), 3-29.
[105] Roslan, S., Hasan, S., Zaremohzzabieh, Z., & Arsad, N. M. (2021). Big Five Personality Traits as Predictors of Systems Thinking Ability of Upper Secondary School Students. *Pertanika Journal of Social Sciences & Humanities*, *29*, p.253.

extrinsic traits that can affect the behaviour of an individual'.[106] Other authors describe it as "The dynamic organization within the individual of those psychophysical systems that determine his unique adjustments to his environment"[107]. Kasschau describes the meaning of personality by giving the example with two people of the same gender and age who have completely different interests, activities, feelings and way of thinking. This leads to the idea that there is 'something inside' of us which distinguishes us from the others[108] and this 'something inside' is the personality.

Therefore, it is not surprising that personality traits can outline a person's reaction and adaptation to the psychological, biological, and social environments, which are part of systems thinking[109]. Thus, this study was driven to examine the relationship between the big five personality traits and systems thinking by previous literature that has already identified a close correspondence between the thinking style and the personality traits[110]. The same is confirmed by a large number of studies based on meta-analysis which found also a relationship between the personality traits and job performance[111]. Numerous personality traits models have been introduced, but the most widely researched and recognised as a leading taxonomy of personality structure is the Five-Factor model (FFM)[112], knowns also as 'The Big Five' personality traits[113][114][115][116]. This model is seen to be closer to what psychologists mean by the

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[106] Digman, J. M. (1994). Child personality and temperament: Does the five-factor model embrace both domains. *The developing structure of temperament and personality from infancy to adulthood*, 323-338.
[107] Komarraju, M., Karau, S. J., & Schmeck, R. R. (2009). Role of the Big Five personality traits in predicting college students' academic motivation and achievement. *Learning and individual differences*, *19*(1), 47-52.
[108] Kasschau, R.A. (2000), Glencoe Understanding Psychology. Missouri: Gelncoe Partners.
[109] Lodi-Smith, J., Rodgers, J. D., Cunningham, S. A., Lopata, C., & Thomeer, M. L. (2019). Meta-analysis of Big Five personality traits in autism spectrum disorder. *Autism*, *23*(3), 556-565.
[110] Balkis, M., & Isiker, G. B. (2005). The relationship between thinking styles and personality types. *Social Behavior and Personality: an international journal*, *33*(3), 283-294.

[111] Scroggins, W. A., Thomas, S. L., & Morris, J. A. (2009). Psychological testing in personnel selection, part III: The resurgence of personality testing. *Public Personnel Management*, *38*(1), 67-77.
[112] Nielsen, M. B., Glasø, L., & Einarsen, S. (2017). Exposure to workplace harassment and the Five Factor Model of personality: A meta-analysis. *Personality and individual differences*, *104*, 195-206.
[113] Goldberg, L. R. (1992). The development of markers for the Big-Five factor structure. *Psychological assessment*, *4*(1), 26.
[114] Digman, J. M. (1990). Personality structure: Emergence of the five-factor model. *Annual review of psychology*, *41*(1), 417-440.
[115] Erdle, S., Gosling, S. D., & Potter, J. (2009). Does self-esteem account for the higher-order factors of the Big Five?. *Journal of Research in Personality*, *43*(5), 921-922.
[116] Nielsen, M. B., Glasø, L., & Einarsen, S. (2017). Exposure to workplace harassment and the Five Factor Model of personality: A meta-analysis. *Personality and individual differences*, *104*, 195-206.

term ‘personality’ while at the same time it incorporates and systematises diverse conceptions and measures. This makes the five-factor model of personality very valuable to the field of management and organisational studies. Therefore, the focus of this monograph is on the five-factor model of general personality, which consists of the five broad domains:[117]

f) extraversion (vs. introversion)
g) neuroticism (emotional instability vs. stability)
h) openness (vs. closeness or unconventionality)
i) agreeableness (vs. antagonism)
j) conscientiousness (vs. disinhibition)

There has been a fairly good debate about the number of the personality dimensions that the five-factor model should consist of. At the same time, there was less agreement about the meaning of each dimension. For instance, authors like Guilford and Zimmerman proposed friendliness as a primary trait dimension[118], while Fiske suggested conformity (to social norms) to be an individual personality dimension[119]. Later in the theoretical development of the FFM, these suggested ‘dimensions’ became part of the personality dimension of ‘agreeableness’. Likewise, the dimension of openness was firstly perceived as ‘intelligence’. This was due to the fact that the term ‘openness’ combines more diverse personality traits than just intelligence. For example, the name openness refers to (i.e., openness to feelings and to new ideas, flexibility of thought, and readiness to indulgence in fantasy). Although, the wide application of the five-factor model in the academic literature, Goldberg was the first one to apply the model to research questionnaires.[120] The aim of the questionnaires consisting of the five-factor model of personality traits was to provide an analysis of rating scales to measure the judgements of others such as to what degree is person X brave, friendly etc. Questionnaire is the most appropriate tool for data collection in the context of the big-five personality traits because the findings in

[117] Widiger, T. A., & Crego, C. (2019). The Five Factor Model of personality structure: an update. *World Psychiatry*, *18*(3), 271.
[118] Guilford, J. P., Shneidman, E. S., & Zimmerman, W. S. (1949). The Guilford-Shneidman-Zimmerman Interest Survey. *Journal of consulting psychology*, *13*(4), 302.
[119] Fiske, D. W. (1949). Consistency of the factorial structures of personality ratings from different sources. *The Journal of Abnormal and Social Psychology*, *44*(3), 329.
[120] Digman, J. M. (1994). Child personality and temperament: Does the five-factor model embrace both domains. *The developing structure of temperament and personality from infancy to adulthood*, 323-338.

the academic literature show that other methods like observation for instance are not reliable as they might be distorted for many reasons.

In fact, the five-factor model of personality is 'an empirical generalisation about the covariation of personality traits'[121]. However, it's a common mistake that the five-factor model is a theory of personality. Yet, the FFM employs the basic doctrines of trait theory which refer to the idea that people can be categorised based on relatively enduring patterns of thoughts, feelings and behaviour[122]. The trait perspective and the phycological theory are based on the assumptions about the nature of the people. The FFM of personality accepts four assumptions: knowability, rationality, variability and proactivity[123]. Knowability is the assumption that it is appropriate science to study and categorise one's personality. This contradicts with some humanistic and existential theories which emphasis on uniqueness of individuals, which according to them cannot be generalisable. Rationality is the next assumptions which promotes the idea that despite the bias and errors people are capable to understand themselves and others, which distinguishes psychology from other sciences. For example, a physician would never ask their patients to calculate their red blood cell count, because they are not capable to access such information by themselves. In contrast, a psychologist can ask their clients or patients about their level of sociability, assertiveness etc.

Nevertheless, the five-factor model is not purely folk psychology as in contrast to the lay understanding that relies mainly on intuition and instinct, the FFM aims to provide explanation about the genotypic level and its operations. Intuition can help people to 'sense' some outstanding personality traits of others, but they lack to provide scientific explanation about their heritability, lifespan developmental course or evolutionary significance. The third assumption of variability proclaims that people differ from each other in psychologically significant means. This position differentiates the trait theory from other psychological and philosophical theories that are interested to find a single answer to the questions related to the human nature[124]. For example, if we seek to answer the simple question if someone is lazy or hard-working, such questions will be inappropriate in the case of the FFM which uses these

[121] McCrae, R. R., & Costa Jr, P. T. (2008). The five-factor theory of personality.
[122] Digman, J. M. (1994). Child personality and temperament: Does the five-factor
[123] Hjelle, A. L., & Ziegler, D. (1976). Personality: Basic Assumptions, Research and Applications.
[124] McCrae, R. R., & Costa Jr, P. T. (2008). The five-factor theory of personality.

two traits as polars of the same dimensions according to which the personality profile of individuals varies.

The last assumption of proactivity is related to the idea that human beings are not complete masters of their destiny. However, the level of control that they apply to their lives is another significant factor that distinguishes them. The eternal philosophical question about the role of destiny and the free has still not been answered. Yet, the FFM highlights on the importance of personality, which is the main factor that determines our life. Moreover, the FFM of personality rejects the idea that people are passive victims of their life circumstances or empty organisms programmed by histories of reinforcement.[125] An important note that must be made here is that there is a significant difference between the proactivity of personality and the proactivity of the individual. It's explained through the difference between tendencies (personality) and goals (individual activity).

2.2.1 A universal personality system

Personality traits are separate distinctive variables. If one seeks to comprehend them, it is compulsory to portray personality itself. Therefore, we can describe the five-factor model as a personality system.[126] The personality system contains of components and interrelation between these components, known also as dynamic processes. As it can be seen on the figure below introduced by McCrae and Costa there are five categories that form the personality system[127]. The first one is the basic tendencies which are biologically prepositioned. This category reflects the dimensions of the five-factor model of personality, which are neuroticism, extraversion, openness, agreeableness and conscientiousness. The second one is the characteristic adaptation such as culturally conditioned phenomena, attitudes and personal striving. This third category is the objective biography such as emotional reactions, mid-career shifts and behaviour. The fourth category refers to the self-concept like self-schemas and personal myths. Last but not least, the fifth category is related to the external influences like cultural norms, life events and situation. As it can be seen all the five factors are interconnected through dynamic and complex relationships.

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[125] McCrae, R. R., & Costa Jr, P. T. (2008). The five-factor theory of personality.
[126] Mayer, J. D. (1998). A systems framework for the field personality. *Psychological Inquiry*, *9*(2), 118-144.
[127] McCrae, R. R., & Costa Jr, P. T. (2008). The five-factor theory of personality.

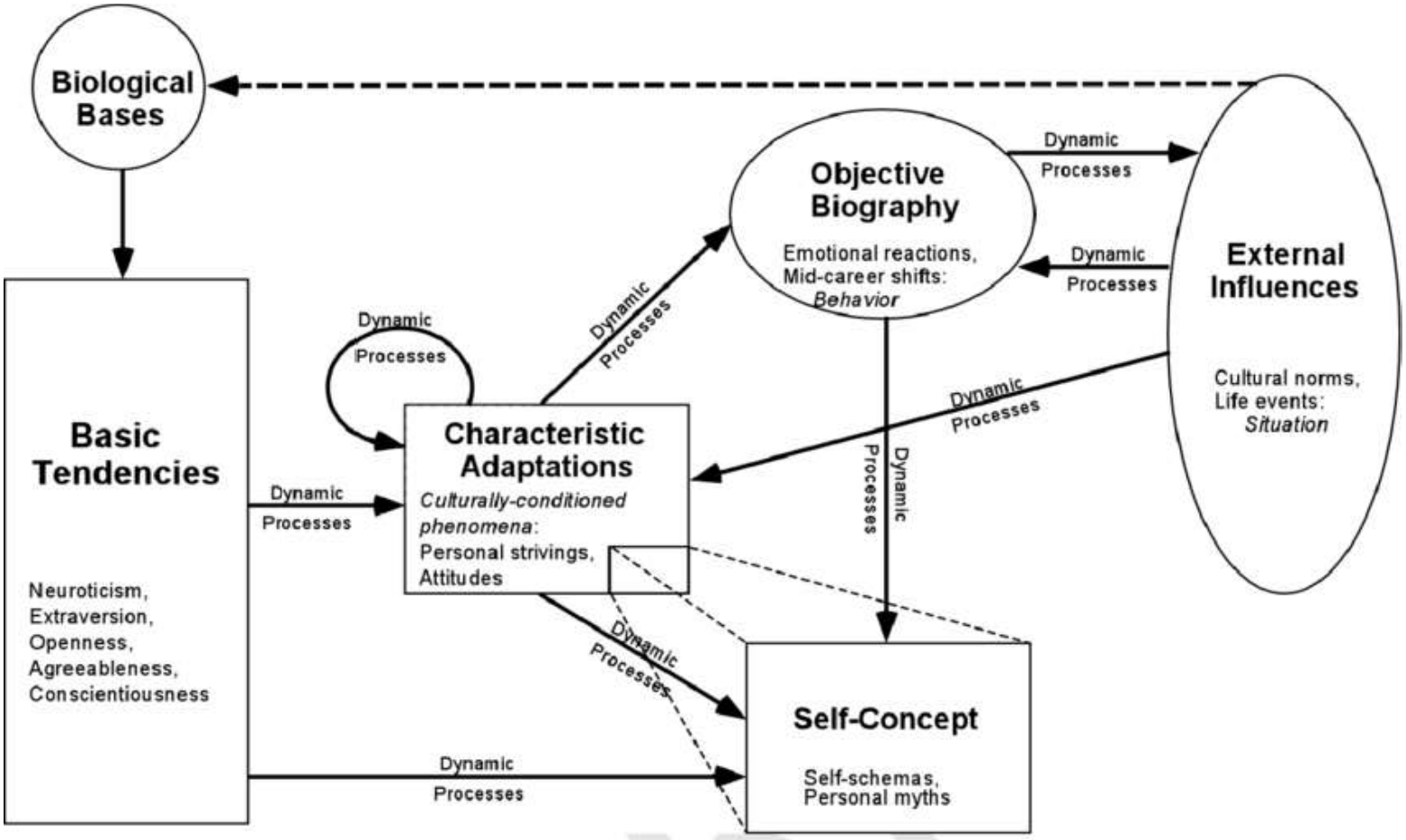

Figure 2 A representation of the five-factor theory personality systems. *Source: Laher (2013)*[128]

[128] Laher, S. (2013). Understanding the five-factor model and five-factor theory through a South African cultural lens. *South African Journal of Psychology*, *43*(2), 208-221.

Basic trndencies	Characteristic adaptation
Neuroticsm - Depresssion (a tendency to experience dysphoric effect – sadness, hopelessness, guilt)	Low self-esteem, irrational perfectionistic beliefs, pessimistic attitudes
Extraversion Gregariousness (a preference for companionship and social stimulation)	Social skills, numerous friendships, enterprising vocational interests, participation in sports, club memberships
Openess (to experience) Actions (a need for variety, novelty, and change)	Interest in travel, many different hobbies, knowledge of foreigh cuisine, diversional vocational interets, friends who share tastes
Agreeableness Compliance (a willingness to defer to others during interpersonal conflict)	Forgiving attitudes, belief in cooperation, inoffensive language, reputation as a pushover
Conscientiousness Achievement Striving (strong sense of purpose and high aspiration levels)	Leadership skills, long-term plans, organised support network, technical expertise

Table 1. Example of FFT Personality System Componen. (Source: own table based on Allik & McCrae, 2002[129]).

2.2.2 Neuroticism

Neuroticism is a dimension of the personality related to the emotional life of a person[130]. In fact, this personality dimension is mainly associated with negative emotions and intense emotional reactions to both minor challenges and little emotional reaction to significant difficulties[131]. High score on neuroticism is an indicator of negative emotions such as fear,

[129] Allik, J., & McCrae, R. R. (2002). A five-factor theory perspective. In *The five-factor model of personality across cultures* (pp. 303-322). Springer, Boston, MA.
[130] Roslan, S., Hasan, S., Zaremohzzabieh, Z., & Arsad, N. M. (2021). Big Five Personality Traits as Predictors of Systems Thinking Ability of Upper Secondary School Students. *Pertanika Journal of Social Sciences & Humanities*, *29*.
[131] Lahey, B. B. (2009). Public health significance of neuroticism. *American Psychologist*, *64*(4), 241.

anger, anxiety, embarrassment, sadness, guilt and disgust, uncertainty avoidance[132]. These emotions increase the level of stress, which means people having a high level of neuroticism are not likely to make rational decisions and handle with stressful situations. A low level of neuroticism indicates emotional stability, calmness and ability to face stressful situation without being upset and irrational. Previous studied identified a negative relationship between a high level of neuroticism and job performance[133]. Discussing the potential impact of neuroticism on systems thinking, we must take into consideration systems thinking is the fifth discipline of the learning organization promoted by Senge. Learning cannot occur without change, and in business management systems thinking is used as a tool to deal with complex situations characterised by a high level of uncertainty[134]. Thus, it is logical to presume that individuals, who avoid stressful and uncertain environments, are less likely to be able to deal with crisis and environmental dynamics. Moreover, people scoring high on neuroticism are not likely to fit in the concept that managers need to 'choose' rather than to 'predict'[135]

Hypothesis 1: Neuroticism has a negative influence on systems thinking.

2.2.3 Extraversion

A stable extraversion is the personality trait that is directly associated with happiness and enjoyable interaction with others[136]. More importantly a high level of extraversion makes individuals to feel comfort while communicating with others. In fact, it is the personality dimension that is the most easily identified as well as the most popular one[137]. Literature findings propose that the level of extraversion can be measured through behaviours such as: talkativeness, activeness, assertiveness, leadership, cheerfulness, communication, optimism, being outgoing and energetic, ambition, gregariousness, surgency and sociability[138].

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[132] Tackett, J. L., & Lahey, B. B. (2017). Neuroticism.
[133] Rothman, S., & Coetzer, E. (2003). The Big Five Sector of Pakistan. *Journal and Development*, *2*, 150-158.
[134] Ison, R. (2017). *Systems Practice: How to Act: In situations of uncertainty and complexity in a climate-change world*. London: Springer London.
[135] Gharajedaghi, J. (2011). *Systems thinking: Managing chaos and complexity: A platform for designing business architecture*. Elsevier.
[136] Fadda, D., & Scalas, L. F. (2016). Neuroticism as a moderator of direct and mediated relationships between introversion-extraversion and well-being. *Europe's journal of psychology*, *12*(1), 49.
[137] McCrae, R. R., & Costa Jr, P. T. (2008). The five-factor theory of personality.
[138] Syed, N., Saeed, A., & Farrukh, M. (2015). Organization commitment and five factor model of personality: Theory recapitulation. *Journal of Asian Business Strategy*, *5*(8), 183-190.

Furthermore, extroverted personalities are energetic, optimistic and more likely to be entrepreneurial. A low score in extroversion, known as introversion, is associated with behaviour traits like reservedness, independence and even paced[139]. According to Gharajedaghi (2011) and Senge (2006) interactions and optimism are key elements of systems thinking. As already explained earlier in this chapter, the emergent property principle introduced by Gharajedaghi (2011) emphasises on the importance of the quality of interactions between elements (i.e. people), which according to him overweight the significance of the quality of the elements themselves. Moreover, people that scored high on extroversion are more likely to be entrepreneurs or pioneers, compared to those who do not [140], because they are more adaptive and risk taking. Therefore, there might be a positive relationship between systems thinking and extraversion.

Hypothesis 2: Extraversion has a positive impact on systems thinking.

2.2.4 Openness

Openness to experience is a dimension that refers to traits like active imagination, intellect, open-mindedness, exploration , intellectual curiosity, independence of judgements, aesthetic sensitivity, preference for variety, and attentiveness to inner feelings[141]. People having a higher score in openness tend to be creative, unconventional thinkers, adventurous and brave to explore opportunities[142]. In contrast, individuals scoring low on openness are more likely to exhibit a traditional, conservative and conventional outlook[143]. In addition, individuals, scoring high in openness, are more likely to think 'out of the box', to be receptive of new ideas and to look for novel solutions to complex problems. According to Naveh, Katz-

[139] Rothman, S., & Coetzer, E. (2003). The Big Five Sector of Pakistan. *Journal and Development*, *2*, 150-158.
[140] Brandstätter, H. (2011). Personality aspects of entrepreneurship: A look at five meta-analyses. *Personality and individual differences*, *51*(3), 222-230.
[141] McCrae, R. R., & Costa Jr, P. T. (2008). The five-factor theory of personality.
[142] Erdheim, J., Wang, M., & Zickar, M. J. (2006). Linking the Big Five personality constructs to organizational commitment. *Personality and individual differences*, *41*(5), 959-970.
[143] Schwaba, T., Luhmann, M., Denissen, J. J., Chung, J. M., & Bleidorn, W. (2018). Openness to experience and culture-openness transactions across the lifespan. *Journal of Personality and Social Psychology*, *115*(1), 118.

Navon and Stern when an individual has a high score on openness to experience, they do not need to be encouraged to' learn' and to 'explore'[144]. Therefore, it is reasonable to presume that openness to experience has a positive influence on systems thinking, which is directly related to creativity, design and learning[145]. As proposed by Senge a key aspect of learning is learning from failures, when mistakes are perceived as an opportunity for growth and development[146].

Hypothesis 3: Openness has a positive influence on systems thinking.

2.2.4 Agreeableness

Agreeableness is the fourth dimension of the personality model, which is characterised with the following traits: sympathy, altruism to others, well mannered, caring, kind, collaborative, loyal, friendly, cooperative, understanding and patient[147]. Individuals who score low in agreeableness are critical, competitive, sceptical, egocentric and showing condescending behaviour[148]. In contrast, individuals that score high on agreeableness are sympathetic, warm, friendly, generous and considerate. Managers scoring low on agreeableness demonstrate a high level of egoism and disrespect toward others[149]. When it comes to the employees with the same result, it is evident that they are not able to work effectively within a team and to pursue collective goals. Hence, it is reasonable to suppose that a high level of agreeableness has a positive influence on systems thinking which lays emphasis on the effective teamwork. The principle of emergent properties introduced by Gharajedaghi puts the accent on the quality of interactions for not only achieving assets such as success and happiness, but also for maintaining them. In fact, the main challenge that organisations have

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[144] Naveh, E., Katz-Navon, T., & Stern, Z. (2015). Active learning climate and employee errors: The moderating effects of personality traits. *Journal of Organizational Behavior*, *36*(3), 441-459.
[145] Bell, B. S., & Kozlowski, S. W. (2008). Active learning: effects of core training design elements on self-regulatory processes, learning, and adaptability. *Journal of Applied psychology*, *93*(2), 296.
[146] Senge, P. M. (2014). Creating the schools of the future: Education for a sustainable society. In *Creating a Sustainable and Desirable Future: Insights from 45 global thought leaders* (pp. 321-329).
[147] Zufferey, P., Caspar, F., & Kramer, U. (2019). The role of interactional agreeableness in responsive treatments for patients with borderline personality disorder. *Journal of personality disorders*, *33*(5), 691-706.
[148] Widiger, T. A. (2015). Assessment of DSM–5 personality disorder. *Journal of Personality Assessment*, *97*(5), 456-466.
[149] De Vries, R. E., De Vries, A., De Hoogh, A., & Feij, J. (2009). More than the Big Five: Egoism and the HEXACO model of personality. *European Journal of Personality*, *23*(8), 635-654.

been facing for the past decades, is not related to obtaining success but to sustaining it. Sustainable organisational success is a key form of competitive advantage resulting from learning, adaptation and change[150]. The literature review indicates that it is reasonable to suppose that agreeableness has a positive impact on systems thinking.

Hypothesis 4: Agreeableness has a positive influence on systems thinking.

2.2.5 Conscientiousness

Conscientiousness is a dimension referring to self-control, well-structured, ambition, punctuality, efficiency, planning, organising and carrying out task[151]. People, who are conscientious, tend to be strong-willed, determined and purposeful. Conscientiousness also relate to achievement orientation, hardworking persistency, responsibility, carefulness, orderliness. Moreover, individuals with a high level of conscientiousness are independent and able to take responsibility of their mistakes. Therefore, such individuals are more likely to learn from their mistakes and consequently to correct them, which is strongly related to the systems thinking principle. However, a high level of conscientiousness is associated with workaholic, compulsive, annoying or even fastidiousness behaviour. Individuals with a low score on conscientiousness are lazy, procrastinating, aimless, and disorganized[152]. Although, this does not mean that such individuals lack moral principles, they are not strict in applying these morals[153]. Examining the last dimension of the five-factor model though the theoretical lenses of systems thinking, it is reasonable to propose that a high level of the conscientiousness personality dimension has a negative impact on systems thinking. Systems thinking requires

[150] Arsawan, I. W. E., Koval, V., Rajiani, I., Rustiarini, N. W., Supartha, W. G., & Suryantini, N. P. S. (2020). Leveraging knowledge sharing and innovation culture into SMEs sustainable competitive advantage. *International Journal of Productivity and Performance Management*.
[151] Lewis, G. J., Dickie, D. A., Cox, S. R., Karama, S., Evans, A. C., Starr, J. M., ... & Deary, I. J. (2018). Widespread associations between trait conscientiousness and thickness of brain cortical regions. *Neuroimage*, *176*, 22-28.
[152] Lewis, G. J., Dickie, D. A., Cox, S. R., Karama, S., Evans, A. C., Starr, J. M., ... & Deary, I. J. (2018). Widespread associations between trait conscientiousness and thickness of brain cortical regions. *Neuroimage*, *176*, 22-28.
[153] Rothman, S., & Coetzer, E. (2003). The Big Five Sector of Pakistan. *Journal and Development*, *2*, 150-158.

risk-taking, unconventional thinking and well-developed intuition[154]. In contrast, a high level of conscientiousness is associated with a high level of responsibility, sticking to established structure and plan, and risk avoidance.

Hypothesis 5: Conscientiousness has a negative impact on systems thinking.

[154] Senge, P. M. (2006). *The fifth discipline: The art and practice of the learning organization*. Currency.

	Neuroticism	Extraversion	Openness	Agreeableness	Conscientiousness
High level	anger fear sadness guilt embarrasment anxiety disgust depression	happiness talkativeness assertiveness leadership cheerfulness optimism communication adaptiveness risk-taking sociability	intuituon active imagination intellect open-mindedness exploration intellectual curiosity independence of judgements aesthetic sensitivity preference for variety unconventional thinking	sympathy altruism to others well mannered caring kindness collaboration loyalty friendliness cooperation understanding patience warmness generosity	self-control well-structured ambitious punctual planning organising carrying out tasks purposefulness hardworking strong-willed determination Resposibility achievement-oriented
Low level	emotional stability calmness ability to face stressful situatios without being irrational or upset	introversion, reservedness independence unadaptiveness less risk-taking even-paced	conservativeness conventional outlook traditionalism rigidness closeness scepticism	criticism competition scepticism egocentric condescending behaviour	lazy procrastinating aimless and disorganized lack of stricktness in application of morals

Table 2. The big five personality trait dimension. (Source: own table based on secondary finding).

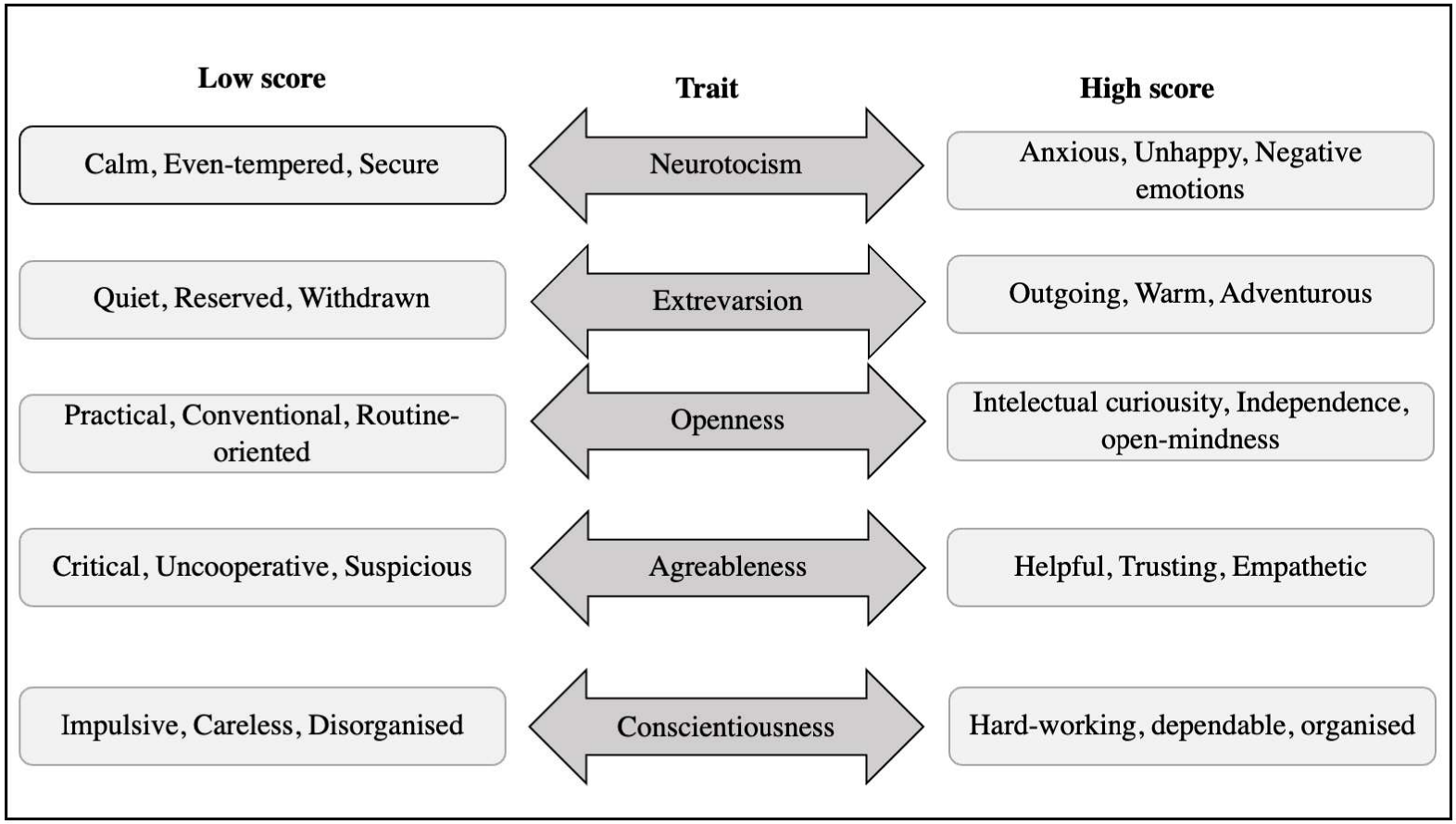

Figure 3 The high and lows of the big five personality dimensions. (Own table: based on the literature revirew).

2.3 Organisational culture

The first question that arises when the term 'organisational culture' is introduced is related to whether there is a legitimacy in transferring the concept of culture to organisations[155].Organisational culture is defined in the literature as a 'collection of traditions, values, policies, beliefs and attitudes that establish a pervasive context for everything individuals do and think in an organisation'[156]. The features of the definition of organisational culture suggests that organisations might have different forms of culture based on "beliefs, ideology, language, ritual, and myth"[157]. Several approaches have been used to describe the culture of organisations. The most outstanding ones are the holistic approach of Schein and the fragmentistic one of Hofstede. The holistic approach mainly represented by Schein proposes the idea that the organisational culture has two layers, one visible and one invisible. The visible one is related to external buildings, clothing, language, regulations, behaviour modes etc. [158]The invisible layer is related to common values, assumptions, norms and faith[159]. When it comes to the fragmentistic approach, which is mainly associated with the work of Hofstede introduces the idea that organisational culture is influenced by forces and depends on the basis of values that were shaped by the surrounding society. According to him, decisive factors were related to the social allocation of power, how uncertainty was handled, the relationship between the individual and their community, gender roles and time orientations[160].

The figure below summarises the dimensionalisation of the organisational culture, introduced by Hofstede. As it can be seen from the figure, Hofstede proses five categories determining the cultural differences:

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[155] Berkemeyer, N., Junker, R., Bos, W., & Müthing, K. (2015). Organizational cultures in education: Theory-based use of an instrument for identifying school culture. *Journal for Educational Research Online*, *7*(3), 86.
[156] Mullins, L. J., & McLean, J. E. (2019). *Organisational behaviour in the workplace*. Harlow: Pearson.
[157] Pettigrew, A. M. (1979). On studying organizational cultures. *Administrative science quarterly*, *24*(4), 570-581, p. 572.
[158] Schein, E. H. (1990). Organizational Culture: What it is and How to Change it. In *Human resource management in international firms* (pp. 56-82). Palgrave Macmillan, London.
[159] Schein, E. H. (1990). *Organizational culture* (Vol. 45, No. 2, p. 109). American Psychological Association.
[160] Berkemeyer, N., Junker, R., Bos, W., & Müthing, K. (2015). Organizational cultures in education: Theory-based use of an instrument for identifying school culture. *Journal for Educational Research Online*, *7*(3), 86.

1. Masculinity vs. femininity
2. Long-term vs. short-term orientation
3. Power distance
4. Uncertainty avoidance
5. Individualism vs. collectivism

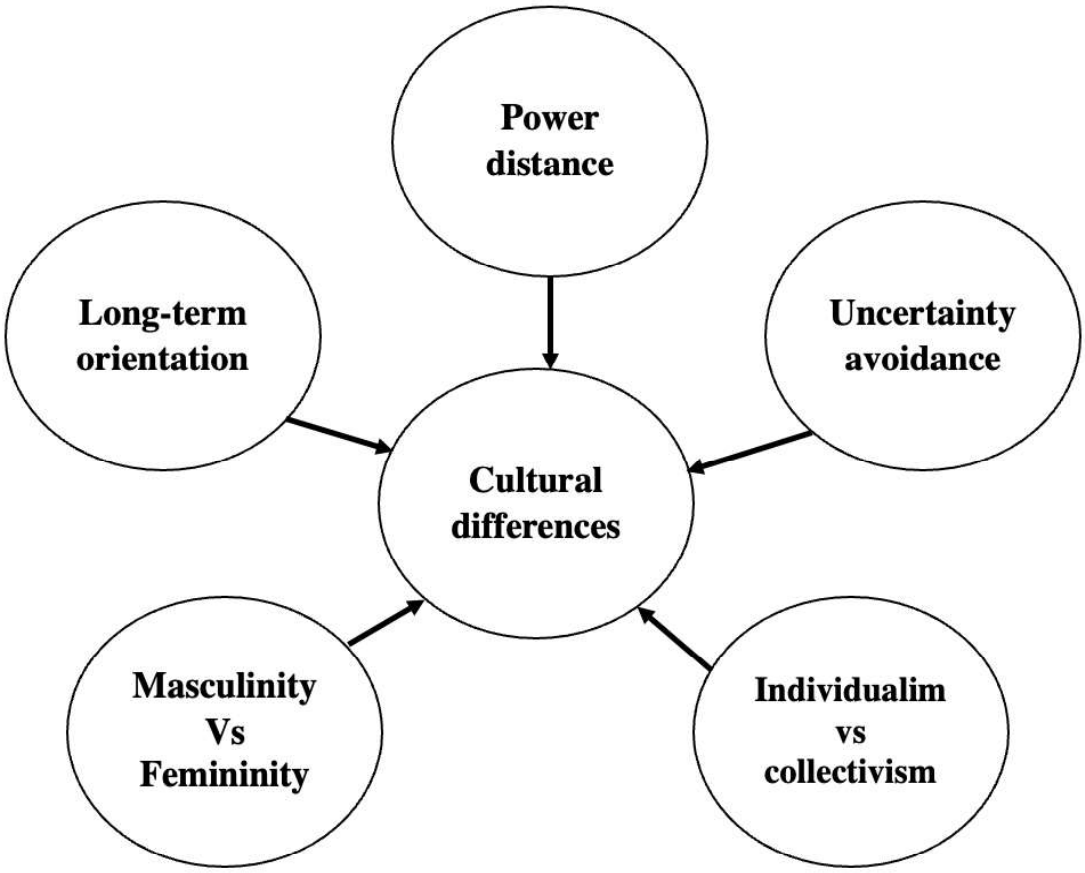

Figure 4 Hofstede's categorisation of organisational culture. (Source: own table based on the findings of the literature review[161]).

Another categorisation of culture is promoted by Aragon, who categorises the organisational culture as positive or negative[162]. A positive culture involves values, beliefs and behaviours, which are built by effective leaders. Furthermore, such leaders should also build a

[161] Hofstede, G. (2011). Dimensionalizing cultures: The Hofstede model in context. *Online readings in psychology and culture*, *2*(1), 2307-0919.
[162] Aragon, R. (1993). Positive organizational culture: A practical approach. *FBI L. Enforcement Bull.*, *62*, 10.

solid foundation, which allows them to foster truly loyal employees with high moral. Moreover, Aragon also draws our attention to the fact that a positive organisational culture is also related to motivation as it is associated with employee's willingness for expending effort to complete tasks. The role of leaders and managers is essential for implementing a positive organisational culture exactly like it is essential for the implementation of systems thinking. Their management style must be oriented toward influencing, coaching, advising and encouraging rather than punishing, controlling and directly managing[163]. Positive organisational culture requires leaders to make employees engaged in the process of determining the organisational goals.

Number of authors like Pors and Cameron and Quinn introduce another approach related to the organisational 'beliefs and views' about the 'right' way for achieving success, which determines their orientation[164]. Therefore, Pors argues that there are four types of organisational culture[165]: The Family, Open Systems, Hierarchical, and the Market culture[166]. As can be observed by the table below, all four typology types are impacted by four factors: orientated toward change, orientated toward stability, external and internal factors. This categorization of the organisational culture is used in this study to give more awareness and detailed information for the variety of organisational cultures and their characteristics, but this is not a form of measure for it. The 'Clan or the Family's culture is associated with family feelings, mentoring, caring, and helpful leadership style. Employees have cooperative and participating orientation, the glue is built on loyalty and trust. The criteria for the success of such cultures are human development and staff perceiving that they are appreciated and cared for.

Such organisational cultures are opposite to the innovative and risk-oriented ones[167]. Adhocracy and Open Systems Culture is associated with innovations, entrepreneurship, dynamics and willingness to take risk. Leadership is also risk and innovation orientated.

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[163] Aragon, R. (1993). Positive organizational culture: A practical approach. *FBI L. Enforcement Bull.*, *62*, 10., p.11

[164] Cameron, K. S., & Quinn, R. E. (2011). *Diagnosing and changing organizational culture: Based on the competing values framework*. John Wiley & Sons.

[165] Pors, N. O. (2008). Management tools, organisational culture and leadership: an explorative study. *Performance Measurement and Metrics*.

[166] Fard, H. D., Rostamy, A. A. A., & Taghiloo, H. (2009). How types of organisational cultures contribute in shaping learning organisations. *Singapore management review*, *31*(1), 49-61.

[167] Fard, H. D., Rostamy, A. A. A., & Taghiloo, H. (2009). How types of organisational cultures contribute in shaping learning organisations. *Singapore management review*, *31*(1), 49-61.

Employees have freedom to be innovative and are encouraged to contribute in a special and visible way. The criteria of success are development of unique services and being on the forefront of the development. The 'Market' culture refers to competition, results and achieving of goals and objectives. As the focus is external, the criteria of success are the percentage of the market penetration and increasing user base by satisfying users. The 'Hierarchical' culture is characterised with structure, predictability, formal rules, policies and control. Leadership style is coordinative, organised and emphasised efficiency. Strategic goals are orientated toward stability. The criteria for the success are trustworthiness, effectiveness and efficiency[168].

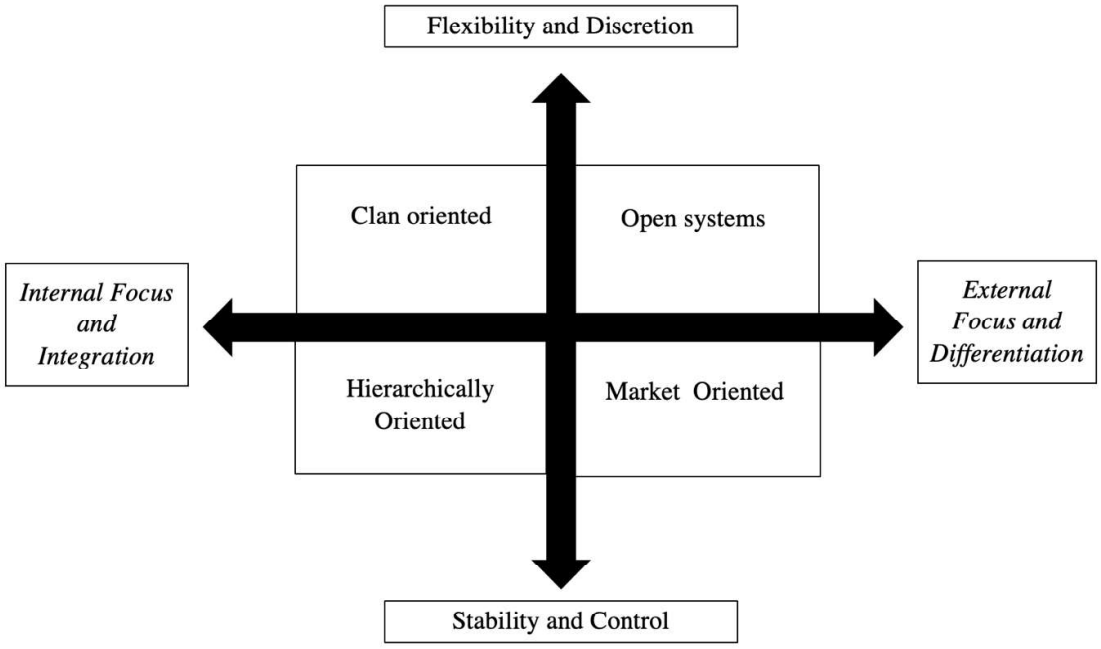

Figure 5 The competing values framework by Cameron and Quinn (Source: Own table based on Berkemeyer et al., (2015).[169]

[168] Fard, H. D., Rostamy, A. A. A., & Taghiloo, H. (2009). How types of organisational cultures contribute in shaping learning organisations. *Singapore management review*, *31*(1), 49-61.
[169] Berkemeyer, N., Junker, R., Bos, W., & Müthing, K. (2015). Organizational cultures in education: Theory-based use of an instrument for identifying school culture. *Journal for Educational Research Online*, *7*(3), 86.

	Oriented toward change		
	The Clan or the Family: Staff orientation, human relations: Personal and warm Caring Loyalty and tradition Cohesiveness and morale Equality and group orientation	**Adhocracy and Open Systems:** Innovations and entrepreneurship: Dynamic and risk oriented Innovation and development Growth and resource acquirement	
Internal focus	**Hierarchical:** Processes: Rules procedures and efficiency: Formalised and structured Rule oriented Standards and procedures Stability	**The Market Culture:** Rationality, rational models and market: Fulfilment of goals and market orientation: Production oriented Pursue goals and objectives Task oriented Competition and results	**External focus**
	Oriented toward stability		

Table 3 A typology of organisational cultures. (Source: Own table based on Pors[170], 2008:142).

[170] Pors, N. O., 2008. Management tools, organisational culture and leadership: an explorative study. Performance Measurement and Metrics, 9(2), p.142.

If we presume that organisations are living organisms, then culture is their 'character' or 'personality' that determines their behaviour. Field leaders such as Hofstede describes culture also as a 'a shared mental software of the people in an organization".[171] Moreover, scientific research indicates a relationship between certain types of organisational culture and effective organisational performance[172]. Chatman and O'Reilly argue that culture is one of the top three values impacting the company's value[173] based on a recent survey with a participation of 1000 CEOs and CFOs[174]. This is explained with the fact that culture can be both beneficial or detrimental for organisations and their performance. There are several reasons that inspire this study to test the potential relationship between organisational culture and systems thinking. First, according to Kayas, McLean, Hines and Wright argue that organisational culture is something that organisations possess and is given to people when they join[175]. Second, if organisational culture is the 'personality' of the company then it reasonable to make a hypothesis that organisational culture has a relationship on systems thinking. Last, there has been identified a relationship between some organisational culture types and organisational performance[176]. Thus, it is reasonable to make a hypothesis that a positive organisational culture has a positive impact on systems thinking.

Hypothesis 6: A positive organisational culture positively impacts systems thinking.

[171] Chatterjee, A., Pereira, A., & Bates, R. (2018). Impact of individual perception of organizational culture on the learning transfer environment. *International Journal of Training and Development*, *22*(1), 15-33.
[172] Lorsch, J. W., & McTague, E. (2016). Culture is not the culprit. *Harvard Business Review*, *94*(4), 21.
[173] Chatman, J. A., & O'Reilly, C. A. (2016). Paradigm lost: Reinvigorating the study of organizational culture. *Research in Organizational Behavior*, *36*, 199-224.
[174] Graham, J. R., Harvey, C. R., Popadak, J., & Rajgopal, S. (2017). *Corporate culture: Evidence from the field* (No. w23255). National Bureau of Economic Research.
[175] Kayas, O. G., McLean, R., Hines, T., & Wright, G. H. (2008). The panoptic gaze: Analysing the interaction between enterprise resource planning technology and organisational culture. *International journal of information management*, *28*(6), 446-452.
[176] Chatman, J. A., & O'Reilly, C. A. (2016). Paradigm lost: Reinvigorating the study of organizational culture. *Research in Organizational Behavior*, *36*, 199-224.

2.4 Research gap

Although, the five-factor model is the leading personality structure model, it has been criticised for being too general to predict important work and life outcomes (Erdle, Gosling & Potter, 2009). Yet, there is significant empirical evidence proving that the FFM is capable to predict important life outcomes, both positive and negative.[177][178] The literature search shows that there are recent studies that examine the relationship between the big-five personality model and systems thinking[179][180], but they are either focusing on secondary school students or system engineers. Moreover, Roslan et., al. (2021) suggest that their findings are valid only for young people and children. There are not prior studies that examine the relationship between systems thinking and the big five personality traits in the context of management. However, this does not due to a lack of research interest among scholars, as the academic works that examine the factors impacting systems thinking are recent from 2021. Perhaps, the pandemic of Covid-19 together with the ongoing economic and political crisis have drawn academic attention on the predetermining factors impacting systems thinking. In the past, more effort was spent on identifying and proving the organisational advantages that systems thinking has to offer. Nowadays, this is already proven by a large amount of academic research. Therefore, it is not surprising that just recently scholars started to be more concerned about what determines whether individuals owe and do not owe systems thinking ability.

When it comes to the link between systems thinking and the organisational culture, the research gap is even bigger. Generally, organisational culture and its impact on number of things such as job performance, competitive advantage, innovation, organisational learning

[177] Ozer, D. J., & Benet-Martinez, V. (2006). Personality and the prediction of consequential outcomes. *Annu. Rev. Psychol.*, *57*, 401-421.
[178] Smith, M. M., Sherry, S. B., Vidovic, V., Saklofske, D. H., Stoeber, J., & Benoit, A. (2019). Perfectionism and the five-factor model of personality: A meta-analytic review. *Personality and Social Psychology Review*, *23*(4), 367-390.
[179] Roslan, S., Hasan, S., Zaremohzzabieh, Z., & Arsad, N. M. (2021). Big Five Personality Traits as Predictors of Systems Thinking Ability of Upper Secondary School Students. *Pertanika Journal of Social Sciences & Humanities*, *29*.
[180] Nagahi, M., Jaradat, R., Goerger, S. R., Hamilton, M., Buchanan, R. K., Abutabenjeh, S., & Ma, J. (2021). The impact of practitioners' personality traits on their level of systems-thinking skills preferences. *Engineering Management Journal*, *33*(3), 156-173.

etc., has been highly studied (i.e., Chatman and O'Reilly[181]; Alvesson and Sveningsson[182]; Katzenbach, Steffen and Kronley[183]; Lorsch and McTague[184]; Oh and Han[185]; Cho et al.,[186]. At the same time, this study has failed to identify even single academic research that examines the role of the organisational culture about the systems thinking ability of the individuals. The explanation is analogous to those about the lack of enough studies examining the relationship between the personality profile of individuals and systems thinking.

The figure below illustrates the research hypothesis made by this study.

[181] Chatman, J. A., & O'Reilly, C. A. (2016). Paradigm lost: Reinvigorating the study of organizational culture. *Research in Organizational Behavior*, *36*, 199-224.
[182] Alvesson, M., & Sveningsson, S. (2015). *Changing organizational culture: Cultural change work in progress*. Routledge.
[183] Katzenbach, J. R., Steffen, I., & Kronley, C. (2012). Cultural change that sticks. *Harvard Business Review*, *90*(7), 110-117.
[184] Lorsch, J. W., & McTague, E. (2016). Culture is not the culprit. *Harvard Business Review*, *94*(4), 21.
[185] Oh, S. Y., & Han, H. S. (2020). Facilitating organisational learning activities: Types of organisational culture and their influence on organisational learning and performance. *Knowledge Management Research & Practice*, *18*(1), 1-15.
[186] Cho, I., Kim, J. K., Park, H., & Cho, N. H. (2013). The relationship between organisational culture and service quality through organisational learning framework. *Total Quality Management & Business Excellence*, *24*(7-8), 753-768.

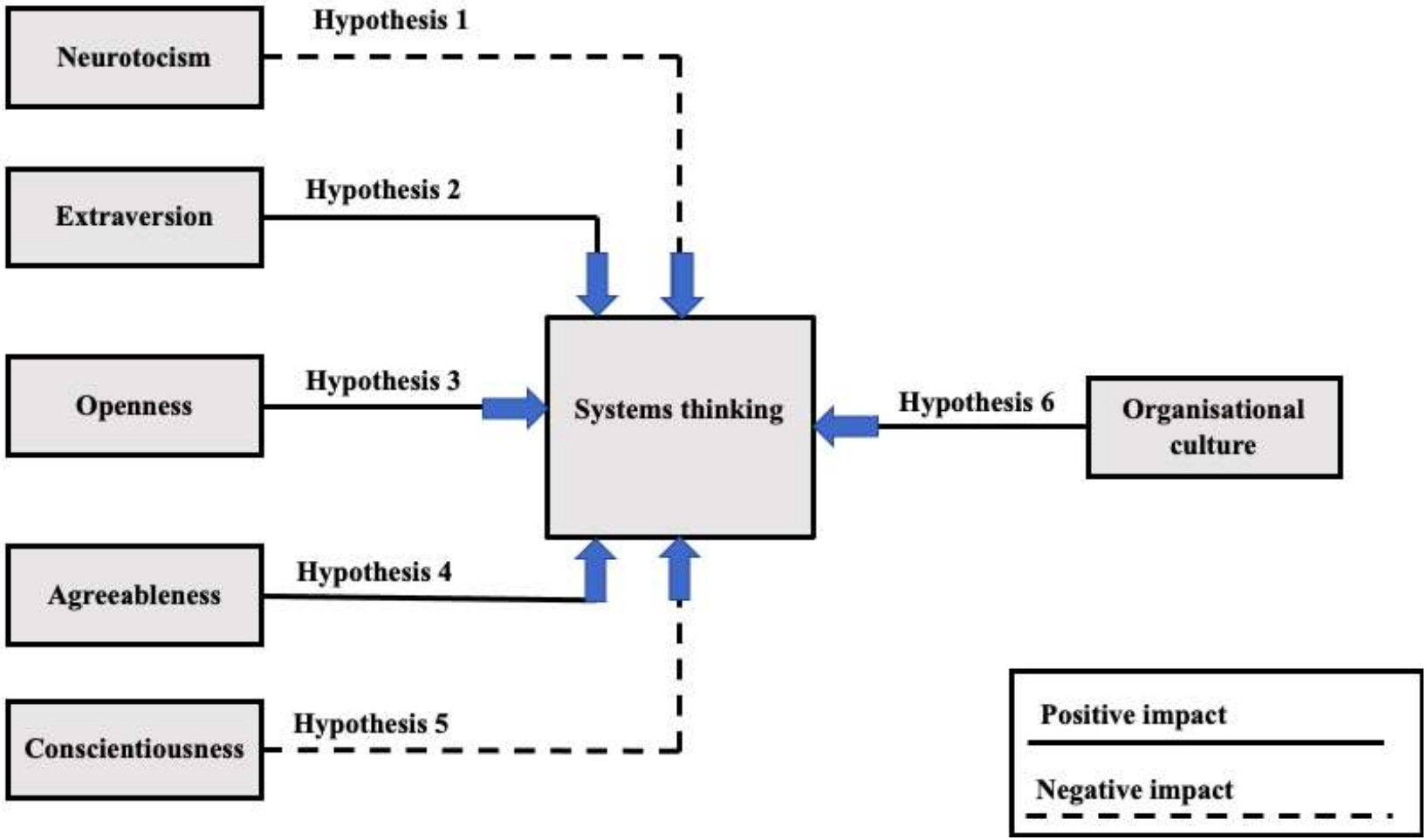

Figure 6 Research hypothesis (Source: own figure)

Chapter 3: Methodology and research design

3.1 Chapter introduction

As previously outlined, to date, there are previous studies that examine the relationship between the big five personality factor model and systems thinking. However, the findings of these academic studies are valid for either children and secondary school students only (i.e. Roslan et., al.,[187]) or systems engineers (Nagahi et al.,[188]). The search of the relevant and recent literature fails to identify any relevant studies that examine the relationship between the five-factor personality dimensions model and systems thinking in organisational and managerial context. The same is valid in the case of the relationship between organisational culture and systems thinking. The most relevant studies explore the relationship between some types of organisational culture and organisational learning. In fact, according to Senge, systems thinking is the fifth element of the learning organisation[189].

In the previous chapter, the dimensions and approaches to organisational culture were discussed in detail when the main one was outlined. As long as this monograph does not exclusively examine the relationship between organisational culture and systems thinking, the approach that was adopted as a theoretical framework was this of Pors. However, variables such as gender and age were also considered. In addition, this study collects data from participants in two countries Bulgaria and the United Kingdom in order to improve data validation and to minimise the research bias resulting from the country culture. Therefore, it is reasonable to conduct more narrow research, as the already proven the correlation between organisational culture and organisational learning is not sufficient argument to assume that automatically similar correlation exists between systems thinking and organisational culture. Thus, an original study has been designed whereas the most appropriate research methodology

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[187] Roslan, S., Hasan, S., Zaremohzzabieh, Z., & Arsad, N. M. (2021). Big Five Personality Traits as Predictors of Systems Thinking Ability of Upper Secondary School Students. *Pertanika Journal of Social Sciences & Humanities*, *29*.

[188] Nagahi, M., Jaradat, R., Goerger, S. R., Hamilton, M., Buchanan, R. K., Abutabenjeh, S., & Ma, J. (2021). The impact of practitioners' personality traits on their level of systems-thinking skills preferences. *Engineering Management Journal*, *33*(3), 156-173.

[189] Senge, P. M. (2006). *The fifth discipline: The art and practice of the learning organization*. Currency.

was adopted, described, explained and justified in this chapter. Following thins, the target population, participant selection, and country background of both England and Bulgaria have been presented. The selection of the research philosophy, strategy, method and designed will be discussed and explained in detail. Followed by the instruments adopted, and the data analytic techniques. Last but not least, this chapter ends with the ethical guidelines that were followed by this study, particularly, the General Data Protection Regulation [190]. All in all, the main objective of this chapter is to provide a foundation for the reader to comprehend the data analysis and discussion chapters.

The figure below is known as a 'research onion', introduced by Saunders, Lewis and Thornhill[191]. Basically, the figure illustrates all research choices when it comes to philosophy, approach, methodological choice, strategy, time horizon and techniques and procedures.

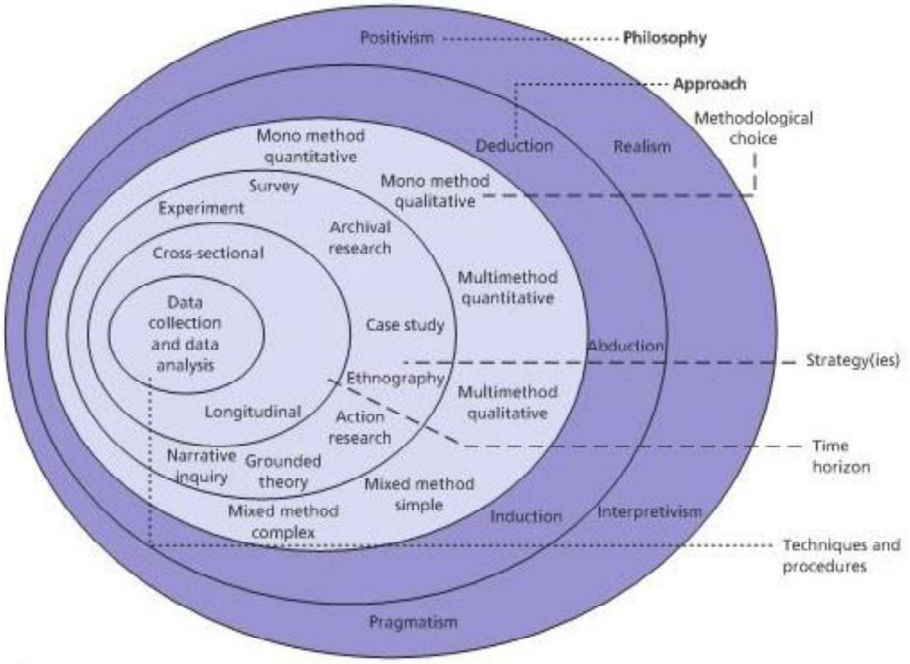

Figure 7 Research onion (Source: Saunders, Lewis & Thornhill 2012: 128[192]).

[190] GDPR. (2018). Regulation (EU) 2016/679 (General Data Protection Regulation) version OJ L 119, 04.05.2016; cor. OJ L 127, 23.5.2018. Retrieved from: https://gdpr-info.eu
[191] Saunders, M., Lewis, P., & Thornhill, A. (2012). Research methods for business students (6. utg.). *Harlow: Pearson*.
[192] Saunders, M., Lewis, P., & Thornhill, A. (2012). Research methods for business students (6. utg.). *Harlow: Pearson*.p.128

3.1 Research philosophy

The research philosophy refers basically to the nature and development of knowledge[193]. According to Creswell researchers always bring certain belief and philosophical assumptions to their research, as a result of our educational training or secondary research (reading books, journals, articles etc.)[194]. The research philosophies also known as epistemological consideration are positivism, realism, interpretivism, objectivism, subjectivism, pragmatism, functionalist, interpretive, radical humanism and radical structuralism. This study adopts the philosophy of positivism, which is also known as the philosophical stance of the natural scientist[195] [196]. In other words, the researcher is working with an observable social reality and the research findings are considered to be law-like generalisations similar to the discoveries of the physical and natural scientists[197]. According to Neuman[198] positivism sees social science as an "organized method for combining deductive logic with precise empirical observations of individual behaviour in order to discover and confirm a set of probabilistic causal laws that can be used to predict general patterns of human activity"[199].

This philosophy sees the empirical facts to be governed by laws of cause and effect rather than by personal ideas and thoughts. Moreover, the patterns of the social reality are seen as constant and unchanging[200][201].This philosophy uses 'an existing theory to develop hypothesis, whereas this hypothesis will be tested and confirmed in whole or in part'[202]. A final

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[193] Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research methods for business students*. Pearson education.
[194] Creswell, J. W. (2013). Steps in conducting a scholarly mixed methods study.
[195] Saunders, M., Lewis, P. H. I. L. I. P., & Thornhill, A. D. R. I. A. N. (2007). Research methods. *Business Students 4th edition Pearson Education Limited, England*.
[196] Bell, E., & Bryman, A. (2007). The ethics of management research: an exploratory content analysis. *British journal of management*, *18*(1), 63-77.
[197] Remenyi D., Williams B., Money A. & Swartz E. (1998), Doing Research in Business and Management, SAGE Publications, London, UK,p. 35.
[198] Neuman, W.L. (2003), "Social Research Methods: Qualitative and Quantitative Approaches" (5th ed.). Boston: Allyn and Bacon.
[199] Antwi, S. K., & Hamza, K. (2015). Qualitative and quantitative research paradigms in business research: A philosophical reflection. *European journal of business and management*, *7*(3), 217-225., p.219.
[200] Crotty, M. J. (1998). The foundations of social research: Meaning and perspective in the research process. *The foundations of social research*, 1-256.
[201] Marczyk, G., DeMatteo, D., & Festinger, D. (2005). General types of research designs and approaches. *Essentials of research design and methodology*, 123-157.
[202] Saunders, M., Lewis, P. H. I. L. I. P., & Thornhill, A. D. R. I. A. N. (2007). Research methods. *Business Students 4th edition Pearson Education Limited, England*, p.103.

key element of this philosophy is that the researcher does not affect or is not affected by the subject of the research[203]. Gill and Johnson suggest that it is likely for positivist researchers to use a highly structured methodology to simplify duplication[204]. Moreover, the accent will be on quantifiable observations, which statistically analyse the data collected[205]. The literature review of this study has provided a relative base allowing quantitative analysis to develop, disprove and support the arguments by providing a reliable data. Adopting a positivistic approach can bring some disadvantages together with the advantages, such as possible limitations and the strict requirement for the researcher to remain objective during the whole approach without bringing any personal feelings and beliefs during data collection, analysis and presenting[206].

3.2 Research approach

Literature has identified two types of research approach: deductive and inductive. This study adopts a deductive approach. Lewis defines it as a scientific research, involving development of a theory subjected to a precise test. Moreover, Robson explores five stages which through deductive research is progressed[207]:

- Deducting hypothesis refers to testing the relationship between two or more concepts or variables based on the theory.
- Describing hypothesis in a way showing how the relationship between concepts and variables will be measured.
- Testing hypothesis by implementing specific techniques.
- Examining the theory by confirming or indicating a need for modification.
- Modifying the theory based on the light of the results, is possible and needed.

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[203] Remenyi D., Williams B., Money A. & Swartz E. (1998), Doing Research in Business and Management, SAGE Publications, London, UK,p. 32.
[204] Johnson, P., & Gill, J. (2010). Research methods for managers. *Research Methods for Managers*, 1-288.
[205] Saunders, M., Lewis, P., & Thornhill, A. (2012). Research methods for business students (6. utg.). *Harlow: Pearson*.
[206] Saunders, M., Lewis, P., & Thornhill, A. (2012). Research methods for business students (6. utg.). *Harlow: Pearson*.
[207] Saunders, M., Lewis, P., & Thornhill, A. (2012). Research methods for business students (6. utg.). *Harlow: Pearson*.

Deductive approach is embodied with the following aspects. Firstly, it uses a research to explain the relationship between variables in the study. Secondly, deductive approach is based on collection quantitative data to test reliable but short-valid hypothesis, which does not exclude the usage of qualitative data. This approach also requires researcher to be independent and remain objective, despite things that they might observe during the research. Furthermore, it also requires the usage of a highly structured methodology[208]. In the case of this research, the only responsibility of the researcher is to collect the data, unlike in qualitative research when the researcher is required to participate (i.e. interviews and focus groups). The researcher is aware that deductive approach needs to be operationalised to enable facts to be measured quantitatively. Last but not least, generalisation is a specific element of the deductive approach, which emphasises on the need of sampling to support the statistical generalisations. Although, generalisation is required, it must be taken into consideration that generalising might be risky, as there are almost always exceptions[209].

3.3 Methodological choice

As already explained, this study adopts a deductive approach or hypothetico-deductive account (i.e. examining theories and hypotheses with regards to their predictive success). This methodological choice considered by Cattel to be the most dominant one in 20th century, especially when it comes to psychology[210]. Thus, many researchers testing hypotheses by adopting conventional statistical methods following the hypothetico-deductive structure[211]. In fact, this is multi-disciplinary research as it includes elements of management and organisational theories (systems thinking and organisational culture), and human resource management and psychology (the big-five factor model). Moreover, organisational theories are collection of management, sociology and psychology theories[212]. Therefore, this study uses the

[208] Johnson, P., & Gill, J. (2010). Research methods for managers. *Research Methods for Managers*, 1-288.
[209] Saunders, M., Lewis, P., & Thornhill, A. (2012). Research methods for business students (6. utg.). *Harlow: Pearson*.
[210] Cattell, R. B. (1966). The scree test for the number of factors. *Multivariate behavioral research*, *1*(2), 245-276.
[211] Haig, B. D. (2005). Exploratory factor analysis, theory generation, and scientific method. *Multivariate Behavioral Research*, *40*(3), 303-329.
[212] Martin, J. A. (2011). Dynamic managerial capabilities and the multibusiness team: The role of episodic teams in executive leadership groups. *Organization science*, *22*(1), 118-140.

quantitative research method, where the phenomena is based on numerical data and statistically analysed[213]. This method allows the examination and confirmation of theories, whereas the main goal is achieving a width of the findings.

3.4 Research strategy

Data findings of this study are based on a survey strategy, which is goes with the positivistic philosophy and the deductive approach. Moreover, this strategy is the most popular and common strategy in business and management research and is most regularly used to answer questions such as what, who, where, how much and how many[214]. This strategy is selected because it oriented toward identifying proofs surrounding attitudes and behaviours, by using a sample of identified population. The nature of the survey, used by this study, is analytical which allows the findings to be highlighted and the relationship between the different variables to be identified[215]. Choosing a survey strategy has several advantages for both collecting and analysing the research data. Firstly, as it will be explained in detail later this chapter, the target audience of this research are managers from England and Bulgaria. This is a relatively 'hard to reach' target audience. Therefore, a survey is more appropriate than conducting an interview or a focus group for example, which will require more time for both participation and task explanation.

People in management positions are more likely to be busy. Thus, the survey is the most appropriate strategy in the case of this research. Second, survey data results can be analysed easily because the target audience is able to understand the content of the questionnaire, and the data is statistically analysed[216]. Third, the format allows a larger amount of data to be collected from a sizeable population in a highly economical way. Fourth, the nature of this study is exploratory and descriptive, which requires the implementation of survey strategy[217]. The data collected using a survey strategy enables the researcher to suggest

[213] Goertzen, M. J. (2017). Introduction to quantitative research and data. *Library Technology Reports*, *53*(4), 12-18.
[214] Saunders, M., Lewis, P. H. I. L. I. P., & Thornhill, A. D. R. I. A. N. (2007). Research methods. *Business Students 4th edition Pearson Education Limited, England*, p.138.
[215] Collis, J., & Hussey, R. (2009). A practical guide for undergraduate and postgraduate students.
[216] Saunders, M., Lewis, P., & Thornhill, A. (2012). Research methods for business students (6. utg.). *Harlow: Pearson*.
[217] Saunders, M. N., Lewis, P., Thornhill, A., & Bristow, A. (2015). Understanding research philosophy and approaches to theory development.

possible reasons and to provide explanation for particular relationships between variables as well as to produce models based on these relationships[218]. Given this, a survey design was implemented for this monograph aimed at testing the if and how the big five personality traits and the organisational culture impact systems thinking.

This method is consistent with the research aims, as it enables the examination and confirmation of theories, determining the variables that need to be studied and exploring the correlations between these variables (i.e., neuroticism as a negative correlate of systems thinking). As argued by Goertzen this method uses standards of reliability and validity, as well as applies approaches and procedures that are not biased[219]. All previous studies that partly examined the relationship between the big five factor model, organisational culture and systems thinking, deployed the quantitative methods as well[220][221]. This can be explained that all these studies including this research set aims and objectives, oriented toward measuring attributes precisely and testing theories[222]. The alternative option related to conducting qualitative research, does not correspond with the targets of this study because it is oriented toward understanding the experiences, perceptions, social situations and processes[223].

[218] Saunders, M., Lewis, P. H. I. L. I. P., & Thornhill, A. D. R. I. A. N. (2007). Research methods. *Business Students 4th edition Pearson Education Limited, England*, p.138.
[219] Goertzen, M. J. (2017). Introduction to quantitative research and data. *Library Technology Reports*, *53*(4), 12-18.
[220] Nagahi, M., Jaradat, R., Goerger, S. R., Hamilton, M., Buchanan, R. K., Abutabenjeh, S., & Ma, J. (2021). The impact of practitioners' personality traits on their level of systems-thinking skills preferences. *Engineering Management Journal*, *33*(3), 156-173.
[221] Roslan, S., Hasan, S., Zaremohzzabieh, Z., & Arsad, N. M. (2021). Big Five Personality Traits as Predictors of Systems Thinking Ability of Upper Secondary School Students. *Pertanika Journal of Social Sciences & Humanities*, *29*.
[222] Adams, J., Khan, H. T., Raeside, R., & White, D. I. (2007). *Research methods for graduate business and social science students*. SAGE publications India.
[223] Gay, L. R., Mills, G. E., & Airasian, P. W. (2009). *Educational research: Competencies for analysis and applications*. Merrill/Pearson.

3.5 Selection of countries: The United Kingdom and Bulgaria

As mentioned in the previous chapters, the five-factor model has been recognised as a leading scale of measurement of one's behaviour and personality. However, number of scholars started to examine the factors that might impact the personality of individuals such as the genetics, family influence and cultural influence. Therefore, more scholars started to conduct cross-cultural examination of the personality profiles of people[224]. This study is also based on cross-cultural data as a form of validation of the data findings. As a result, data was collected from managers from Bulgaria and the United Kingdom. These two countries were the context of this research due to the following reasons:

1. First, Bulgaria and the UK are representatives of two opposing contexts. The United Kingdom is a Western-European developed country, while Bulgaria is a small Eastern-European developing country. Economically, the two countries are unmatched. The World Bank Report shows that the population of Bulgaria for 2020 is 6.93 million, whereas the GDP is 69,889.35. In contrast, the GDP of The UK for 2020 is 2,759,804.06, whereas the population is 67, 215, 293. More importantly, the United Kingdom has an innovation-based economy, while the Bulgarian economy is underdeveloped[225226227228229230] that has slowed down its modernisation[231].

[224] Digman, J. M. (1990). Personality structure: Emergence of the five-factor model. *Annual review of psychology*, *41*(1), 417-440.
[225] Bariakova, D. A. (2019). A Systematic Review of Social Innovation in Higher Education Systems as a Driver of Student Employability. *Innovate Higher Education to Enhance Graduate Employability: Rethinking the Possibilities*, 44-55.
[226] Bariakova, D. P. (2019). *Transformation of the Higher Education systems of Eastern European developing countries through organisational learning: the case of Bulgaria"* (Doctoral dissertation, University of Southampton).
[227] Dobreva, J., & Ilieva-Koleva, D. (2015, June). Managing Sustainable Enterprises and Promoting Open Innovation in Bulgaria. In *The 8th International Conference for Entrepreneurship, Innovation and Regional Development.* (p. 287).
[228] Lazarova, T., Zhelyazkova, V., & Vazov, R. (2015). Innovation leadership as a key concept in entrepreneurship. In *Proceedings of International Conference for Entrepreneurship, Innovation and Regional Development ICEIRD* (pp. 275-287).
[229] Todorov, K., & Akbar, Y. H. (2018). *Strategic Management in Emerging Markets: Aligning Business and Corporate Strategy*. Emerald Group Publishing.
[230] Durankev, B. (2019). An overtaking vision for the catching-up development of Bulgaria. *Economic Thought journal*, (3), 123-128.
[231] Hristov, I. (2006). The Sociology of Law–The Privileged Viewpoint for the Dissection of the Modern Society. *Социологически проблеми*, *38*(Special), 238-244.

2. Second, both topics of systems thinking, and the five-factor model are under covered in Bulgaria. There are few studies that cover business psychology in the Eastern European region including in Bulgaria[232]. In general, in many cases, the context of the Eastern European countries is understudied[233].

3. Third, the culture comparison between Bulgaria and the UK, based on the Hofstede's measurement framework, shows some key differences that might affect the results of this study. Dramatic differences are observed in several dimensions such as in the levels of 'power distance', 'individualism', 'uncertainty avoidance' and 'indulgence'. For instance, Bulgaria is collectivist society, while The UK is an individualised society[234]. Moreover, the uncertainty avoidance in Bulgaria is two times higher than in the UK. As discussed in the previous chapter, one of the main benefits of systems thinking is related to its ability to deal with a significant uncertainty. As data is generated from two contrasting contexts, will enable a wider generalisation of the findings. As it can be seen, the graph and the table below illustrate the cultural differences between the UK and Bulgaria based on Hofstede's six dimensions[235].

[232] Brandt, T., Gomes, J. F., & Boyanova, D. (2011). Personality and psychological capital as indicators of future job success?. *Liiketaloudellinen Aikakauskirja*, (3).
[233] Bariakova, D. P. (2019). *Transformation of the Higher Education systems of Eastern European developing countries through organisational learning: the case of Bulgaria"* (Doctoral dissertation, University of Southampton).
[234] Hofstede, https://www.hofstede-insights.com/fi/product/compare-countries/, accessed 2022.
[235] Hofstede, https://www.hofstede-insights.com/fi/product/compare-countries/, accessed 2022.

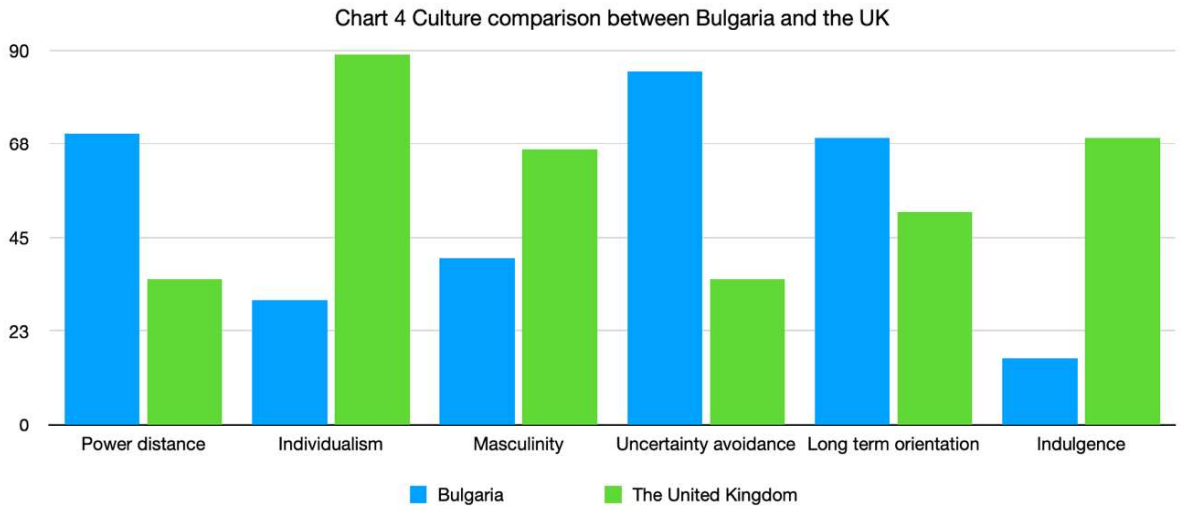

Table 4 Culture comparison between Bulgaria and the UK

	Bulgaria	The United Kingdom
Power distance	70	35
Individualism	30	89
Masculinity	40	66
Uncertainty avoidance	85	35
Long term orientation	69	51
Indulgence	16	69

Figure 8 Culture comparison between Bulgaria and the UK (Source: Own table and figure based on the data from Hofstede's official website[236]).

3.6 Time limit

The usage of a cross-sectional study is required in this particular case, as it involves observation of all of a population or a representative group at one specific point in time[237]. Data collection was obtained only once, which will limit costs and make the whole process less complicated. Cross-sectional studies require a precise identification of the respondents from who the researcher desire to collect data. In some occasions, reaching even a particular individual as respondent is necessary. What should also be taken into consideration is the size of the sample, as sometimes it is limited, which makes difficult achieving the desire results.

[236] Hofstede, https://www.hofstede-insights.com/fi/product/compare-countries/, accessed 2022.
[237] Bell, E., & Bryman, A. (2007). The ethics of management research: an exploratory content analysis. *British journal of management*, *18*(1), 63-77.

Type and number of questions should be also very carefully estimated in order effective research to be achieved[238]. The features of the survey design will be detailly elaborated later in this chapter.

3.7 Target population and sampling

The target audience of this study were managers from the UK and Bulgaria. Their number was not estimated or limited. The only limitation applied was related to their level of education and their management position. People with education lower than a Secondary education diploma (for Bulgaria) or A levels certificate (for the UK) would not be able to understand the questions properly, which would make the reliability of data questionable. Thus, data was collected from 353 participants from three sectors (public, private and non-profit) participated, as there were representatives of 19 industries like constructing, engineering, manufacturing development, administration, human resources, training, accounting/finance, telecommunication, electronics/IT, government/Civil service, marketing, advertising/PR, media/creative/design, sales, legal, banking/insurance, research, consulting, services, and hospitality.

A population is any complete group from doctors to students or mothers. What unites this group, is the common characteristics they share. Therefor, representatives are used to for an insight about the whole group to be gained. The larger the number of representatives is, the clearer and better results are achieved. Furthermore, business research allows using a small number of population elements or a sample, defined also as a 'subset or some part of a larger population'[239]. The usage of samples is required by business research studies. However, the selections of respondents should be random so that researcher can be assured they collected reliable and valid data. In addition, samples are used not only because data collection demands resources such as time and finance, but also because depends on the good will of the responders. Consequently, it is almost impossible all group members to be reached.

[238] Saunders, M., Lewis, P., & Thornhill, A. (2012). Research methods for business students (6. utg.). *Harlow: Pearson*.
[239] Zikmund, W. G., Babin, B. J., Carr, J. C., & Griffin, M. (2013). *Business research methods*. Cengage learning,p.385.

3.7.1 Response rate

This study achieved a successful rate of 90% total responses on the questionnaires and in particular 100% responses on the electronic copies and 80% of the hard copies. The success of the rate is explained as follows:

a) The size of the group was not restricted which allowed the researcher to collect a larger amount of data. In most of the cases, the research participants were informed and asked in advance to participate in the study. The practice shows that if emails for research purposes are directly sent, they will be either ignored or considered as a spam. Consequently, the response rate is expected to be quite low.

b) The adoption of the snowball sampling method also contributed to the high response rate. The participants were asked to recruit other participants for the survey. As in this case, the research participants were managers, they recruited other managers or associates from other departments or organisations. Thus, it was easier to collect data from an audience that otherwise would be hard to reach.

c) The usage of both hard and soft electronic copies was very effective as they allowed the researcher to reach a larger number of people. Thus, some of them were given a chance to fill the questionnaire in their spare time. Moreover, it made the whole research more flexible, so participants were more likely to respond.

d) Some other techniques like dressing smart, smiling, behaving in a polite and a positive manner also contributed to for a larger number of participants to be achieved.

e) The research was conducted in two countries, which also increased the chance to achieve good results in terms of response rate.

3.7.2 Confidentiality and anonymity

As suggested by Bell and Bryman confidentiality and anonymity stimulates responders to be more open and honest when answering the questions of the survey[240]. For this purpose, responders were informed in the front page of the survey that their confidentiality and anonymity will be kept and also the data collected will be used with a research and development purposes only.

3.7.3 Ethical issues

Bell and Bryman consider that business research cannot be carried out without involving of research ethics[241]. In many cases, data collection can involve collecting sensitive or confidential information that can be harmful for some parties that are directly or indirectly involved in the research. In the case of this study, there is not information that is considered sensitive except for the personal data. In case of this study, the personal data is related to their background, personal traits and teamwork. In fact, personal data is a key issue of an ethical concern, as participants should be assured that their personal data will be used for research and development only and it is not going to cause damage to any of the data subjects concerned[242]. In addition, though the data collected will be used with research purposes only, participants must be convinced and assured that any detail indicating their contribution will not be published. As long as, the data is not officially published responders have no right to access it, as the only one who decide what to do with the date is the researcher, although the limitations they have in terms of ethics and purposes[243]. This study adopts the ethical norms set by Bournemouth University. All the rules and norms, required by the ethical policy of Bournemouth University were strictly followed and taken into consideration by the researcher.

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[240] Bell, E., & Bryman, A. (2007). The ethics of management research: an exploratory content analysis. *British journal of management*, *18*(1), 63-77.
[241] Bell, E., & Bryman, A. (2007). The ethics of management research: an exploratory content analysis. *British journal of management*, *18*(1), 63-77.
[242] Bell, E., & Bryman, A. (2007). The ethics of management research: an exploratory content analysis. *British journal of management*, *18*(1), 63-77.
[243] Bell, E., & Bryman, A. (2007). The ethics of management research: an exploratory content analysis. *British journal of management*, *18*(1), 63-77.

3.8 Survey design

The questionnaire technique is the most appropriate choice when it comes to survey strategy as suggested by Saunders, Lewis and Thornhill who argue that this is the most used technique within business and management research[244]. Kervin describes a questionnaire as 'Where the person answering the question actually records their own answers[245] [246]. The most relevant and appropriate description of a questionnaire is the one of deVaus, who perceives it as a: '*a general term to include all techniques of data collection in which each person is asked to respond to the same set of questions in predetermined order'*[247]In fact, the design of the questionnaire will impact both the response rate, the reliability and validity of the collected data[248]. Therefore, Saunders, Lewis and Thornhill advise several elements to be considered[249]:

- Careful design of individual questions
- Clear layout of the questionnaire form
- Lucid explanation of the purpose of the questionnaires
- Pilot testing
- Carefully planned and executed administration

Taking the above advice into consideration, the questionnaire was designed and organised in a manner to be anonymous and easy for completion. It consisted only of closed questions where the participants had to choose the extent to which a certain statement is valid. The survey participants were managers from UK and Bulgaria, so two versions of the same questionnaire were designed: one in English and another in Bulgarian. The design, the numbers and the types of questions were utterly identical. The translated version contains both the original text and its translation. Despite the second version is longer than the original version because of the translation added, it was still more appropriate strategy than simply to translate of the survey into a foreign language. This was the preferred option as a translated version can cause a misunderstanding that will be an obstacle for collecting reliable data. Moreover,

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[244] Saunders, M., Lewis, P. H. I. L. I. P., & Thornhill, A. D. R. I. A. N. (2007). Research methods. *Business Students 4th edition Pearson Education Limited, England*, p.354.
[245] Kervin, J. B. (1999). Methods for business research (2"^ ed.). *Reading: Addison-Wesley*.
[246] Saunders, M., Lewis, P. H. I. L. I. P., & Thornhill, A. D. R. I. A. N. (2007). Research methods. *Business Students 4th edition Pearson Education Limited, England*, pp. 353 – 354).
[247] De Vaus, D. (2002). *Analyzing social science data: 50 key problems in data analysis*. sage.
[248] Saunders, M. N. K., Lewis, P., & Thornhill, A. (2019). Research Methods for Business Students Eight Edition. *QualitativeMarket Research: An International Journal*.
[249] Saunders, M., Lewis, P. H. I. L. I. P., & Thornhill, A. D. R. I. A. N. (2007). Research methods. *Business Students 4th edition Pearson Education Limited, England*,p.356)

respondents, whose first language is foreign (Bulgarian), were able to read the questions in both English and Bulgarian languages. This will prevent any confusion resulting from the translations, as the original text will help the reader to validate the meaning. In addition, this option was also helpful for the researcher to easily process the data collected. When it comes to the length of the survey, it is optimal as it must not be too long, otherwise the readers will lose interest easily. At the same time, it must not be also too short, as this is the only research method adopted by this study and all aspects of the researched topic must be covered. In fact, the questionnaire contains total of 84 questions, but it was designed in such manner that the reader cannot really feel that the number of the questions is so vast.

The table below illustrates the questions related to the organizational culture reflecting the scale of measurement used in this study. Opposite characteristics of organizational culture are listed accompanied by a scale from 1 to 7. The listed polar characteristics are: stable-dynamic; closed/bureaucratic-open/interactive; reactive-proactive; individual oriented – group oriented; aggressive- accommodating; reserved-friendly; quantitative-focused – qualitative-focused; badly social responsible – highly social responsible; short-term focused- sustainably focused.

Stable	◄	1	2	3	4	5	6	7	►	Dynamic
Closed / bureaucratic	◄	1	2	3	4	5	6	7	►	Open / interactive
Reactive	◄	1	2	3	4	5	6	7	►	Proactive
Individual orientated	◄	1	2	3	4	5	6	7	►	Group orientated
Aggressive	◄	1	2	3	4	5	6	7	►	Accommodating
Reserved	◄	1	2	3	4	5	6	7	►	Friendly
Quantitative-focused	◄	1	2	3	4	5	6	7	►	Qualitative-focused
Badly social responsible	◄	1	2	3	4	5	6	7	►	Highly social responsible
Short-term focused	◄	1	2	3	4	5	6	7	►	Sustainably focused

Table 4 Example questions from the questionnaire.

The figure below displays the design of the questions aiming to gather information about the sector and the industry of the research participants. As it can be seen from the figure below, all three sectors are listed as well as a great number of industries.

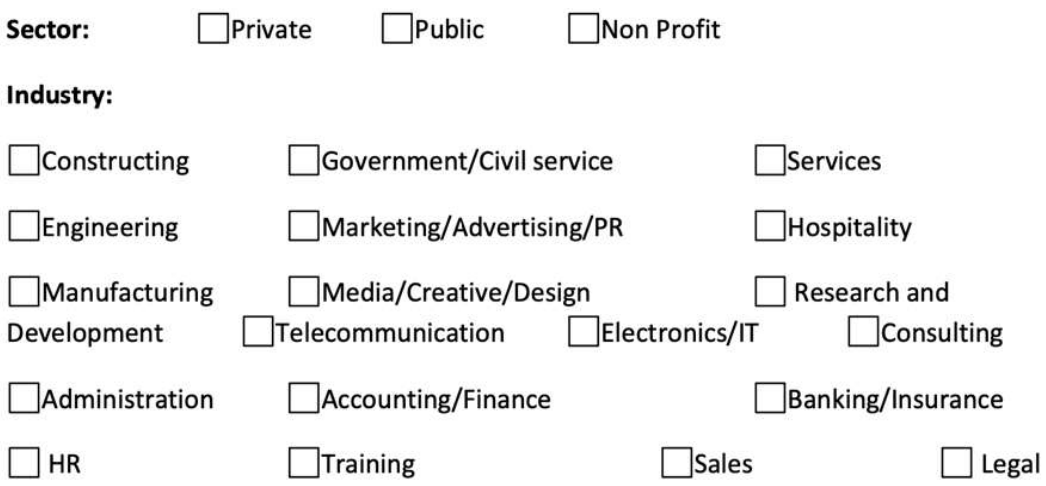

Figure 9 Example questions from the questionnaire.

The table below shows the questions used meausere the personality profile of the survey participants. It is again constructed on the basis of polar traits measured by a scale from 1 to 7.

	Very		Moderately	Neither	Moderately		Very	
1. Unenergetic	1	2	3	4	5	6	7	Energetic
2. Inactive	1	2	3	4	5	6	7	Active
3. Unassertive	1	2	3	4	5	6	7	Assertive
4. Unadventurous	1	2	3	4	5	6	7	Adventurous
5. Introverted	1	2	3	4	5	6	7	Extroverted
6. Unkind	1	2	3	4	5	6	7	Kind
7. Uncooperative	1	2	3	4	5	6	7	Cooperative
8. Disagreeable	1	2	3	4	5	6	7	Agreeable
9. Distrustful	1	2	3	4	5	6	7	Trustful
10. Stingy	1	2	3	4	5	6	7	Generous
11. Disorganized	1	2	3	4	5	6	7	Organized
12. Irresponsible	1	2	3	4	5	6	7	Responsible

Table 5 Example questions from the questionnaire.

Likewise, the table below consists of questions related to the organisational climate, culture and the individual's attitude about them. Again, a scale from 1 to 7 was used to measure the level of validity of each statement.

	Strongly disagree						Strongly agree
1. Every member in my team is trustworthy.	1	2	3	4	5	6	7
2. Members of my team help me even when they are not required to.	1	2	3	4	5	6	7
3. I believe that everybody values everybody else's opinion in the team.	1	2	3	4	5	6	7
4. The outcome of our work is highly appreciated by colleagues outside of our team.	1	2	3	4	5	6	7
5. I always give advice, comments, and suggestions to other team members.	1	2	3	4	5	6	7
6. My colleagues and my boss often ask for my opinion.	1	2	3	4	5	6	7
7. I always give advice, comments and suggestions to my boss.	1	2	3	4	5	6	7
8. In our team we have our own jargon that may be hard for people working in other departments of the organisation to understand.	1	2	3	4	5	6	7
9. When faced with urgent or difficult operations/procedures/tasks our team follow a strict power/responsibility chain.	1	2	3	4	5	6	7

Table 6 Example questions from the questionnaire.

As it can be seen from the tables and figures above, the questionnaire consists of 5 categories (types) of questions. The first category requires the participants to indicate their level of agreeableness or disagreeableness to certain statements and phrases. The scale applied is from 1 to 7, where 1 is 'strongly disagree', 7 is 'strongly agree'.

For example, **Q1.** *"When facing a problem, I often break it down and solve each of the parts"*. The possible options are:

- **1** Strongly disagree
- **2** Disagree
- **3** Slightly disagree
- **4** Neutral
- **5** Slightly agree
- **6** Agree

- **7** Strongly agree.

The second category of questions contains opposite personality traits such as: unenergetic and energetic, active or inactive etc., where the participants need to determine which one describes them better plus indicating again the level of relevance. The scale applied starts again from 1 and ends with 7 where 1 stands for very, 2 and 3 stand for moderately, 4 stands for neither, 5 and 6 stand for moderately, and 7 stands for very.

For example, *"Please rate your personality according to the scale below: unenergetic vs. energetic"*:

- **1.** Very (unenergetic)
- **2.** Moderately (unenergetic)
- **3.** Moderately (unenergetic)
- **4.** Neutral (neither unenergetic nor energetic).
- **5.** Moderately (energetic)
- **6.** Moderately (energetic)
- **7.** Very (energetic)

The third category of questions aims to gain understanding about the team working and the team that each of the participants belongs to. This set of questions also contains phrases, which relevance is identically measured with the scale from 1 to 7, where 1 stands for 'strongly disagree', 4 stands for 'neutral', and 7 stands for 'strongly agree'.

For instance, *"Some more items for your team and teamwork. Every member of my team is trustworthy"*. The possible options are:

- **1.** Strongly disagree
- **2.** Disagree
- **3.** Slightly disagree
- **4.** Neutral
- **5.** Slightly agree
- **6.** Agree
- **7.** Strongly agree

Next, the fourth category of questions aims to gain an insight of the organisational culture of the organisations that these participants work. Questions are based again on polar cultural traits such as stable vs. dynamic, individual-oriented vs. group oriented etc. The scale of measurement used is from 1 to 7, whereas 1 stands for 'very', 2 and 3 stand for 'moderately', 4 stands for 'neutral', 5 and 6 stand for 'moderately', and 7 stands for 'very'.

For example, "*Organisational culture comprises the attitudes, experiences, beliefs and values that are shared by people and groups in the workplace and influence the way in which they interact with each other. Please indicate how you would describe your business culture on the following scales: stable vs. dynamic"*:

- **1.** Very (stable)
- **2.** Moderately (stable)
- **3.** Moderately (stable)
- **4.** Neutral (neither stable nor dynamic).
- **5.** Moderately (dynamic)
- **6.** Moderately (dynamic)
- **7.** Very (dynamic)

The last category aims to collect background data about the participant such as: age, gender, occupation, level of education, industry, and sector. The question related to the participants' age was an open question. In other words, the participants were asked to write down their exact age. The results were later organised into age groups. The question related to the gender of the participants contained two options:

- Male
- Female

Education qualification listed were:

- High school (diploma)
- Foundation year (applicable for the UK participants only)
- Degree Diploma (Bachelor)
- Master

- PhD

Sector:

- Private
- Public
- Non for profit

Industry:

- Constructing
- Engineering
- Manufacturing Development
- Administration
- HR
- Government/Civil service
- Marketing/Advertising/PR
- Media/Creative/Design
- Telecommunication
- Accounting/Finance
- Training
- Services
- Hospitality
- Research
- Consulting
- Electronics/IT
- Banking/Insurance
- Sales
- Legal

3.9 Questionnaire measures

All participants were required to indicate their age, gender, education, sector and industry. This information is needed as it may possibly influence the results of this study. For instance, there might be dissimilarity in behaviour between the older and the younger participants, or between women and men. Genders and generations are likely to have

differences in their attitudes[250] [251]. Likewise, the level of education has also the potential to affect the responses of the participants as there is evidence in the literature for the impact of higher education on success[252]. An immense distinction is expected in relation to the sector and the industry, as they might affect both the organisational culture and work behaviour[253]. As already mentioned, the questions of this study were designed based on the Likert Scale, which is one of the most used practices for data collecting, because it is simple and allow a bigger number of questions to be asked[254]. In the case of this study, the scaled questions were 72, which is relatively big number of questions for a questionnaire.

Yet, the Likert Scale shortened much the time for completion, which otherwise will be three times longer if another question design was used. As already discussed in the previous section, the participants had to respond to the question in 1(strongly disagree) to 7(strongly agree) format, where they had 7 options. Thus, the researcher increases the probability to collect more precise data. As it is evident from the sample figures, the four sections cover different aspects of the research. The first one is directly related to systems thinking theory. The second one refers to the five-factor model and the personality traits theory. The third one reflects the organisational culture theory, and the last one was designed to gather background data for the research participants. The categories measuring the organisational culture are based on a widely utilised and well-known scale introduced by Baruch and Peiperl [255]. The questions related to the five-factor model were created in accordance with the Godlberg's scale[256] of The Big Five theory. Personality traits are qualities/characteristics that make a distinction between the character, action, and attitude of an individual. The Big Five factors of personality are

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[250] Van Velsor, E., & Hughes, M. W. (1990). *Gender Differences in the Development of Managers: How Women Managers Learn from Experience*. Publications, Center for Creative Leadership, PO Box 26300, Greensboro, NC 27438-6300 (Stock# 145R; $30.00 each)..

[251] Jones, J. S., Murray, S. R., & Tapp, S. R. (2018). Generational differences in the workplace. *The Journal of Business Diversity*, *18*(2), 88-97.

[252] Patimo, D. M., & Lucero, M. B. A. (2021). Predictors of Success in Advance Higher Education: A Case in Northwest Samar State University, Philippines. *Research in Social Sciences and Technology*, *6*(1), 40-52.

[253] Chatman, J. A., & Jehn, K. A. (1994). Assessing the relationship between industry characteristics and organizational culture: how different can you be?. *Academy of management journal*, *37*(3), 522-553.

[254] Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research methods for business students*. Pearson education.

[255] Baruch, Y., & Peiperl, M. (2000). Career management practices: An empirical survey and implications. *Human resource management*, *39*(4), 347-366.

[256] Goldberg, L. R. (1992). The development of markers for the Big-Five factor structure. *Psychological assessment*, *4*(1), 26.

presumed to embody the basic structure behind all personality traits. The Goldberg's International Personality Item Pool (IPIP) (Goldberg's questionnaire was used to identify respondents' personality traits[257]. Last but not least, questions linked to systems thinking resulted from the work of Peter Senge[258] and Jamshid Gharajedaghi[259]. Systems thinking can be defined as individuals' cognitive ability to perceive a system as a whole[260], and it consists of elements, interconnections, and a function or purpose[261]. The Systems Thinking Scale (STS) was employed to measure the systems thinking ability[262].

3.9.1 Questionnaire distribution and receipt

Questionnaires were distributed via email, in person or through a third person. Respectively, both hard and soft copies were created. The large number of responses targeted by this study and the time limit required several channels of distribution. In the cases when a third person was involved, the answers were received via email or scanned first and then sent via email, so participants' anonymity was guaranteed. The hard copies of questionnaires did not required the usage of envelop, as the personal details were located in the last page. Furthermore, there was no confidential information requiring the usage of envelop. The questionnaire begins with an introduction about the topic and the purpose of the study, where the contact details of the researcher were provided. Respondents were assured that the data will be used for research and development purposes only, so they were encouraged to be optimally honest in their answering.

Data collection took place in the summer of 2013 started at the beginning of June and ended at the beginning of July. Participants had a one-month time limit to fill and send back the

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[257] Goldberg, L. R., Johnson, J. A., Eber, H. W., Hogan, R., Ashton, M. C., Cloninger, C. R., & Gough, H. G. (2006). The international personality item pool and the future of public-domain personality measures. *Journal of Research in personality*, *40*(1), 84-96.
[258] Senge, P. M. (2014). *The fifth discipline fieldbook: Strategies and tools for building a learning organization*. Currency.
[259] Gharajedaghi, J. (2011). *Systems thinking: Managing chaos and complexity: A platform for designing business architecture*. Elsevier.
[260] Mobus, G. E. (2018). Teaching systems thinking to general education students. *Ecological Modelling*, *373*, 13-21.
[261] Meadows, D. H. (2008). *Thinking in systems: A primer*. chelsea green publishing.
[262] Moore, S. M., Komton, V., Adegbite-Adeniyi, C., Dolansky, M. A., Hardin, H. K., & Borawski, E. A. (2018). Development of the systems thinking scale for adolescent behavior change. *Western journal of nursing research*, *40*(3), 375-387.

questionnaires. The target audience consisted only of managers from UK and Bulgaria, who are usually busier and harder to reach compared to other types of target audience such as students or consumers. Moreover, data collection was taking place during the summer, when most of the working people go off on holidays. One month was enough long enough time for people who were off on a holiday to be reached. Most of the respondents choose to fill the soft copy (electronic copy), which shorten the time for data processing. It was also an easier and time and money saving method to reach the participants via email rather than to go in person.

3.9.2 Data Analysis Methods

3.9.1.1 Internal consistency

Internal consistency is responsible for establishing the correlation amongst the items[263], whereas the Cronbach alpha (α) is a formula of determining reliability based on internal consistency[264]. Therefore after the data is iimported into SPSS (statistical analysis software) and double-checked to guarantee precision, the Cronbach's alpha was firstly measured by using a pearson correlation matrix. Any questions not exhibiting a high level of internal consistency need to be disregarded for the purposes of analysis and the reasons for this inconsistency to be reflected. According to Murphy and Davidshofer all coefficients above .7 are acceptable, and since all items are above this figure the research can be confident the Cronbach alpha's are high enough to make the findings reliable[265].

3.9.1.2 Central points of tendency

Examining the collected raw data is the initiate step which is taking place before the actual start of the statistical analysis. Usually when two or more different data sets are to be compared and contrasted it is obligatory to compress the data. However, data evaluation requires more than just a frequency distribution and visual presentation. Therefore, it is compulsory to summarize the data set into a single value. Such a value usually somewhere in the center and represent the entire data set and hence it is called measure of central tendency or averages. Two measures of central tendency were employed– the mean and the median. Both were used for the analysis of the demographic data because of their ability to identify whether

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[263] Bernstein, N. J. 11994 Psychometric theory. New York.
[264] Nunnally, J. C. (1978). Psychometric theory (2nd ed.). New York: McGraw-Hill.
[265] Murphy, K. R., & DeShon, R. (2000). Interrater correlations do not estimate the reliability of job performance ratings. *Personnel Psychology*, *53*(4), 873-900.

there are trends related to the average length of service and age[266]. In addition, the mean measure of the central tendency was also used to test the average response in the Likert scale in order to be tested how strongly respondents agreed or disagreed with the statements.
Types of Measure of Central Tendency:

- Arithmetic Mean
- Geometric Mean
- Harmonic Mean
- Mode
- Median

Different measures of central tendency aim to identify what might diversely be characterised as typical, normal, excepted or average value of data set.[267]

3.9.1.3 Multiple regressions

Multiple regression analysis is a statistical tool that can assess the strength of the relationship between one dependent variable and multiple independent variables[268]. It is one of the most prevalent methodologies in business research[269], because it provides a conceptually simple method for identifying functional relationships among variables. This happens through taking data, fitting a model and then assessing the fit using the following formula:

$y = MX_1 + MX_2 + MX_3 \ldots + b$

y= the dependent variable of the regression

M=slope of the regression

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[266] Fink, A. (2003). *The survey handbook*. sage.
[267] McCluskey, A., & Lalkhen, A. G. (2007). Statistics II: Central tendency and spread of data. *Continuing Education in Anaesthesia, Critical Care and Pain*, *7*(4), 127-130.
[268] Field, A. P. (2005). Is the meta-analysis of correlation coefficients accurate when population correlations vary?. *Psychological methods*, *10*(4), 444.
[269] Wilson, S. R., Whitmoyer, J. G., Pieper, T. M., Astrachan, J. H., Hair Jr, J. F., & Sarstedt, M. (2014). Method trends and method needs: Examining methods needed for accelerating the field. *Journal of Family Business Strategy*, *5*(1), 4-14.

X_1=first independent variable of the regression

X_2=second independent variable of the regression

X_3=third independent variable of the regression

B=constant

The appeal of this methodology is specifically relevant in the case of this research, which purpose is to determine whether there is a significant statistical relationship between the chosen variables. Furthermore, this technique is used to analyse of the relationship between number of independent variables, and to predict a dependant variable. There are three forms of multiple regressions: standard multiple regression, sequential regression and statistical regression. This study employs a standard multiple regression which is the most commonly used form of multiple regression analysis, where all independent variables are entered into the equation concurrently[270]. Therefore, this is a sufficient technique to verify a statistical link.

The **standardized regression coefficient**, discovered by multiplying the regression coefficient b_i by S_{Xi} and dividing it by S_Y, represents the estimated change in Y (in standardised units of S_Y where each "unit" is a statistical unit equal to one standard deviation) due to an increase in X_i of one of its standardized units (ie, S_{Xi}), with all other X variables unchanged[271]. The absolute values of the standardized regression coefficients may be compared, giving a rough indication of the relative importance of the variables[272]. Each standardized regression coefficient is in units of standard deviations of Y per standard deviation of X_i [273]. A coefficient with a value higher than 0.05 is believed that cannot occur by chance so it is reasonable to consider it as an indicator of a link between the variables.

The SSPS software was used for the data analysis. The data was manually entered in Excel and then imported to SPSS. Within the SSPS output, the R Square Change provides "the

[270] Tabachnick, B. G., Fidell, L. S., & Ullman, J. B. (2007). *Using multivariate statistics* (Vol. 5, pp. 481-498). Boston, MA: pearson.
[271] Siegel, A. F. (2016). *Practical business statistics*. Academic Press.
[272] Siegel, A. F. (2016). *Practical business statistics*. Academic Press.
[273] Siegel, A. F. (2016). *Practical business statistics*. Academic Press.

proportion of variance incremented by the variables entered"[274]. This test was used to determine the extent to which the variables have an impact on the constant and to verify whether there is an evidence to support the hypothesis. The Durbin- Watson test will also be employed to confirm the level of autocorrelation.

3.10 Reliability

Reliability and validity are ways of demonstrating and communicating the rigour of research processes and the creditability of research findings. If research is to be useful, it should avoid deceiving those who use it[275]. Research creditability depends on number of features:

- The initial research questions.
- How the data is collected: from whom, when and what questions and methods are used?
- How are data findings analysed?
- What conclusions are drawn?

Bell and Bryman utilise three concepts of reliability:

- **Stability:** refers to the reliability of a research is measured in terms of time. In other words, in order to be reliable, the results have to remain the same overtime. Little deviations are allowed, but if there are significant changes then the research is considered unreliable and invalid.

- **Internal reliability:** refers to the respondents' consistency in answering of the survey questions. In order a data to has an internal reliability, all people's responses across items on a multiple-item measure need to be consistent. Thus require the scores of related questions to be correlated with each other. The

[274] Pedhazur, E. J., & Schmelkin, L. P. (1991). Artifacts and pitfalls in research. *Measurement, Design, and analysis: An Integrated Approach. Hillsdale, NJ: Lawrence Erlbaum Associates*, 234-241.
[275] Roberts, P., & Priest, H. (2006). Reliability and validity in research. *Nursing standard*, *20*(44), 41-46.

internal reliability is mainly applied mainly to measure people's behaviour which makes it a relevant method in the case of this research.

- **Interobserver consistency:** This is measure of reliability can be employed when more than one researcher is involved. In such cases, researchers present different opinions about the interpretation and presentation of the collected data. In this particular study, this measurement of consistency is irrelevant as the researcher is only one.

Two concepts of consistency were adopted (stability and internal reliability) to guarantee data reliability of this research. As it was already mentioned earlier in this chapter, the research participants were given enough time to complete the survey. Thus, they are expected to provide more honest and truthful answers compared to when they have to respond under pressure. The internal reliability was guaranteed by the usage of similar questions to check whether the participants were consistent and honest in their answers. The nature of the survey does not allow any interference of the researcher, which increases the objectivity of the data findings. In fact, the main challenge referred to the interpretation of the data, which will be discussed in the next section.

3.11 Validity

If the reliability of data is about the consistency of a measure, the validity of data is related to the accuracy of a measure. As suggested by Bryman and Bell the validity of data refers to the extent to which the results really measure what they are supposed to measure[276]. Thus, the questions included in the questionnaire have to be created in accordance with the initial research question and research hypothesis. In fact, five forms of data validation: face validity, predictive validity, construct validity, concurrent validity and convergent validity. This study adopts a construct validity, which can be based on three types of evidence:[277]

- **Homogeneity—**meaning that the instrument measures one construct.

[276] Bell, E., & Bryman, A. (2007). The ethics of management research: an exploratory content analysis. *British journal of management*, *18*(1), 63-77.
[277] Heale, R., & Twycross, A. (2015). Validity and Reliability in Quantitative Studies. Evid Based Nurs, 18(4), 66-67.p. 66.

- **Convergence**—this arises when the instrument measures concepts are comparable to that of other instruments. Although if there are no similar instruments available the usage of this instrument will be impossible.
- **Theory evidence**—this is evident when behaviour is similar to theoretical propositions of the construct measured in the instrument.

The construct validity of this research is based on theory evidences, as each of the panels of questions was created based on the leading theories and scales on the five-factor theory, systems thinking and organisational culture. Thus, literature and established studies and theories were used to support the data and confirm its validity. Yet, in some cases it is acceptable when results challenge and disprove the theory, but still there should be a link between the secondary and the primary data of every research. This is logical as the literature and theories are also formed on the basis of primary research. Therefore, the primary and secondary data must be corresponding. In the occasions when there is a conflict between the review of the relevant literature and the findings of the study, reasons and explanations must be provided to explain the mismatch.

Chapter 4: Presentation of findings

This chapter presents the findings that emerged from the 353 survey questionnaires. The chapter is organised into three sections: data description, Correlation Table and Regression. All results relevant to the research aims and objectives of this study will be illustrated and analysed in order all six hypothesis to be tested.

4.1 Data Description

The table below illustrates the descriptive statistical data collected by this study. The number of the valid data related to the gender of the participants is 353 with 0 missing. The total number of valid data when it comes to the age of the respondents is 318 with 35 missing. When it comes to the qualification the valid data is 348 with 5 missing responses. The responses related to the sector

Statistics

		Gender	Age	Qualification	Sector	Industry
N	Valid	353	318	348	353	351
	Missing	0	35	5	0	2
Mean		1.54	40.83	2.34	1.45	8.99
Std. Error of Mean		.027	.569	.044	.029	.316
Median		2.00	39.00	2.00	1.00	9.00
Std. Deviation		.499	10.154	.814	.552	5.911
Range		1	45	5	2	18
Minimum		1	23	1	1	1
Maximum		2	68	6	3	19

Table 7 Statistics.

As it can be seen from the graph below in terms of demographic representation, 45.6% of the respondents were male, which is almost equal to the number of the female, which is 54.4%.

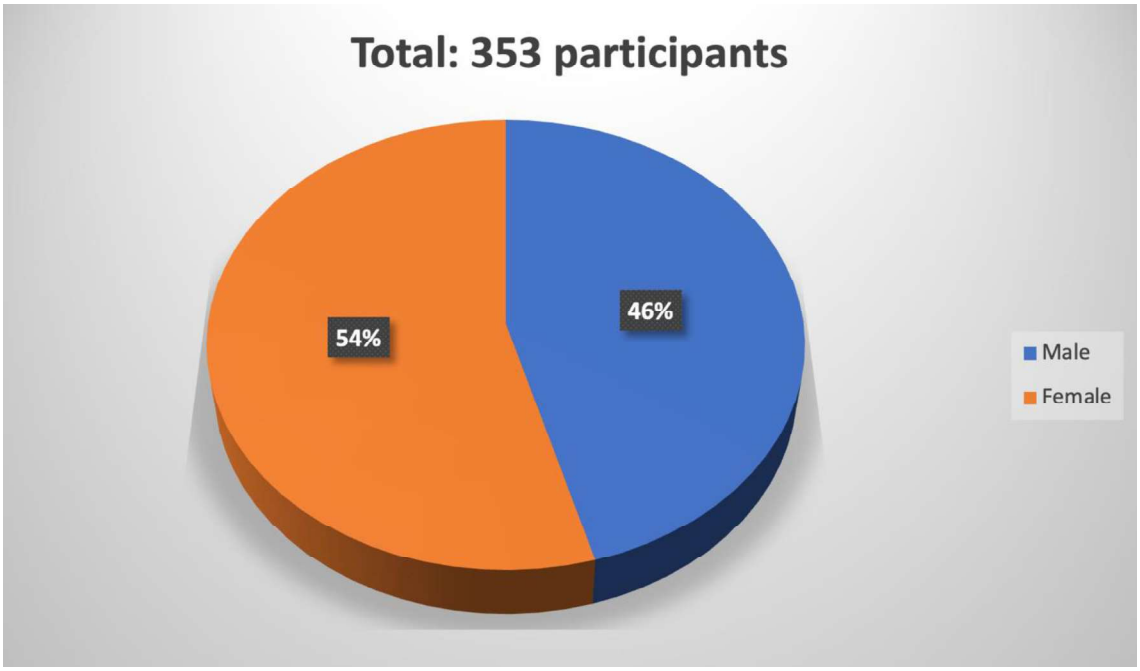

Figure 10 Demographic representations of the research participants. (own graph).

As it can be seen from the table below the frequency for male is 161 and for female is 192 which is equal to 45.6 % and 54.4%. The total number of participants is 353 (100%). The percentages are valid.

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	161	45.6	45.6	45.6
	Female	192	54.4	54.4	100.0
	Total	353	100.0	100.0	

Table 8 Gender statistics.

When it comes to the qualification of the respondents the frequency of the responses only 5 are missing. A relatively high number of respondents 63.7% out of 348 had a masters degree, followed by 25.8% who had a bachelor degree, 5.6% had a doctor degree. Only 2% of the 353 respondents had a foundation degree, and 1.7% had a high-school degree.

Qualification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	PhD	19	5.4	5.5	5.5
	Master	225	63.7	64.7	70.1
	Degree	91	25.8	26.1	96.3
	Foundation	7	2.0	2.0	98.3
	High School	6	1.7	1.7	100.0
	Total	348	98.6	100.0	
Missing	88	5	1.4		
Total		353	100.0		

Table 9 Qualification.

These results are expected and logical as the target audience of this study consists of managers only, who in most of the cases are expected to be highly qualified. When it comes to the age of the research participant, the age range was between 23-68 years with a mean central point of tendency of 40 and a median of 39. Although the age range is very wide, on average the majority of the participants is fairly mature.

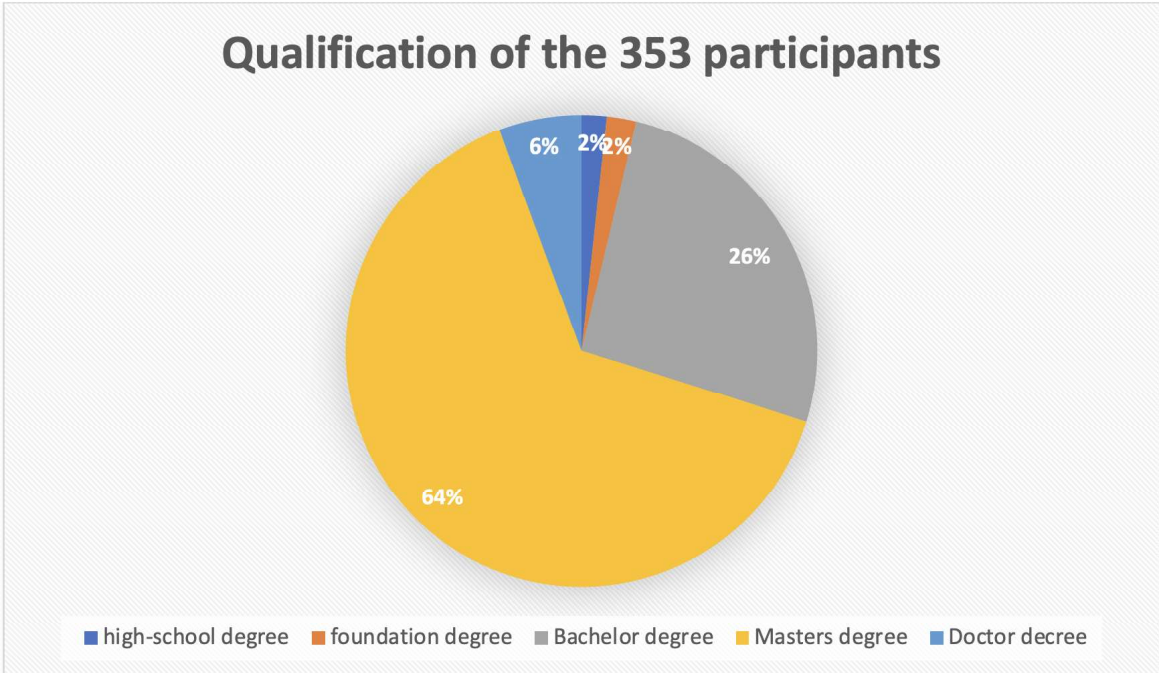

Figure 11 Qualification of the participants.

All of the 353 respondents indicated the sector they are belonging to, which varies from 1 to 3 (private, public and non-for profit). The mean central point of tendency is 2 and a median is 1.54.

Sector

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Private	204	57.8	57.8	57.8
	Public	139	39.4	39.4	97.2
	Non-profit	10	2.8	2.8	100.0
	Total	353	100.0	100.0	

Table 10. Sector.

Representatives of the private sector were 57.8%, while those from the public sector are 39.4% of the total 353 survey participants. The slightest percent was of these who came from the non-profit sector 2.8%.

Statistics

		Gender	Age	Qualification	Sector	Industry
N	Valid	353	318	348	353	351
	Missing	0	35	5	0	2
Mean		1.54	40.83	2.34	1.45	8.99
Std. Error of Mean		.027	.569	.044	.029	.316
Median		2.00	39.00	2.00	1.00	9.00
Std. Deviation		.499	10.154	.814	.552	5.911
Range		1	45	5	2	18
Minimum		1	23	1	1	1
Maximum		2	68	6	3	19

Table 11. Statistics.

The table above displays additional statistical details of the data findings. The mean value of the different demographic categories was gender (1.54), age (40.83), qualification (2.34), sector (1.45), and industry (8.99). The minimum and maximum value of gender was (1 to 2), age (23 to 68), qualification (1 to 6), sector (1 to 3), and industry (1 to 19).

A 351 out of 353 participants indicated the industry they are working in. The minimum number is 1 and the maximum is 19. The mean central point of tendency is 8.9 and a median is 9. Industries included in the survey are the following: Constructing, Government/Civil Service, Services, Engineering, Marketing/Advertising/PR, Hospitality, Manufacturing, Media/Creative/Design, Research and Development, Telecommunications, Electronics/IT, Consulting, Administration/Finance, Banking/Insurance, HR, Training, Sales, and Legal. The two participants that miss to indicate their sector of belongings might not find their industries listed in the survey sheet.

Industry

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Construction	11	3.1	3.1	3.1
	Government/civil service	74	21.0	21.1	24.2
	Services	32	9.1	9.1	33.3
	Engineering	8	2.3	2.3	35.6
	Marketing/advertising	12	3.4	3.4	39.0
	Hospitality	15	4.2	4.3	43.3
	Manufacturing	8	2.3	2.3	45.6
	Media/creative/design	15	4.2	4.3	49.9
	R&D	7	2.0	2.0	51.9
	Telecommunication	4	1.1	1.1	53.0
	Electronics/IT	6	1.7	1.7	54.7
	Consulting	14	4.0	4.0	58.7
	Administration	24	6.8	6.8	65.5
	Accounting & finance	22	6.2	6.3	71.8
	Banking & insurance	61	17.3	17.4	89.2
	HR	7	2.0	2.0	91.2
	Training	8	2.3	2.3	93.4
	Sale	14	4.0	4.0	97.4
	Legal	9	2.5	2.6	100.0
	Total	351	99.4	100.0	
Missing	88	2	.6		
Total		353	100.0		

Table 12 Industry.

As it can be seen from the table above the number of the representatives of the government/civil and banking& insurance sectors were the highest. The slightly represented industries were those of R&D and telecommunication. The total number of the participants who indicated their sector is 351 with 2 missing.

Descriptive Statistics

	Mean	Std. Deviation	N
ST	5.3225	.64901	353
E	4.9316	1.03880	353
A	5.3620	1.06011	353
C	5.5998	1.12012	353
N	4.6707	1.01355	353
O	5.5197	1.05167	353
CT	4.6915	.98600	353

Table 13 Descriptive Statistics.

The table above shows the descriptive statistics of the research items of this study with a pronounced emphasis on the mean value. The mean value for all the seven items is as follows: systems thinking (5.3225), extraversion (4.9316), agreeableness (5.3620), consciousness (5.5998), neuroticism (4.6707), openness (5.5197) and organisational culture (4.6915).

4.2 Internal Consistency

The Pearson correlation matrix is shown on page (table) and has been presented without decimal points. The correlation is significant at the 0.01 level (2-tailed) and it *. Correlation is significant at the 0.05 level (1-tailed). According to Murphy and Davidshofer (1998) all coefficients above .7 are acceptable. Therefore since all items are above this figure the researcher can be confident the Cronbach alpha's are high enough to make it reliable. All 8 items are at or above .71 which is classed as a moderate to high level of internal reliability, and openness has a coefficient of .89, having a high level of reliability.

	M	SD	N	ST	E	A	C	N	O	CT
ST	5.32	.64	353	(.76)						
E	4.93	1.03	353	.177**	(.84)					
A	5.36	1.06	353	.139*	.647**	(.86)				
C	5.59	1.12	353	0.77	.718**	.769**	(.88)			
N	4.67	1.01	353	.100	.455**	.512**	.539**	(.73)		
O	5.51	1.05	353	.206**	.716**	.758**	.792**	.483**	(.89)	
CT	4.69	0.98	353	.222**	.117*	.47	-. 11	.154**	.25	(.78)
	M	SD	N	ST	E	A	C	N	O	CT

Table 14 Relationship between variables.

4.3 Regression analysis

This section is organised into six subsections, where each hypothesis is tested by multiple regression analysis. Moreover, the most significant results are then discussed. All significant figures, less than 0.05, will have an asterisk next to them within the tables, and those that are highly significant, less than 0.01 will have a double asterisk to highlight their importance. Within each table the R Square Change values are included to show the overall influence of the group of variables upon the constant. Additionally the Durbin-Watson value has also been shown. This test for autocorrelation found that, in each table, the results are close to 2, and always within the limit of 1 and 3, indicating non- autocorrelation and therefore an independence of error [278].

4.3.1 The relationship between systems thinking and neuroticism

Hypothesis 1 states that neuroticism influences negatively systems thinking. The regression analysis table shows that the value of the R Square Change is 0.074, the F Change is 5.477, significant F change is .496 and the value of Durbin Watson is 1.711. In this case, B and Beta are .028 and .044 respectively.

[278] Field, A. P. (2005). Is the meta-analysis of correlation coefficients accurate when population correlations vary?. *Psychological methods*, *10*(4), p.444.

Therefore, hypothesis 1 is rejected as no significant relationship between systems thinking and is identified.

Independent variables	B	*β*	*Sig.*
Constant	5.281		.000
Age	-.002	- .031	.577
Gender	-.029	-.023	.678
Qualification	-.010	-.013	.817
Sector	.092	.078	.165
Industry	.007	.062	.264
Constant	4.510		.000
Neuroticism	**.028**	**.044**	**.496**
R^2 Change		.074	
Durbin-Watson			1.711

Table 15. Neuroticism and systems thinking.

a. Predictors: (Constant), Industry, Qualification, Gender, Age, Sector
b. Predictors: (Constant), Industry, Qualification, Gender, Age, Sector, N
c. Dependent Variable: ST

4.3.2 The relationship between Systems thinking and Extraversion

Hypothesis 2 states that extraversion influences positively systems thinking. The regression analysis table shows that the value of the R Square Change is 0.074, the F Change is 5.477, significant F change is .115 and the value of Durbin Watson is 1.711. The standardized and unstandardized coefficients B and Beta are .081 and .130 respectively.

Therefore hypothesis 2 is rejected.

Independent variables	B	*β*	*Sig.*
Constant	5.281		.000
Age	-.002	- .031	.577
Gender	-.029	-.023	.678
Qualification	-.010	-.013	.817
Sector	.092	.078	.165
Industry	.007	.062	.264
Constant	4.510		.000
Extraversion	**.081**	**.130**	**.115**
R^2 Change		.074	
Durbin-Watson			1.711

Table 16. Extraversion and systems thinking.

a. Predictors: (Constant), Industry, Qualification, Gender, Age, Sector
b. Predictors: (Constant), Industry, Qualification, Gender, Age, Sector, E
c. Dependent Variable: ST

4.3.2 The relationship between Systems thinking and Openness

Hypothesis 3 states that openness influences positively systems thinking. The regression analysis table shows that the value of the R Square Change is 0.074, the F Change is 5.477, significant F change is .001 and the value of Durbin Watson is 1.711. The standardized and unstandardized coefficients B and Beta are .202 and .044 respectively.

Therefore, hypothesis 1 is supported.

Independent variables	B	*β*	*Sig.*
Constant	5.281		.000
Age	-.002	- .031	.577
Gender	-.029	-.023	.678
Qualification	-.010	-.013	.817
Sector	.092	.078	.165
Industry	.007	.062	.264
Constant	4.510		.000
Openness	**.202**	**.044**	**.001**
R^2 Change		.074	
Durbin-Watson			1.711

Table 17. Openness and systems thinking.

a. Predictors: (Constant), Industry, Qualification, Gender, Age, Sector

b. Predictors: (Constant), Industry, Qualification, Gender, Age, Sector, O

c. Dependent Variable: ST

4.3.4 The relationship between Systems thinking and Agreeableness

Hypothesis 4 states that agreeableness influences positively systems thinking. The regression analysis table shows that the value of the R Square Change is 0.074, the F Change is 5.477, significant F change is .806 and the value of Durbin Watson is 1.711. The standardized and unstandardized coefficients B and Beta are .014 and .023 respectively.

Therefore, hypothesis 4 is rejected.

Independent variables	B	*β*	*Sig.*
Constant	5.281		.000
Age	-.002	- .031	.577
Gender	-.029	-.023	.678
Qualification	-.010	-.013	.817
Sector	.092	.078	.165
Industry	.007	.062	.264
Constant	4.510		.000
Agreeableness	**.014**	**.023**	**.806**
R^2 Change		.074	
Durbin-Watson			1.711

Table 18. Agreeableness and systems thinking.

a. Predictors: (Constant), Industry, Qualification, Gender, Age, Sector

b. Predictors: (Constant), Industry, Qualification, Gender, Age, Sector, A

c. Dependent Variable: ST

4.3.5 The relationship between Systems thinking and conscientiousness

Hypothesis 5 states that conscientiousness influences negatively systems thinking. The regression analysis table shows that the value of the R Square Change is 0.074, the F Change is 5.477, significant F change is .002 and the value of Durbin Watson is 1.711. The standardized and unstandardized coefficients B and Beta are -.181 and -.312 respectively.

Therefore, hypothesis 5 is supported.

Independent variables	B	*β*	*Sig.*
Constant	5.281		.000
Age	-.002	- .031	.577
Gender	-.029	-.023	.678
Qualification	-.010	-.013	.817
Sector	.092	.078	.165
Industry	.007	.062	.264
Constant	4.510		.000
Conscientiousness	**-.181**	**-.312**	**.002**
R^2 Change		.074	
Durbin-Watson			1.711

Table 19. Conscientiousness and systems thinking.

a. Predictors: (Constant), Industry, Qualification, Gender, Age, Sector

b. Predictors: (Constant), Industry, Qualification, Gender, Age, Sector, C

c. Dependent Variable: ST

4.3.6 The relationship between Systems thinking and Organisational culture

Hypothesis 6 states that organisational culture influence systems thinking. The regression analysis table shows that the value of the R Square Change is 0.048, the F change is 17.451, the significant F change is .000 and the Durbin Waston value is 1.692.

Therefore, hypothesis 6 is supported, as the Significant F change is < 0.05.

Independent variables	B	*β*	*Sig.*
Constant	5.281		.000
Age	-.002	- .031	.577
Gender	-.029	-.023	.678
Qualification	-.010	-.013	.817
Sector	.092	.078	.165
Industry	.007	.062	.264
Constant	4.510		.000
Organisational culture			**.000**
R^2 Change		.048	
Durbin-Watson			1.692

Table 20. Organisational culture and systems thinking.

a. Predictors: (Constant), Industry, Qualification, Gender, Age, Sector
b. Predictors: (Constant), Industry, Qualification, Gender, Age, Sector, CT
c. Dependent Variable: ST

Chapter 5: Discussion

5.1 Chapter introduction

This chapter aims to summarise the results of the whole research. The chapter begins with the elaboration of the survey findings that address the aims of the thesis. The research findings reveal that openness and agreeableness influence positively systems thinking, while consciousness impacts it negatively. Organisational culture also was proved to affect the systems thinking ability. Surprisingly, contrast to the expectations a relationship between systems thinking and extraversion and neuroticism was not identified. This chapter will discuss and explain the results of the study.

5.2 The relationship between systems thinking and neuroticism

The first hypothesis, that neuroticism has a negative impact on systems thinking was rejected by the findings. Research findings revealed that there is no relationship between the systems thinking ability and the personality trait of neuroticism. The motivation behind the formation of the hypothesis was based on the Barlow et al.,'s work[279] which suggests that individuals who are characterised with neuroticism traits have a tendency to experience negative emotions frequently, which are also often accompanied by the perception that the world was a dangerous and threatening place. Therefore, it is not surprising to make a preposition that neuroticism can hamper their systems thinking ability. Moreover, people who score low on neuroticism are of an optimistic nature which has positive association with entrepreneur behaviour[280][281]. Optimistic personalities are more likely to innovate, create, design or redesign. This study has failed to identify direct evidence in the academic literature that support the idea that neuroticism influences systems thinking. For example, Randle's doctoral research also identified the lack of relevance between systems thinking and neuroticism.[282] In contrast, there is plenty of academic work recognising the negative influence

[279]Barlow, D. H., Sauer-Zavala, S., Carl, J. R., Bullis, J. R., & Ellard, K. K. (2014). The nature, diagnosis, and treatment of neuroticism: Back to the future. *Clinical Psychological Science*, *2*(3), 344-365.

[280] Sharpe, J. P., Martin, N. R., & Roth, K. A. (2011). Optimism and the Big Five factors of personality: Beyond neuroticism and extraversion. *Personality and Individual Differences*, *51*(8), 946-951.

[281] Bernoster, I., Rietveld, C. A., Thurik, A. R., & Torrès, O. (2018). Overconfidence, optimism and entrepreneurship. *Sustainability*, *10*(7), 2233.

[282] Randle, J. M. (2014). *The systems thinking paradigm and higher-order cognitive processes* (Doctoral dissertation).

of neuroticism on job performance[283][284]. This can be explained with the fact that job performance is shaped by eight factors such as knowledge, experience, skills, abilities, awareness, values, motives and needs.

Most of the listed factors can be negatively impacted by the neuroticism behaviour, which is associated with depression, emotional instability, fear, anxiety, anger etc. Systems thinking on the other hand is a specific way of thinking[285] that promotes the ability of seeing the whole and the parts. A high level of neuroticism is associated with disability to make rational decisions, which might have an extremely negative impact on job performance, but systems thinking stresses on the role of both intuition and logical thinking[286]. Furthermore, systems thinking requires a well-developed intuition more than a well-developed logic. This is suggested by both field leading scholars Peter Senge and Jamshid Gharajedaghi[287] who draw our attention on the new tendencies in leadership that is driven by intuition rather than by logic. In fact, there are not theories stating that systematic thinkers should be optimistic or pessimistic, prone to stress etc. As believed by Senge both positive and negative experiences are helpful for the development of our learning ability, which supports the findings showing no significant relationship between systems thinking and neuroticism[288]. If both positive and negative experiences are equally useful for implementing systems thinking, it means both the ones having low score on neuroticism and the ones having high score on it have an equal chance to be or not to be systematic thinkers.

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[283] Kim, H. J., Shin, K. H., & Swanger, N. (2009). Burnout and engagement: A comparative analysis using the Big Five personality dimensions. *International Journal of Hospitality Management*, *28*(1), 96-104.

[284] Gridwichai, P., Kulwanich, A., Piromkam, B., & Kwanmuangvanich, P. (2020). Role of personality traits on employees job performance in pharmaceutical industry in Thailand. *Systematic Reviews in Pharmacy*, *11*(3), 185-194.

[285] Senge, P. M. (2006). *The fifth discipline: The art and practice of the learning organization*. Currency.

[286] Senge, P. M. (2006). *The fifth discipline: The art and practice of the learning organization*. Currency.

[287]Gharajedaghi, J. (2011). *Systems thinking: Managing chaos and complexity: A platform for designing business architecture*. Elsevier.

[288] Senge, P. M. (2006). *The fifth discipline: The art and practice of the learning organization*. Currency.

5.3 The relationship between systems thinking and extraversion

The second hypothesis claiming that extraversion has a positive impact on systems thinking was also rejected by the research findings. In fact, the results of this study failed to identify any relationship between systems thinking and extraversion. The preposition behind this theory was explained with the sociability, activity, assertiveness and talkativeness which are traits of extraversion. They were linked to Gharajedaghi's mental model of "emergent property'[289], which embodies the idea of the importance of interactions between the elements. Therefore, interaction is considered to be one of the main elements of systems thinking[290]. Moreover, hypothesis 2 was built on the point that personalities avoiding social interactions are not likely to apply group learning and systems thinking. Furthermore, extraversion is also associated with entrepreneurship and risk, which are believed by Brandstatter to be essential elements for economic and business development[291]. In addition, it is reasonable to assume that extraversion is positively associated with systems thinking, as it requires new experiences, which will be hardly achieved without entrepreneurship and interactions.

There are several arguments for reasoning the rejection of hypothesis 2 by the research findings of this study. Despite the secondary findings in the academic literature on systems thinking suggesting that interactions are one of its key elements, a low score on extraversion does not necessarily indicate an impossibility of implementation of systems thinking. This can be explained with the fact that introverts are reserved and independent, but it does not mean that they do not interact at all. In addition, introverts are known to be more selective of who they communicate and socialize with, which means they are giving more importance to the quality of interactions than the quantity. The importance of the quality of interactions in the context of systems thinking is explored by Gharajedaghi[292]. Extroverts on the other hand communicate and socialize easily, which gives them the advantage to meet a lot of new people and get different experiences. Moreover, their adventurous nature makes them more likely to get new experiences and to risk, which does not mean that introverts are closed to a new

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[289] Gharajedaghi, J. (2011). *Systems thinking: Managing chaos and complexity: A platform for designing business architecture*. Elsevier.
[290] Gharajedaghi, J. (2011). *Systems thinking: Managing chaos and complexity: A platform for designing business architecture*. Elsevier.
[291] Brandstätter, H. (2011). Personality aspects of entrepreneurship: A look at five meta-analyses. *Personality and individual differences*, *51*(3), 222-230.
[292] Gharajedaghi, J. (2011). *Systems thinking: Managing chaos and complexity: A platform for designing business architecture*. Elsevier.

experience. A high score on extraversion is an indicator for natural and relaxed environment, which is favourable for systems thinking and organisational learning to be implemented. Findings however, show that individuals can learn and implement systems thinking in other types of organisational environment as well, which sounds rational, as organisations does not consist of extroverts only. Moreover, the findings of Carvalho et al. suggest that the extroverted functioning seems powerless in traumatic situations and cannot influence people' systems thinking.[293] Systems thinking is a problem-solving tool for dealing with complex problems and situations, which could provide an explanation for the missing relationship between systems thinking and extraversion.[294] Introverts and extroverts both have weaknesses and strengths regarding systems thinking. This leads us to the conclusion why none of them has a particular significant influence on it.

5.4 The relationship between systems thinking and openness

The third hypothesis, proposing that openness has a positive impression on systems thinking was supported by the research findings of this study. These results are consistent with the research findings of Roslan et al. who also identified a strong relationship between a high level of openness and systems thinking.[295] This study also managed to identify a significant positive relationship between a high level of openness and systems thinking. Openness is the personality dimension referring to active imagination, intellectual curiosity, independence of judgements, aesthetic sensitivity, preference for variety, and attentiveness to inner feelings, which are essential components of systems thinking.[296] This dimension is also related to the principle of Openness presented by Gharajedaghi, who exhibits the idea people who are not open for new experiences and are not curious intellectually, will not be able to predict the environment and prepare the system[297]. Furthermore, another explanation for the results

[293] Carvalho, L. de F., Pianowski, G., & Gonçalves, A. P. (2020). Personality differences and COVID-19: Are extroversion and conscientiousness personality traits associated with engagement with containment measures? Trends in Psychiatry and Psychotherapy, 42(2), 179-184. doi: 10.1590/2237-6089-2020-0029

[294] Senge, P. M. (2006). *The fifth discipline: The art and practice of the learning organization*. Currency.

[295] Roslan, S., Hasan, S., Zaremohzzabieh, Z., & Arsad, N. M. (2021). Big Five Personality Traits as Predictors of Systems Thinking Ability of Upper Secondary School Students. *Pertanika Journal of Social Sciences & Humanities*, *29*.

[296] Rothman, S., & Coetzer, E. (2003). The Big Five Sector of Pakistan. *Journal and Development*, *2*, 150-158.

[297] Gharajedaghi, J. (2011). *Systems thinking: Managing chaos and complexity: A platform for designing business architecture*. Elsevier.

confirming the relationship between systems thinking and openness, is related to the emphasised role on leadership. Systems thinking promotes the idea that leaders are more important than simply managers as they are the one who inspire others and create a suitable environment for learning and development.

A high score on the personality dimension of openness is an indicator for leadership. This is because they are open-minded, which allows them to discover new experiences and learn from their mistakes. Furthermore, the personality dimension of openness is positively associated with persuasion. Only those, who are open for new experiences and have an open-minded outlook, can produce a novel and significant creations and solutions to complex issues. Moreover, as suggested by authors like Peter Senge systems thinking does not require you to be the best problem-solver out there, but to persuade the world that you are this person. The 21st century has been proven to belong to the problem solvers and innovators such as Steve Jobs, Elon Musk, Richard Branson etc. These are the leaders who have inspired a great number of people with their original and innovative products, services and business models. As suggested by Senge, systematic thinkers are those who are able to see the big picture and are open to novel and innovative solutions and consequently experiences[298]. In contrast, a low score in openness indicates a conservative outlook, which is not valued personality trait in the context of systems thinking.

Another characteristic of openness is related to the ability to reflect and learn from mistakes[299]. The role of reflection is also of a great importance to systems thinking as it requires individuals to assess, realise and correct their past behaviours and mistakes, which is also a big 'turn on' for improvement and seeking new and innovative solutions. Both positive and negative experiences are opportunities for learning and improving. If individuals however, are not reflective, they will skip a great chance for improvement and development. Thus, it is not surprising that there is a significant relationship between systems thinking and the personality dimension of openness.

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[298] Senge, P. M. (2006). *The fifth discipline: The art and practice of the learning organization*. Currency.

[299] Barner, R. W., & Barner, C. P. (2011). Mindfulness, openness to experience, and transformational learning.

5.5 The relationship between systems thinking and agreeableness

The fourth hypothesis suggesting that a low score on agreeableness has a negative impact on systems thinking was rejected by the research findings of this study. In fact, results from the primary research reveal that there is no relationship between systems thinking and the personality dimension of agreeableness. Hypothesis four was built on the theory stating that a low score on agreeableness is an indicator for scepticism for the intentions of others and competition rather than cooperation. Thus, a low score on agreeableness was considered to negatively influence systems thinking, as it is related to inability to work in a team and achieve collective goals. Individuals who score low on agreeableness are individualistic, self-focused and likely to persuade mainly individualistic aims and goals. In fact, the research findings of this study challenge the findings of Roslan et al., who identified a correlation between agreeableness and systems thinking[300]. The mismatch between the research findings can be explained with the target audience which in their case are secondary school students from Malaysia. The target audience of this study is more heterogenous and representative since it consists of adults (managers) who represent a various number of industries, sectors, age group, gender and qualification level. Moreover, reflecting on the results that did not manage to establish any relationship between systems thinking and agreeableness, we can argue that both high and low levels of agreeableness are associated with enablers and disablers of systems thinking.

For instance, a low score on agreeableness is strongly associated with inability to perform well in a team.[301] This is a significant weakness when it comes to systems thinking and organisational learning as explained in one of the five mental models introduced by Gharajedaghi "emergent properties". At the same time, a low score on agreeableness stimulates the competitiveness in individuals, which in the case of systems thinking is a positive stimulus. Systems thinking's main objective is to offer novel and innovative solutions to complex problems. [302]It academically proven that individuals are competitive they are likely to put a lot

[300] Roslan, S., Hasan, S., Zaremohzzabieh, Z., & Arsad, N. M. (2021). Big Five Personality Traits as Predictors of Systems Thinking Ability of Upper Secondary School Students. *Pertanika Journal of Social Sciences & Humanities*, *29*.
[301] Bradley, B. H., Baur, J. E., Banford, C. G., & Postlethwaite, B. E. (2013). Team players and collective performance: How agreeableness affects team performance over time. *Small Group Research*, *44*(6), 680-711.
[302] Lavi, R., Dori, Y. J., & Dori, D. (2020). Assessing novelty and systems thinking in conceptual models of technological systems. *IEEE Transactions on Education*, *64*(2), 155-162.

of effort at innovation, improvement and development[303]. The effect of a high level of agreeableness is also mixed when it comes to systems thinking. A high score on agreeableness is linked to sympathy, altruism to others, eager to help them and expectation for the same in return. The literature research on systems thinking shows that none of the listed above characteristics is related to systems thinking. Moreover, there are not any direct and indirect evidence in the literature that indicate that egocentricity, which is associated with a low level of agreeableness is enabler or disabler to individual's ability to think in systems. Thus, we can come to the conclusion that both low and high score on agreeableness have no significant relationship with systems thinking. Though, a low score on agreeableness can be somehow related to systems thinking, some of its characteristics have a positive impact while others have a negative impact on systems thinking. This makes it impossible a systems thinking ability to be predicted based on this personality dimension, which explains why findings show no significant relationship between them.

5.6 The relationship between systems thinking and conscientiousness

The fifth hypothesis of this study claims that a high score on conscientiousness has a negative impact on systems thinking. The research findings of this study have confirmed this hypothesis. In fact, there is a significant relationship between systems thinking and conscientiousness. Conscientiousness is a personality dimension associated with a strong will, determination and purposefulness, achievement orientation, hardworking, persistency, responsibility, carefulness, orderliness[304]. A high score on this dimension however, is linked to workaholism, compulsiveness, annoying or even fastidious behaviour. People scoring high on conscientiousness, are over strict and responsible which makes them less likely to take risk or to be intuition driven. As it was already discussed earlier in this chapter, systems thinking prioritise intuition over the rational when it comes to decision making. Furthermore, too

[303] Aghion, P., Cherif, R., & Hasanov, F. (2021). Competition, Innovation, and Inclusive Growth. *IMF Working Papers*, *2021*(080).
[304] Barrick, M. R., Mount, M. K., & Li, N. (2013). The theory of purposeful work behavior: The role of personality, higher-order goals, and job characteristics. *Academy of management review*, *38*(1), 132-153.

rational individuals are less likely to seek original and novel solutions to problems, which are also associated with a propensity to risk-taking[305].

According to leading scholars like Gharajedaghi, managers without a well-developed intuition cannot be systems thinkers as they will not be able to predict the environment and prepare the system. Systems thinking requires alternative to the established approaches used by managers in their behaviour and interaction with their employees. This due to the fact that systems thinking suggests that managerial behaviour should be oriented on influencing rather than supervising employees[306]. Furthermore, managers who are able to emotionally influence their employees, will also be able to motivate and support them in a significant way. Authors like Ferguson and Austin identify the correlation between intuition and emotional influence[307], which are crucial for managers who are systems thinkers. Systems thinking requires flexibility, which is negatively associated with a high level of conscientiousness. Managers scoring high on this personality dimension are not likely to inspire others to achieve the goals that they set. Moreover, systems thinking is one of the components of organisational learning, which is a discipline which focuses on constant improvements, developments, and learning. Personalities scoring high on conscientiousness are the ones who follow strictly rules and norms. These individuals are not likely to think 'out of the box' and seek for alternatives to these rules. In addition, a high score on conscientiousness is associated with a personality that is ready to break a problem into parts, rather than seeing the whole, which contradicts with systems thinking's most distinguishing concept of seeing the big picture. To sum up, the results related to the fifth hypothesis are well reasoned in the academic literature.

[305] Woods, S. A., Mustafa, M. J., Anderson, N., & Sayer, B. (2017). Innovative work behavior and personality traits: Examining the moderating effects of organizational tenure. *Journal of Managerial Psychology*.
[306] Senge, P. M. (2006). *The fifth discipline: The art and practice of the learning organization*. Currency.
[307] Ferguson, F. J., & Austin, E. J. (2010). Associations of trait and ability emotional intelligence with performance on Theory of Mind tasks in an adult sample. *Personality and individual differences*, *49*(5), 414-418.

5.7 The relationship between systems thinking and organisational culture

The sixth hypothesis of this study states that organisational culture influences systems thinking. The research findings of this study support the sixth hypothesis. Indeed, there is a significant relationship between systems thinking and organisational culture. Organisational culture is related to collection of traditions, values, policies, beliefs and attitudes, which according to Mullins are responsible for everything individuals do and think within an organisation[308]. Cultural values are important to be accepted by employees according to Cartwright as it increases organisational power whereby motivation[309]. Although four different types of organisational culture have been utilised, not all of them are likely to implement systems thinking. The results of this study do not give an insight about which type of culture impacts systems thinking. Yet, we will discuss which types are more or less likely to positively or negatively influence systems thinking based on their features. For instance, the type of organisational culture called 'The Clan' is likely to implement systems thinking to some extent, as it has internal orientation toward change[310]. For instance, the type of organisational culture called 'The Clan' is likely to implement systems thinking to some extent, as it has internal orientation toward change[311]. Despite it is characterised with a caring and cooperative environment not orientated toward risk and innovation, it has some components which positively influence systems thinking. Cooperation is associated with interactions and group orientation, which are key elements of systems thinking. Furthermore, the leadership style is caring, which means that leaders can influence employees at emotional level. Thus, makes this organisational culture type more likely to positively impact systems thinking.

Open systems is also a type of organisational culture that is likely to stimulate systems thinking, as it is also orientated toward change, but in a contrast to 'the clan' it has external focus. This type of organisational culture is likely to implement systems thinking as it is associated with innovations, entrepreneurship, dynamics and risk-taking tendency. The leadership style is flexible and liberal, as it encourages and gives employees the freedom to be

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[308] Mullins, L. J. (2007). *Management and organisational behaviour*. Pearson education.
[309] Mullins, L. J. (2007). *Management and organisational behaviour*. Pearson education.
[310] FAKHRI, M., SYARIFUDDIN, S., WINARNO, A., NURNIDA, I., & HANUM, S. (2021). Democratic leadership practice to construct clan organizational culture in family companies. *The Journal of Asian Finance, Economics, and Business*, *8*(1), 803-811.
[311] Schein, E. H. (1984). Coming to a new awareness of organizational culture. Sloan Management Review, 25 (2), 3-16.

innovative and to contribute to the organisation in a visible way. All these characteristics are strongly appreciated in the field of systems thinking which is a problem solving tool used for innovation and improvement[312].

Likewise, the next cultural type known as a 'market culture' can also positively impact systems thinking as it is associated with competition and achieving goals, results and objectives.[313] All these characteristics are negatively associated with systems thinking, as it is related to creating a vision, cooperation, innovation and long-term focus[314]. Furthermore, the 'Market' culture's main aim is to satisfy users and it is not focus on employees, which means that learning, improvement and development are not encouraged in such cultures. The next type of culture - the 'hierarchical' culture is also not likely to implement systems thinking, as it is associated with control, structure and predictability[315]. Leadership style is coordinative, transactional, organised and efficiency-oriented. This kind of organisational culture and leadership style lack the flexibility required by systems thinking. Thus, we can conclude that systems thinking is not likely to occur in the hierarchical culture, as it is a discipline orientated toward inspiration rather than supervision and regulatory managing[316][317]. In addition, it requires flexible, freedom and less regulated environment. The analysis of the research findings suggest that it is not surprising that hypothesis six is supported. As it can be seen from the search in the academic literature there are significant arguments exposing the relationship between organisational culture and systems thinking. Aragon who sees organisational culture as positive or negative[318], also supports the hypothesis 6, as both positive organisational culture and systems thinking have similar methods, visions and understanding for leadership and

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[312] Grisold, T., & Peschl, M. F. (2017). Why a systems thinking perspective on cognition matters for innovation and knowledge creation. A framework towards leaving behind our projections from the past for creating new futures. *Systems Research and Behavioral Science*, *34*(3), 335-353.
[313] Underhill-Sem, Y., Cox, E., Lacey, A., & Szamier, M. (2014). Changing market culture in the P acific: Assembling a conceptual framework from diverse knowledge and experiences. *Asia Pacific Viewpoint*, *55*(3), 306-318.
[314] Pors, N. O. (2008). Management tools, organisational culture and leadership: an explorative study. *Performance Measurement and Metrics*.
[315] Pors, N. O. (2008). Management tools, organisational culture and leadership: an explorative study. *Performance Measurement and Metrics*.
[316] Senge, P. M. (2006). *The fifth discipline: The art and practice of the learning organization*. Currency.
[317] Gharajedaghi, J. (2011). *Systems thinking: Managing chaos and complexity: A platform for designing business architecture*. Elsevier.
[318]Aragon, R. (1993). Positive organizational culture: A practical approach. *FBI L. Enforcement Bull.*, *62*, 10.

management style. Furthermore, they have fundamental similarities such as the need of influencing, motivating, fostering employees etc. which explains the findings of this study.

5.7 Chapter summary and conceptual model

The figure below summarises the research findings and analysis related to the factors influencing systems thinking. As it can be seen from the figure below the results of this study has failed to identify any relationship between the three of the big five personality dimensions of neuroticism, extraversion and agreeableness and systems thinking. In contrast, the factors that impact systems thinking significantly are the organisational culture and the personality dimensions of openness and conscientiousness. Moreover, as it is displayed on the figure a moderate or high level of openness has a positive impact on systems thinking, while a high-level of conscientiousness has a negative effect on systems thinking.

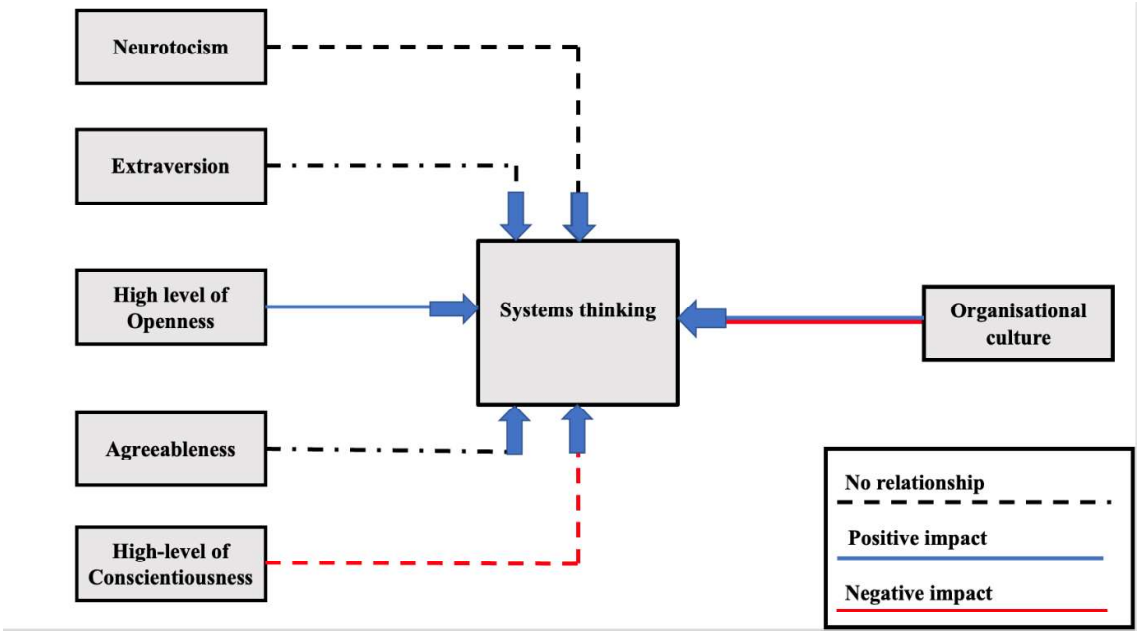

Figure 12. Factors influencing systems thinking. (Own graph)

When it comes to culture, this study suggests that it has a significant impact on systems thinking. However, whether organisational culture impacts systems thinking positively or negatively fully depends on its type. For instance, organisational cultures such as "the Clan", "Open systems" are likely to positively influence systems thinking, while "the Market" and "the Hierarchical" cultures are likely to influence it negatively.

Chapter 6: Conclusions, reflections and implications

6.1 Chapter introduction

This study aims to fill the gap in the existing literature of systems thinking and management by examining the personality and cultural construct of systems thinking. Literature review shows that the relationship between the personality profile and systems thinking ability has been previously examined only by Roslan et al., (2021)[319] and Nagahi et al., (2021) [320]. However, the study of Roslan et al., does not offer a contribution to the management field as their target audience consists of secondary school students from Malaysia. The same is valid for the research conducted by Nagahi et al., whose focus is on system engineers. In contrast, this research focuses exclusively on managers. Data was gathered from managers from Bulgaria and the UK, who are representatives of the three sectors of economy (public, private and non-for profit) and 19 industries. Moreover, the age of the participants varies from 23 to 68 years, where male and female are almost equally represented, which increases the validity of the research findings. The number of the research participants was also high enough (n=353) to increase the validity of the findings. Two models of multiple regression analysis were adopted to guarantee the accuracy of the research findings. Moreover, the results of the internal consistency and the central point of tendency also confirmed the accuracy and validity of the research findings.

When it comes to the relationship of organisational culture and systems thinking, the search of the relevant and late literature has failed to identify any academic study that examines the impact of the organisational culture on systems thinking. The lack of such studies can be explained with the relatively newness of the application of systems thinking to management. Systems thinking is a research domain that originates from the general systems theory and was firstly examined in the field of engineering. Its application to management and the organisational studies had been recognised much later by scholars like Barry Richmond and Peter Checkland. The more recent examinations of systems thinking as a problem-solving

[319] Roslan, S., Hasan, S., Zaremohzzabieh, Z., & Arsad, N. M. (2021). Big Five Personality Traits as Predictors of Systems Thinking Ability of Upper Secondary School Students. *Pertanika Journal of Social Sciences & Humanities*, *29*.

[320] Nagahi, M., Jaradat, R., Goerger, S. R., Hamilton, M., Buchanan, R. K., Abutabenjeh, S., & Ma, J. (2021). The impact of practitioners' personality traits on their level of systems-thinking skills preferences. *Engineering Management Journal*, *33*(3), 156-173.

management tool are associated mainly with the work of Peter Senge and its theory of the "Learning organisation" and "The fifth discipline"[321]. The use of systems thinking is not only in the context of the corporations and business organisations, but also in the educational and higher educational institutions[322]. As the application of systems thinking in management is relatively new, the research effort was mainly focused on the identification the advantages and contributions of systems thinking. Thus, the identification of factors (both enablers and disablers) impacting the individuals' ability to become systems thinkers have been somehow neglected understudied. Literature search clearly demonstrates that systems thinking offers a significant contribution to managers and organisations, which are dealing with complex problems or are aiming to achieve a sustainable growth and gain a competitive advantage toward competitors[323][324]. Consequently, the examination of the factors that determine or influence systems thinking ability of individuals started to be a focus of examination just recently in 2021. **Therefore, this monograph offers a significant contribution to both theory and practice through launching a completely novel theory, which can be used a solid base for further examinations.**

6.2. Review of the main findings and the theoretical contribution of this academic work.

The design of this study is grounded on the comprehensive review of relevant literature and the methodological choice that links its research questions to evidence. Data findings are based on quantitative research with 353 research participants (managers) from Bulgaria and the UK. The results of the study contributed to the academic literature of systems thinking and management by offering a profile of both personality and organisational culture where systems thinking is likely to occur. For this purpose, the big five personality model developed by scholars such as Norman and Goldberg, was adopted as a scale of measurement, whereas Pors's

[321] Senge, P., Schneider, F., & Wallace, D. (2014). Peter Senge on the 25th Anniversary of The Fifth Discipline. *Reflections*, *14*(3).
[322] Senge, P. M., Cambron-McCabe, N., Lucas, T., Smith, B., & Dutton, J. (2012). *Schools that learn (updated and revised): A fifth discipline fieldbook for educators, parents, and everyone who cares about education*. Currency.
[323] Sanneh, E. S. (2018). Systems thinking for sustainable development. *Cham: Springer International Publishing*.
[324] Galanakis, K. (2006). Innovation process. Make sense using systems thinking. *Technovation*, *26*(11), 1222-1232.

work was used to guide the study in connection with the organisational culture part. In terms of personality, the results reveal that the two personality dimensions that impact one's systems thinking are those of openness and conscientiousness. There has been also identified that the other three personality dimensions have no impact on individuals' ability to be systems thinkers. In fact, according to the findings of this research the personality dimension of openness was recognised to positively impact systems thinking. However, this is valid only in the cases when the individuals have a moderate or high score in openness (to a new experience). A moderate or high level of openness is associated with leadership, open-mindedness, persuasion, ability to reflect and willingness to learn from mistakes and experiences. These are key elements of systems thinking according to field leaders like Peter Senge and Jamshid Gharajedaghi. The personality dimension of openness refers to the informational aspect, which was confirmed by the scientific research to have a positive significant impact on networking[325]. At the same time, systems thinking highlights on the importance and the quality of interactions between the system actors. In addition, the personality trait of openness is connected to innovation. At the same time, systems thinking is associated with providing original and novel solutions of complex problems.

The other personality dimension, that influence the systems thinking ability of individuals according to the results of this study, is conscientiousness. A moderate or high level of conscientiousness is seen to negatively impact one's to be a systems thinker. Conscientiousness is a personality dimension linked to a strong will, purposefulness and presistance, achievement, ambition, hardworking, responsibility, cautiousness and organisation[326]. A high score on this dimension however, is linked to workaholism, compulsivity, frustrating or even fastidious behaviour. People scoring high on conscientiousness, are over right-minded which dramatically decreases the chance to take risk or to allow themselves to be intuition driven. Additionally, people who are too rational right-minded are not likely to seek alternative and original solutions to problems, because they

[325] Wolff, H. G., & Kim, S. (2012). The relationship between networking behaviors and the Big Five personality dimensions. *Career Development International*.
[326] Barrick, M. R., Mount, M. K., & Li, N. (2013). The theory of purposeful work behavior: The role of personality, higher-order goals, and job characteristics. *Academy of management review*, *38*(1), 132-153.

require a greater amount of money, time and risk-taking[327]. In contrast to the expectations there was not identified any relationship between the other three personality dimensions of agreeableness, neuroticism and extraversion and systems thinking. The explanation of why the extraversion has no relationship with systems thinking is rooted in the fact that although introverts are less likely to participate in large groups and to actively communicate with other, this does not mean that they do not communicate at all. Moreover, the covid-19 crisis showed that extroverts are powerless in a highly stressful and traumatic situations[328] whereas systems thinking is mostly dealing with such problems and situations. The results revealed a lack of relationship between systems thinking and agreeableness, which conflicts with research findings of Roslan et al., who identified a positive relationship between the two. The mismatch between their results and the results of this study can be reasoned with the difference of the target audience[329].

Roslan et al. did their examination on secondary school students from Malaysia, while the target audience of this study is more heterogenous and representative[330]. This due to the fact that it consists of adults (managers) who embody a pronounced number of industries, sectors, age group, gender and qualification level. Besides, reflecting on the results that have failed to recognise any relationship between systems thinking and agreeableness, we can argue that both high and low levels of agreeableness are enablers and disablers of systems thinking at the same time. For example, a low score on agreeableness is strongly linked to inability to work and perform well in a team.[331] This is a major disadvantage when it comes to systems thinking and organisational learning according to a leading scholar like Gharajedaghi who introduces the model of "emergent properties", which exclusively based on interactions

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[327] Woods, S. A., Mustafa, M. J., Anderson, N., & Sayer, B. (2017). Innovative work behavior and personality traits: Examining the moderating effects of organizational tenure. *Journal of Managerial Psychology*.

[328] Carvalho, L. de F., Pianowski, G., & Gonçalves, A. P. (2020). Personality differences and COVID-19: Are extroversion and conscientiousness personality traits associated with engagement with containment measures? Trends in Psychiatry and Psychotherapy, 42(2), 179-184. doi: 10.1590/2237-6089-2020-0029

[329] Roslan, S., Hasan, S., Zaremohzzabieh, Z., & Arsad, N. M. (2021). Big Five Personality Traits as Predictors of Systems Thinking Ability of Upper Secondary School Students. *Pertanika Journal of Social Sciences & Humanities*, *29*.

[330] Roslan, S., Hasan, S., Zaremohzzabieh, Z., & Arsad, N. M. (2021). Big Five Personality Traits as Predictors of Systems Thinking Ability of Upper Secondary School Students. *Pertanika Journal of Social Sciences & Humanities*, *29*.

[331] Bradley, B. H., Baur, J. E., Banford, C. G., & Postlethwaite, B. E. (2013). Team players and collective performance: How agreeableness affects team performance over time. *Small Group Research*, *44*(6), 680-711.

between team players. Meanwhile, a low score on agreeableness encourages the competitiveness of individuals, which has a positive effect on systems thinking. The contradictory impact of extraversion on systems thinking is the potential explanation for the lack of relationship between this personality dimension and systems thinking.

When it comes to the absent link between the personality trait of neuroticism and systems thinking ability. A moderate or high level of neuroticism is linked to depression, anxiety, emotional instability, fear, anger etc. The search in the literature indicates that a high score on neuroticism is allied to the infirmity to make rational decisions, which has the potential to impact negatively activities such as job performance or entrepreneurship.[332] However, systems thinking gives a priority to intuition over logic. At the same time, negative emotions such as fear and anxiety might have a negative influence on systems thinking. The contradicting effect of neuroticism on systems thinking ability perhaps explains the lack of relationship between them. Last but not least, this study found that there is a significant relationship between the organisational culture and systems thinking. Organisational culture is correlated to the collection of traditions, values, policies, beliefs and attitudes, which as stated by Mullins are accountable for everything individuals do and think within an organisation[333].

This research adopted the Pors's classification of organisational culture, which consists of four types of organisational culture: 'The Clan', 'Open systems', 'Market culture' and 'The hierarchical culture'. Some of these types of organisational culture are more likely to implement systems thinking. For example, systems thinking is likely to occur in organisational cultures like 'The clan' and 'Open systems", because they are oriented toward change and growth (the clan) or toward innovation and entrepreneurship (open systems)[334]. Their characteristics are associated with systems thinking because these two types of organisational culture highlight the importance of change and growth. The only difference is in the focus of

[332] Gridwichai, P., Kulwanich, A., Piromkam, B., & Kwanmuangvanich, P. (2020). Role of personality traits on employees job performance in pharmaceutical industry in Thailand. *Systematic Reviews in Pharmacy*, *11*(3), 185-194.
[333] Mullins, L. J. (2007). *Management and organisational behaviour*. Pearson education.
[334] Pors, N. O. (2008). Management tools, organisational culture and leadership: an explorative study. *Performance Measurement and Metrics*.

change, which in 'the clan' is internal, while in the 'open systems' is external[335]. The other two types of organisational culture – the 'market culture' and the 'hierarchical culture' are negatively associated with systems thinking because these two types of organisational culture are characterised with discipline, strict regulation and customers orientation only. In contrast, systems thinking requires freedom and flexible less regulated environment. **The main theoretical contribution of this study is in the introduction of a new theory on the factors that impact systems thinking ability.** There are tons of academic work examining the effect of systems thinking on organisational performance, innovation and sustainable development. **However, what there are no previous studies which examine the factors determining the individual's systems thinking ability in management and organisational context.**

6.3. Managerial and organisational implications

Findings of this study, which are based on data collected by 353 managers from Bulgaria and the UK, offer the following implications for both managers and organisation. Firstly, this monograph offers a personality profile of the systems thinkers based on the Big Five Personality Traits Model. Thus, the personality traits and dimensions that are likely to influence one's systems thinking ability in either positive or negative way, are identified by this academic work. This study found a relationship between only two out of the five personality dimensions of the Big five model and systems thinking. These are the personality dimensions of openness and conscientiousness. The other three dimensions of extraversion, agreeableness and neuroticism were not directly or indirectly linked to systems thinking according to the data findings of this study. In fact, the survey results reveal that a moderate or a high level of openness has a significant positive influence on people's systems thinking ability. In contrast, a moderate or a high level of conscientiousness was proven to influence negatively the systems thinking ability of individuals. Identifying the profile of a 'systems thinker' will help managers and organisations to choose and promote the candidates that owe this profile. The ability to recognise and develope people who have systems thinking ability is crucial for the organisations due to several reasons:

[335] Pors, N. O. (2008). Management tools, organisational culture and leadership: an explorative study. *Performance Measurement and Metrics*.

1. Systems thinkers are able to solve old and complex problems by offering original and novel solutions.
2. Systems thinking ability is associated with the ability to see 'the big picture' and the whole together with its all-interactive elements.
3. Systems thinkers have well-developed intuition which enables them to see non-obvious connections between things and at the same time to understand why these things behave one way or another.
4. There is much evidence in the academic literature about the relationship between systems thinking and innovation[336]. Likewise, the same relationship is proven when it comes to systems thinking and sustainable economic development[337].
5. Systems thinking is mainly applied to situation characterised with a high level of uncertainty and social and economic dynamics. Thus, the present challenging times resulting from the Covid-19 pandemic and the War in Ukraine require both public and private organisations to adopt, survive and enhance throughout the upholding financial and economic crisis.

This monograph also offers an insight of the types of organisational culture that have the potential to impact systems thinking ability of the individuals in either positive or negative way. This study adopts Pors four categories of organisational culture: 'the Clan', 'Market Culture', 'Open systems' and 'the hierarchical culture'. Data findings suggest that organisational cultures that have a positive impact on systems thinking are those of 'the Clan' and 'Open systems. Likewise, those having a negative impact on systems thinking ability are 'market culture' and 'the hierarchical culture'. Therefore, this study support organisations which aim to achieve innovation and sustainable development, through indicating the profile of organisational culture that is likely to attain these goals.

[336] Stead, S. M. (2019). Using systems thinking and open innovation to strengthen aquaculture policy for the United Nations Sustainable Development Goals. *Journal of fish biology*, *94*(6), 837-844.
[337] Reynolds, M., Blackmore, C., Ison, R., Shah, R., & Wedlock, E. (2018). The role of systems thinking in the practice of implementing sustainable development goals. In *Handbook of sustainability science and research* (pp. 677-698). Springer, Cham.

6.4. Research limitations and future research

The period of data collection occurred in the summer when most employed people are on holiday or out of office, which impacted the number of questionnaires collected to meet the research purpose of this study. Perhaps, if the data collection was conducted in a more active period of the year the response rate was estimated to be around 500. However, the collected data from the 353 surveys was representative enough in terms of demographical, age, industry, sector and qualification of the respondents. Another research limitation was related to the target audience, which in the case of this study were managers. It is much more difficult to reach this target audience compared to regular employees due to several reasons. At first place managers are much busier and less likely to respond positively to the research quest. At second place their number is much more limited compared to this of the regular employees. When it comes to the nature of the study, it can be criticised to be more general because it is based on a whole theory rather than on a specific case study. Yet, as there are no prior studies that are scrutinizing the topic, the whole theory approach can be used a solid base for further examination.[338] The scale of measurement of organisational culture consisted only of four types as Pors categories of organisational culture were adopted. It would be useful if more categories of organisational culture are used to test their impact on systems thinking. In the case of this study this was not appropriate as organisational culture was not the focus on this research. In fact, it was only one of the examined constructs. The more detailed examination of organisational culture would increase the length of the questionnaires which were already long. This would have had a very negative impact on the response rate and consequently to the weight of the research findings. Therefore, since this academic work identifies the relationship between organisational culture and systems thinking and is able to indicate which types of organisational culture are likely to positively impact it – an important area is opened for further examination. Moreover, the findings of this study are based on quantitative research only, which is more appropriate in the cases when there is a need to be estimated a link or connection between variables. Yet, qualitative research supplementing the quantitative findings of this work will be crucial as it will offer an insight and detailed explanation about the connection between the organisational culture, the personality dimensions of openness and conscientiousness, and systems thinking.

[338] Whetten, D. A. (1989). What constitutes a theoretical contribution?. *Academy of management review*, *14*(4), 490-495.

References

1. Ackoff, R. L. (1978). The Art of Problem Solving Accompanied by Ackoff's Fables.
2. Ackoff, R.L. (1974) Redesigning the Future. New York: Wiley.
3. Adams, J., Khan, H. T., Raeside, R., & White, D. I. (2007). *Research methods for graduate business and social science students*. SAGE publications India.
4. Aghion, P., Cherif, R., & Hasanov, F. (2021). Competition, Innovation, and Inclusive Growth. *IMF Working Papers*, *2021*(080).
5. Allik, J., & McCrae, R. R. (2002). A five-factor theory perspective. In *The five-factor model of personality across cultures* (pp. 303-322). Springer, Boston, MA.
6. Alvesson, M., & Sveningsson, S. (2015). *Changing organizational culture: Cultural change work in progress*. Routledge.
7. Antonakakis, N., Gabauer, D., Gupta, R., & Plakandaras, V. (2018). Dynamic connectedness of uncertainty across developed economies: A time-varying approach. *Economics Letters*, *166*, 63-75.
8. Antwi, S. K., & Hamza, K. (2015). Qualitative and quantitative research paradigms in business research: A philosophical reflection. *European journal of business and management*, *7*(3), 217-225., p.219.
9. Aragon, R. (1993). Positive organizational culture: A practical approach. *FBI L. Enforcement Bull.*, *62*, 10., p.11
10. Arnold, R. D., & Wade, J. P. (2015). A definition of systems thinking: A systems approach. *Procedia computer science*, *44*, 669-678.
11. Arnold, R. D., & Wade, J. P. (2017). A complete set of systems thinking skills. *Insight*, *20*(3), 9-17.
12. Arsawan, I. W. E., Koval, V., Rajiani, I., Rustiarini, N. W., Supartha, W. G., & Suryantini, N. P. S. (2020). Leveraging knowledge sharing and innovation culture into SMEs sustainable competitive advantage. *International Journal of Productivity and Performance Management*.
13. Balkis, M., & Isiker, G. B. (2005). The relationship between thinking styles and personality types. *Social Behavior and Personality: an international journal*, *33*(3), 283-294.
14. Bariakova, D. A. (2019). A Systematic Review of Social Innovation in Higher Education Systems as a Driver of Student Employability. *Innovate Higher Education to Enhance Graduate Employability: Rethinking the Possibilities*, 44-55.
15. Bariakova, D. P. (2019). *Transformation of the Higher Education systems of Eastern European developing countries through organisational learning: the case of Bulgaria"* (Doctoral dissertation, University of Southampton).
16. Barlow, D. H., Sauer-Zavala, S., Carl, J. R., Bullis, J. R., & Ellard, K. K. (2014). The nature, diagnosis, and treatment of neuroticism: Back to the future. *Clinical Psychological Science*, *2*(3), 344-365.
17. Barner, R. W., & Barner, C. P. (2011). Mindfulness, openness to experience, and transformational learning.
18. Barrick, M. R., Mount, M. K., & Li, N. (2013). The theory of purposeful work behavior: The role of personality, higher-order goals, and job characteristics. *Academy of management review*, *38*(1), 132-153.
19. Baruch, Y., & Peiperl, M. (2000). Career management practices: An empirical survey and implications. *Human resource management*, *39*(4), 347-366.
20. Beck, U. (1992) Risk Society: Towards a New Modernity. London: Sage.
21. Beckman, S. L., & Barry, M. (2007). Innovation as a learning process: Embedding design thinking. *California management review*, *50*(1), 25-56.

22. Bell, B. S., & Kozlowski, S. W. (2008). Active learning: effects of core training design elements on self-regulatory processes, learning, and adaptability. *Journal of Applied psychology*, *93*(2), 296.
23. Bell, E., & Bryman, A. (2007). The ethics of management research: an exploratory content analysis. *British journal of management*, *18*(1), 63-77.
24. Berkemeyer, N., Junker, R., Bos, W., & Müthing, K. (2015). Organizational cultures in education: Theory-based use of an instrument for identifying school culture. *Journal for Educational Research Online*, *7*(3), 86.
25. Bernoster, I., Rietveld, C. A., Thurik, A. R., & Torrès, O. (2018). Overconfidence, optimism and entrepreneurship. *Sustainability*, *10*(7), 2233.
26. Bernstein, N. J. 11994 Psychometric theory. New York.
27. Bertalanffy, L. V. (1968). *General system theory: Foundations, development, applications*. G. Braziller.
28. Bianchi, J. (2011). Overborrowing and systemic externalities in the business cycle. *American Economic Review*, *101*(7), 3400-3426.
29. Bradley, B. H., Baur, J. E., Banford, C. G., & Postlethwaite, B. E. (2013). Team players and collective performance: How agreeableness affects team performance over time. *Small Group Research*, *44*(6), 680-711.
30. Brandstätter, H. (2011). Personality aspects of entrepreneurship: A look at five meta-analyses. *Personality and individual differences*, *51*(3), 222-230.
31. Brandt, T., Gomes, J. F., & Boyanova, D. (2011). Personality and psychological capital as indicators of future job success?. *Liiketaloudellinen Aikakauskirja*, (3).
32. Bryer, R. A. (1979). The status of the systems approach. *Omega*, *7*(3), 219-231.
33. Cameron, K. S., & Quinn, R. E. (2011). *Diagnosing and changing organizational culture: Based on the competing values framework*. John Wiley & Sons.
34. Carvalho, L. de F., Pianowski, G., & Gonçalves, A. P. (2020). Personality differences and COVID-19: Are extroversion and conscientiousness personality traits associated with engagement with containment measures? Trends in Psychiatry and Psychotherapy, 42(2), 179-184. doi: 10.1590/2237-6089-2020-0029
35. Castells, M. (2004) 'Informationalism, networks, and the network society: a theoretical blueprint', in Manuel Castells (ed.), The Network Society: a Crosscultural Perspective. Northampton, MA: Edward Elgar. pp. 3–48.
36. Cattell, R. B. (1966). The scree test for the number of factors. *Multivariate behavioral research*, *1*(2), 245-276.
37. Chatman, J. A., & Jehn, K. A. (1994). Assessing the relationship between industry characteristics and organizational culture: how different can you be?. *Academy of management journal*, *37*(3), 522-553.
38. Chatman, J. A., & O'Reilly, C. A. (2016). Paradigm lost: Reinvigorating the study of organizational culture. *Research in Organizational Behavior*, *36*, 199-224.
39. Chatterjee, A., Pereira, A., & Bates, R. (2018). Impact of individual perception of organizational culture on the learning transfer environment. *International Journal of Training and Development*, *22*(1), 15-33.
40. Checkland, P. (1999). Systems thinking. *Rethinking management information systems*, 45-56.
41. Chen-Levi, T., Schechter, C., & Buskila, Y. (2021). Exploring Systems Thinking in Schools: Mental Models of School Management Teams. *International Journal of Educational Reform*, *30*(2), 116-137.
42. Cho, I., Kim, J. K., Park, H., & Cho, N. H. (2013). The relationship between organisational culture and service quality through organisational learning framework. *Total Quality Management & Business Excellence*, *24*(7-8), 753-768.

43. Collis, J., & Hussey, R. (2009). A practical guide for undergraduate and postgraduate students.
44. Creswell, J. W. (2013). Steps in conducting a scholarly mixed methods study.
45. Crotty, M. J. (1998). The foundations of social research: Meaning and perspective in the research process. *The foundations of social research*, 1-256.
46. De Vaus, D. (2002). *Analyzing social science data: 50 key problems in data analysis*. sage.
47. De Vries, R. E., De Vries, A., De Hoogh, A., & Feij, J. (2009). More than the Big Five: Egoism and the HEXACO model of personality. *European Journal of Personality*, *23*(8), 635-654.
48. Digman, J. M. (1990). Personality structure: Emergence of the five-factor model. *Annual review of psychology*, *41*(1), 417-440.
49. Digman, J. M. (1994). Child personality and temperament: Does the five-factor model embrace both domains. *The developing structure of temperament and personality from infancy to adulthood*, 323-338.
50. Dobreva, J., & Ilieva-Koleva, D. (2015). Managing Sustainable Enterprises and Promoting Open Innovation in Bulgaria. In *The 8th International Conference for Entrepreneurship, Innovation and Regional Development.* (p. 287).
51. Dominici, G. (2012). Why does systems thinking matter?. *Business Systems Review*, *1*(1), 1-2.
52. Durankev, B. (2019). An overtaking vision for the catching-up development of Bulgaria. *Economic Thought journal*, (3), 123-128.
53. Erdheim, J., Wang, M., & Zickar, M. J. (2006). Linking the Big Five personality constructs to organizational commitment. *Personality and individual differences*, *41*(5), 959-970.
54. Erdle, S., Gosling, S. D., & Potter, J. (2009). Does self-esteem account for the higher-order factors of the Big Five?. *Journal of Research in Personality*, *43*(5), 921-922.
55. Fadda, D., & Scalas, L. F. (2016). Neuroticism as a moderator of direct and mediated relationships between introversion-extraversion and well-being. *Europe's journal of psychology*, *12*(1), 49.
56. FAKHRI, M., SYARIFUDDIN, S., WINARNO, A., NURNIDA, I., & HANUM, S. (2021). Democratic leadership practice to construct clan organizational culture in family companies. *The Journal of Asian Finance, Economics, and Business*, *8*(1), 803-811.
57. Fard, H. D., Rostamy, A. A. A., & Taghiloo, H. (2009). How types of organisational cultures contribute in shaping learning organisations. *Singapore management review*, *31*(1), 49-61.
58. Fathabadi, H. (2020). The Impact of Systemic Thinking on Improving Organizational Performance in Military Units. *C4I Journal*, *4*(1), 70-85.
59. Fell, L., & Russell, D. B. (2000). 2 The human quest for understanding and. *Agricultural Extension and Rural Development: Breaking Out of Knowledge Transfer Traditions*.
60. Ferguson, F. J., & Austin, E. J. (2010). Associations of trait and ability emotional intelligence with performance on Theory of Mind
61. Field, A. P. (2005). Is the meta-analysis of correlation coefficients accurate when population correlations vary?. *Psychological methods*, *10*(4), p.444.
62. Fink, A. (2003). *The survey handbook*. sage.
63. Fiske, D. W. (1949). Consistency of the factorial structures of personality ratings from different sources. *The Journal of Abnormal and Social Psychology*, *44*(3), 329.

64. Flood, R. L., & Romm, N. R. (Eds.). (1997). Critical systems thinking: current research and practice.
65. Forrester, J. W. (1994). System dynamics, systems thinking, and soft OR. *System dynamics review*, *10*(2-3), 245-256.
66. Forrester, J.W. (1958) Industrial dynamics – a major breakthrough for decision makers. Harvard Business Review, 36(4), 37–66.
67. Galanakis, K. (2006). Innovation process. Make sense using systems thinking. *Technovation*, *26*(11), 1222-1232.
68. Gay, L. R., Mills, G. E., & Airasian, P. W. (2009). *Educational research: Competencies for analysis and applications*. Merrill/Pearson.
69. GDPR. (2018). Regulation (EU) 2016/679 (General Data Protection Regulation) version OJ L 119, 04.05.2016; cor. OJ L 127, 23.5.2018. Retrieved from: https://gdpr-info.eu
70. Gharajedaghi, J. (2011). *Systems thinking: Managing chaos and complexity: A platform for designing business architecture*. Elsevier.
71. Goertzen, M. J. (2017). Introduction to quantitative research and data. *Library Technology Reports*, *53*(4), 12-18.
72. Goldberg, L. R. (1992). The development of markers for the Big-Five factor structure. *Psychological assessment*, *4*(1), 26.
73. Goldberg, L. R., Johnson, J. A., Eber, H. W., Hogan, R., Ashton, M. C., Cloninger, C. R., & Gough, H. G. (2006). The international personality item pool and the future of public-domain personality measures. *Journal of Research in personality*, *40*(1), 84-96.
74. Graham, J. R., Harvey, C. R., Popadak, J., & Rajgopal, S. (2017). *Corporate culture: Evidence from the field* (No. w23255). National Bureau of Economic Research.
75. Gridwichai, P., Kulwanich, A., Piromkam, B., & Kwanmuangvanich, P. (2020). Role of personality traits on employees job performance in pharmaceutical industry in Thailand. *Systematic Reviews in Pharmacy*, *11*(3), 185-194.
76. Grisold, T., & Peschl, M. F. (2017). Why a systems thinking perspective on cognition matters for innovation and knowledge creation. A framework towards leaving behind our projections from the past for creating new futures. *Systems Research and Behavioral Science*, *34*(3), 335-353.
77. Grohs, J. R., Kirk, G. R., Soledad, M. M., & Knight, D. B. (2018). Assessing systems thinking: A tool to measure complex reasoning through ill-structured problems. *Thinking Skills and Creativity*, *28*, 110-130.
78. Guilford, J. P., Shneidman, E. S., & Zimmerman, W. S. (1949). The Guilford-Shneidman-Zimmerman Interest Survey. *Journal of consulting psychology*, *13*(4), 302.
79. Haig, B. D. (2005). Exploratory factor analysis, theory generation, and scientific method. *Multivariate Behavioral Research*, *40*(3), 303-329.
80. Heale, R., & Twycross, A. (2015). Validity and Reliability in Quantitative Studies. Evid Based Nurs, 18(4), 66-67.p. 66.
81. Hitchins, D. K. (2003). *Advanced systems thinking, engineering, and management*. Artech House.
82. Hjelle, A. L., & Ziegler, D. (1976). Personality: Basic Assumptions, Research and Applications.
83. Hofstede, G. (2011). Dimensionalizing cultures: The Hofstede model in context. *Online readings in psychology and culture*, *2*(1), 2307-0919.
84. Hofstede, https://www.hofstede-insights.com/fi/product/compare-countries/, accessed 2022.

85. Hopper, M., & Stave, K. A. (2008, July). Assessing the effectiveness of systems thinking interventions in the classroom. In *26th international conference of the system dynamics society*.
86. Hristov, I. (2006). The Sociology of Law–The Privileged Viewpoint for the Dissection of the Modern Society. *Социологически проблеми*, *38*(Special), 238-244.
87. Ison, R. (2017). *Systems Practice: How to Act: In situations of uncertainty and complexity in a climate-change world*. London: Springer London.
88. Ison, R. L. (2008). Systems thinking and practice for action research. *The Sage handbook of action research participative inquiry and practice*, *2*, 139-158.
89. Ison, R. L., & Russell, D. B. (2000). Exploring some distinctions for the design of learning systems. *Cybernetics & human knowing*, *7*(4), 43-56.
90. Jackson, M. C. (1982). The nature of soft systems thinking: The work of Churchman, Ackoff and Checkland. *Journal of applied systems analysis*, *9*(1), 17-29.
91. Jackson, M. C. (1991). The origins and nature of critical systems thinking. *Systems practice*, *4*(2), 131-149.
92. Jackson, M. C. (1994). Critical systems thinking: beyond the fragments. *System Dynamics Review*, *10*(2-3), 213-229.
93. Jackson, M. C. (2009). Fifty years of systems thinking for management. *Journal of the Operational Research Society*, *60*(1), S24-S32.
94. Johnson, P., & Gill, J. (2010). Research methods for managers. *Research Methods for Managers*, 1-288.
95. Jones, J. S., Murray, S. R., & Tapp, S. R. (2018). Generational differences in the workplace. *The Journal of Business Diversity*, *18*(2), 88-97.
96. Kasschau, R.A. (2000), Glencoe Understanding Psychology. Missouri: Gelncoe Partners.
97. Katzenbach, J. R., Steffen, I., & Kronley, C. (2012). Cultural change that sticks. *Harvard Business Review*, *90*(7), 110-117.
98. Kayas, O. G., McLean, R., Hines, T., & Wright, G. H. (2008). The panoptic gaze: Analysing the interaction between enterprise resource planning technology and organisational culture. *International journal of information management*, *28*(6), 446-452.
99. Kerr, S. P., Kerr, W. R., & Xu, T. (2018). Personality traits of entrepreneurs: A review of recent literature. *Foundations and Trends® in Entrepreneurship*, *14*(3), 279-356.
100. Kervin, J. B. (1999). Methods for business research (2"^ ed.). *Reading: Addison-Wesley*.
101. Kim, H. J., Shin, K. H., & Swanger, N. (2009). Burnout and engagement: A comparative analysis using the Big Five personality dimensions. *International Journal of Hospitality Management*, *28*(1), 96-104.
102. Komarraju, M., Karau, S. J., & Schmeck, R. R. (2009). Role of the Big Five personality traits in predicting college students' academic motivation and achievement. *Learning and individual differences*, *19*(1), 47-52.
103. Kopainsky, B., Alessi, S. M., & Davidsen, P. I. (2011, July). Measuring knowledge acquisition in dynamic decision making tasks. In *The 29th International Conference of the System Dynamics Society* (pp. 1-31). Albany, NY: System Dynamics Society.
104. Laher, S. (2013). Understanding the five-factor model and five-factor theory through a South African cultural lens. *South African Journal of Psychology*, *43*(2), 208-221.
105. Lahey, B. B. (2009). Public health significance of neuroticism. *American Psychologist*, *64*(4), 241.

106. Larsson, M. (2009). Learning Systems Thinking. *The role of semiotic and cognitive resources*, *145*.
107. Laszlo, A., & Krippner, S. (1998). Systems theories: Their origins, foundations, and development. *Advances in Psychology-Amsterdam-*, *126*, 47-76.p. 76
108. Lavi, R., Dori, Y. J., & Dori, D. (2020). Assessing novelty and systems thinking in conceptual models of technological systems. *IEEE Transactions on Education*, *64*(2), 155-162.
109. Lazarova, T., Zhelyazkova, V., & Vazov, R. (2015). Innovation leadership as a key concept in entrepreneurship. In *Proceedings of International Conference for Entrepreneurship, Innovation and Regional Development ICEIRD* (pp. 275-287).
110. Letcher, T., & Vallero, D. (Eds.). (2019). *Waste: A handbook for management*. Academic Press.
111. Lewis, G. J., Dickie, D. A., Cox, S. R., Karama, S., Evans, A. C., Starr, J. M., ... & Deary, I. J. (2018). Widespread associations between trait conscientiousness and thickness of brain cortical regions. *Neuroimage*, *176*, 22-28.
112. Lodi-Smith, J., Rodgers, J. D., Cunningham, S. A., Lopata, C., & Thomeer, M. L. (2019). Meta-analysis of Big Five personality traits in autism spectrum disorder. *Autism*, *23*(3), 556-565.
113. Lorsch, J. W., & McTague, E. (2016). Culture is not the culprit. *Harvard Business Review*, *94*(4), 21.
114. Marczyk, G., DeMatteo, D., & Festinger, D. (2005). General types of research designs and approaches. *Essentials of research design and methodology*, 123-157.
115. Martin, J. A. (2011). Dynamic managerial capabilities and the multibusiness team: The role of episodic teams in executive leadership groups. *Organization science*, *22*(1), 118-140.
116. Mayer, J. D. (1998). A systems framework for the field personality. *Psychological Inquiry*, *9*(2), 118-144.
117. McCluskey, A., & Lalkhen, A. G. (2007). Statistics II: Central tendency and spread of data. *Continuing Education in Anaesthesia, Critical Care and Pain*, *7*(4), 127-130.
118. McCrae, R. R., & Costa Jr, P. T. (2008). The five-factor theory of personality.
119. Meadows, D. H. (2008). *Thinking in systems: A primer*. chelsea green publishing.
120. Mele, C., Pels, J., & Polese, F. (2010). A brief review of systems theories and their managerial applications. *Service science*, *2*(1-2), 126-135.
121. Micheli, P., Wilner, S. J., Bhatti, S. H., Mura, M., & Beverland, M. B. (2019). Doing design thinking: Conceptual review, synthesis, and research agenda. *Journal of Product Innovation Management*, *36*(2), 124-148.
122. Midgley, G. (1996). What is this thing called CST?. In *Critical systems thinking* (pp. 11-24). Springer, Boston, MA.
123. Mingers, J., & White, L. (2010). A review of the recent contribution of systems thinking to operational research and management science. *European journal of operational research*, *207*(3), 1147-1161.
124. Miser, H. J., & Quade, E. S. (Eds.). (1985). *Handbook of systems analysis: craft issues and procedural choices* (Vol. 2). Elsevier Science Limited.p.16
125. Mobus, G. E. (2018). Teaching systems thinking to general education students. *Ecological Modelling*, *373*, 13-21.
126. Monat, J. P., & Gannon, T. F. (2015). What is systems thinking? A review of selected literature plus recommendations. *American Journal of Systems Science*, *4*(1), 11-26.

127. Moore, S. M., Komton, V., Adegbite-Adeniyi, C., Dolansky, M. A., Hardin, H. K., & Borawski, E. A. (2018). Development of the systems thinking scale for adolescent behavior change. *Western journal of nursing research*, *40*(3), 375-387.
128. Mullins, L. J. (2007). *Management and organisational behaviour*. Pearson education.
129. Murphy, K. R., & DeShon, R. (2000). Interrater correlations do not estimate the reliability of job performance ratings. *Personnel Psychology*, *53*(4), 873-900.
130. Nagahi, M., Jaradat, R., Goerger, S. R., Hamilton, M., Buchanan, R. K., Abutabenjeh, S., & Ma, J. (2021). The impact of practitioners' personality traits on their level of systems-thinking skills preferences. *Engineering Management Journal*, *33*(3), 156-173.
131. Naveh, E., Katz-Navon, T., & Stern, Z. (2015). Active learning climate and employee errors: The moderating effects of personality traits. *Journal of Organizational Behavior*, *36*(3), 441-459.
132. Neuman, W.L. (2003), "Social Research Methods: Qualitative and Quantitative Approaches" (5th ed.). Boston: Allyn and Bacon.
133. Nielsen, M. B., Glasø, L., & Einarsen, S. (2017). Exposure to workplace harassment and the Five Factor Model of personality: A meta-analysis. *Personality and individual differences*, *104*, 195-206.
134. Nunnally, J. C. (1978). Psychometric theory (2nd ed.). New York: McGraw-Hill.
135. Oh, S. Y., & Han, H. S. (2020). Facilitating organisational learning activities: Types of organisational culture and their influence on organisational learning and performance. *Knowledge Management Research & Practice*, *18*(1), 1-15.
136. Ormerod, R. J. (2011). The relationship between operational research and systems thinking. *Journal of the Operational Research Society*, *62*(1), 242-245.
137. Ozer, D. J., & Benet-Martinez, V. (2006). Personality and the prediction of consequential outcomes. *Annu. Rev. Psychol.*, *57*, 401-421.
138. Palmberg, I., Hofman-Bergholm, M., Jeronen, E., & Yli-Panula, E. (2017). Systems thinking for understanding sustainability? Nordic student teachers' views on the relationship between species identification, biodiversity and sustainable development. Education Sciences, 7(3), 1–18. doi: 10.3390/educsci7030072
139. Parks-Leduc, L., Feldman, G., & Bardi, A. (2015). Personality traits and personal values: A meta-analysis. *Personality and Social Psychology Review*, *19*(1), 3-29.
140. Patimo, D. M., & Lucero, M. B. A. (2021). Predictors of Success in Advance Higher Education: A Case in Northwest Samar State University, Philippines. *Research in Social Sciences and Technology*, *6*(1), 40-52.
141. Patterson, F., Kerrin, M., & Gatto-Roissard, G. (2009). Characteristics and behaviours of innovative people in organisations. *Literature review prepared for the NESTA Policy & Research Unit*, 1-63.
142. Pedhazur, E. J., & Schmelkin, L. P. (1991). Artifacts and pitfalls in research. *Measurement, Design, and analysis: An Integrated Approach. Hillsdale, NJ: Lawrence Erlbaum Associates*, 234-241.
143. Pettigrew, A. M. (1979). On studying organizational cultures. *Administrative science quarterly*, *24*(4), 570-581, p. 572.
144. Plate, R., & Monroe, M. (2014). A structure for assessing systems thinking. *The Creative Learning Exchange*, *23*(1), 1-3.
145. Pors, N. O., 2008. Management tools, organisational culture and leadership: an explorative study. Performance Measurement and Metrics, 9(2), p.142.
146. Randle, J. M. (2014). *The systems thinking paradigm and higher-order cognitive processes* (Doctoral dissertation).

147. Remenyi D., Williams B., Money A. & Swartz E. (1998), Doing Research in Business and Management, SAGE Publications, London, UK.
148. Reynolds, M., Blackmore, C., Ison, R., Shah, R., & Wedlock, E. (2018). The role of systems thinking in the practice of implementing sustainable development goals. In *Handbook of sustainability science and research* (pp. 677-698). Springer, Cham.
149. Richmond, B. (1987). *Systems thinking: Four key questions*. High Performance Systems.p.1
150. Richmond, B., & Peterson, S. (2001). *An introduction to systems thinking*. Lebanon, NH: High Performance Systems., Incorporated.
151. Rittel, H.W.J. and Webber, M.M. (1973) 'Dilemmas in a general theory of planning', Policy Science, 4: 155–69.
152. Roberts, P., & Priest, H. (2006). Reliability and validity in research. *Nursing standard*, *20*(44), 41-46.
153. Rosenhead, J. V. (1976). Some further comments on the social responsibility of operational research. *Journal of the Operational Research Society*, *27*(1), 266-272.
154. Roslan, S., Hasan, S., Zaremohzzabieh, Z., & Arsad, N. M. (2021). Big Five Personality Traits as Predictors of Systems Thinking Ability of Upper Secondary School Students. *Pertanika Journal of Social Sciences & Humanities*, *29*, p.253.
155. Rothman, S., & Coetzer, E. (2003). The Big Five Sector of Pakistan. *Journal and Development*, *2*, 150-158.
156. Sanneh, E. S. (2018). Systems thinking for sustainable development. *Cham: Springer International Publishing*.
157. Saunders, M. N. K., Lewis, P., & Thornhill, A. (2019). Research Methods for Business Students Eight Edition. *QualitativeMarket Research: An International Journal*.
158. Saunders, M. N., Lewis, P., Thornhill, A., & Bristow, A. (2015). Understanding research philosophy and approaches to theory development.
159. Saunders, M., Lewis, P. H. I. L. I. P., & Thornhill, A. D. R. I. A. N. (2007). Research methods. *Business Students 4th edition Pearson Education Limited, England*, pp. 353 – 354).
160. Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research methods for business students*. Pearson education.
161. Saunders, M., Lewis, P., & Thornhill, A. (2012). Research methods for business students (6. utg.). *Harlow: Pearson*.
162. Schein, E. H. (1984). Coming to a new awareness of organizational culture. Sloan Management Review, 25 (2), 3-16.
163. Schein, E. H. (1990). *Organizational culture* (Vol. 45, No. 2, p. 109). American Psychological Association.
164. Schein, E. H. (1990). Organizational Culture: What it is and How to Change it. In *Human resource management in international firms* (pp. 56-82). Palgrave Macmillan, London.
165. Schwaba, T., Luhmann, M., Denissen, J. J., Chung, J. M., & Bleidorn, W. (2018). Openness to experience and culture-openness transactions across the lifespan. *Journal of Personality and Social Psychology*, *115*(1), 118.
166. Scroggins, W. A., Thomas, S. L., & Morris, J. A. (2009). Psychological testing in personnel selection, part III: The resurgence of personality testing. *Public Personnel Management*, *38*(1), 67-77.
167. Senge, P. (1990). Peter Senge and the learning organization. *Rcuperado de*.
168. Senge, P. M. (2006). *The fifth discipline: The art and practice of the learning organization*. Currency.

169. Senge, P. M. (2014). Creating the schools of the future: Education for a sustainable society. In *Creating a Sustainable and Desirable Future: Insights from 45 global thought leaders* (pp. 321-329).
170. Senge, P. M., & Sterman, J. D. (1992). Systems thinking and organizational learning: Acting locally and thinking globally in the organization of the future. *European journal of operational research*, *59*(1), 137-150.
171. Senge, P. M., Cambron-McCabe, N., Lucas, T., Smith, B., & Dutton, J. (2012). *Schools that learn (updated and revised): A fifth discipline fieldbook for educators, parents, and everyone who cares about education*. Currency.
172. Senge, P., Schneider, F., & Wallace, D. (2014). Peter Senge on the 25th Anniversary of The Fifth Discipline. *Reflections*, *14*(3).
173. Shaffie, A., & Stec, T. (2014). *Gaining a competitive advantage with sustainable business–implementing inductive charging using systems thinking, A Benchmarking of EVs and PHEVs* (Master's thesis).
174. Sharpe, J. P., Martin, N. R., & Roth, K. A. (2011). Optimism and the Big Five factors of personality: Beyond neuroticism and extraversion. *Personality and Individual Differences*, *51*(8), 946-951.
175. Shön, D.A. (1995) 'The new scholarship requires a new epistemology', Change (November/December): 27–34.
176. Siegel, A. F. (2016). *Practical business statistics*. Academic Press.
177. Skyttner, L. (2005). *General systems theory: Problems, perspectives, practice*. World scientific.
178. SLIM (2004a) 'SLIM framework: social learning as a policy approach for sustainable use of water' (see http://slim.open.ac.uk).
179. Smith, M. M., Sherry, S. B., Vidovic, V., Saklofske, D. H., Stoeber, J., & Benoit, A. (2019). Perfectionism and the five-factor model of personality: A meta-analytic review. *Personality and Social Psychology Review*, *23*(4), 367-390.
180. Stead, S. M. (2019). Using systems thinking and open innovation to strengthen aquaculture policy for the United Nations Sustainable Development Goals. *Journal of fish biology*, *94*(6), 837-844.
181. Sterman, J. D. (2010). Does formal system dynamics training improve people's understanding of accumulation?. *System Dynamics Review*, *26*(4), 316-334.
182. Sweeny, L. B., & Sterman, J. D. (2000, August). Bathtub dynamics: Preliminary results of a systems thinking inventory. In *International System Dynamics Conference, Bergen, Norway*.
183. Syed, N., Saeed, A., & Farrukh, M. (2015). Organization commitment and five factor model of personality: Theory recapitulation. *Journal of Asian Business Strategy*, *5*(8), 183-190.
184. Tabachnick, B. G., Fidell, L. S., & Ullman, J. B. (2007). *Using multivariate statistics* (Vol. 5, pp. 481-498). Boston, MA: pearson.
185. Tackett, J. L., & Lahey, B. B. (2017). Neuroticism.
186. Thomas, A. R., & Lockett, M. (1979). Marxism and systems research: values in practical action. In *Improving the Human Condition: Quality and Stability in Social Systems. Proceedings of the silver anniversary international meeting of the Society for General Systems Research (SGSR)* (pp. 20-24).
187. Todorov, K., & Akbar, Y. H. (2018). *Strategic Management in Emerging Markets: Aligning Business and Corporate Strategy*. Emerald Group Publishing.
188. Underhill-Sem, Y., Cox, E., Lacey, A., & Szamier, M. (2014). Changing market culture in the P acific: Assembling a conceptual framework from diverse knowledge and experiences. *Asia Pacific Viewpoint*, *55*(3), 306-318.

189. Van Velsor, E., & Hughes, M. W. (1990). *Gender Differences in the Development of Managers: How Women Managers Learn from Experience*. Publications, Center for Creative Leadership, PO Box 26300, Greensboro, NC 27438-6300 (Stock# 145R; $30.00 each).
190. Watson, D., Clark, L. A., & Chmielewski, M. (2008). Structures of personality and their relevance to psychopathology: II. Further articulation of a comprehensive unified trait structure. *Journal of personality*, *76*(6), 1545-1586.
191. Whetten, D. A. (1989). What constitutes a theoretical contribution?. *Academy of management review*, *14*(4), 490-495.
192. Widiger, T. A. (2015). Assessment of DSM–5 personality disorder. *Journal of Personality Assessment*, *97*(5), 456-466.
193. Widiger, T. A., & Crego, C. (2019). The Five Factor Model of personality structure: an update. *World Psychiatry*, *18*(3), 271.
194. Wilson, S. R., Whitmoyer, J. G., Pieper, T. M., Astrachan, J. H., Hair Jr, J. F., & Sarstedt, M. (2014). Method trends and method needs: Examining methods needed for accelerating the field. *Journal of Family Business Strategy*, *5*(1), 4-14.
195. Wimsatt, W. C. (2006). Reductionism and its heuristics: Making methodological reductionism honest. *Synthese*, *151*(3), 445-475.
196. Wolff, H. G., & Kim, S. (2012). The relationship between networking behaviors and the Big Five personality dimensions. *Career Development International*.
197. Woods, S. A., Mustafa, M. J., Anderson, N., & Sayer, B. (2017). Innovative work behavior and personality traits: Examining the moderating effects of organizational tenure. *Journal of Managerial Psychology*.
198. Zięba, K. (2021). How can systems thinking help us in the COVID-19 crisis?. *Knowledge and Process Management*.
199. Zikmund, W. G., Babin, B. J., Carr, J. C., & Griffin, M. (2013). *Business research methods*. Cengage learning.
200. Zufferey, P., Caspar, F., & Kramer, U. (2019). The role of interactional agreeableness in responsive treatments for patients with borderline personality disorder. *Journal of personality disorders*, *33*(5), 691-706.