

**Personality Traits, Needs and Cultural Background as Influencing
Factors on the Usage Intention of Gamification –
A cross cultural study comparing India and Germany**

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“Games are the only force in the known universe that can get people to take actions against their self-interest, in a predictable way, without using force.”

Gabe Zichermann

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IV List of abbreviations

AVE	Average Variance Extraced
BFI	Big Five Inventory - 44-item inventory
BFI-10	Big Five Inventory (10 Item Scale)
CB-SEM	Covariance-Based-Structural Equation Modelling
e.g.	for example (from latin <i>exempli gratia</i>)
ESS	Enterprise Social Software
et al.	et alia / alii / aliae (and others)
etc.	et cetera
fig.	Figure
HCI	Human Computer Interaction
HTMT	heterotrait-monotrait ratio
HT-SMEs	High-Tech-Small-and-Medium-Enterprises
i.a.	inter alia
IoU	Intention to use
IS	Information systems
KBTF	Knowledge-based theory of the firm
KM	Knowledge management
KPI	Key Performance Indicator
LV	latent variables (unobservable constructs)
NEO-PI	BIG5 NEO Personality Inventory
PLS	Partial Least Squares
PLS-SEM	Partial Least Squares-Structural Equation Modelling
PRF	Personality Research Form (PRF; Jackson, 1984)
PV	proxy variables (to measure latent constructs)
RBV	Resource Based View
SD	Standard Deviation
SDT	Self-determination theory
SEM	Structural Equation Modelling
SMEs	Small and medium enterprises
SNS	Social networking Sites
TAM	Technology Acceptance Model
TRA	Theory of reasoned action
UTAUT	Unified Theory of Acceptance and Use of Technology
VIF	Variance Inflation Factor

"Good gamification design seeks to understand and align an organisation's objectives with a player's intrinsic motivation (an innate drive to do something, or your pursuit of activities that are rewarding in and of themselves). Then, through the use of extrinsic rewards and intrinsically satisfying design, move the player through their journey of mastery. This journey requires elements such as desire, incentive, challenge, reward and feedback to create engagement." (Gabe Zichermann 2011)

1 Introduction

Today's digital transformation enables the integration of technology into all areas of business, thereby fundamentally changing the processes of value creation and delivery. Many products and services can easily be consumed worldwide with the ease of a mouse click. But at the same time companies compete for resources they need to offer these products or services on a global scale. The international sourcing of highly qualified talent (knowledge workers) to compete with rising pressures to develop innovative products and services is omnipresent.¹ Constantly rising product complexity and shorter time-to-market cycles challenge today's entrepreneurs and their teams.² Team members need to be motivated in order to perform, collaborate and stay satisfied. The necessity to successfully combine specialized know-how is the key to competitive advantage in a world which transforms towards a knowledge-based society.³ Knowledge-economies represent the new dominant societal and economic growth paradigm.⁴

However, knowledge is created and held by individuals and not by organisations.⁵ Looking at the experts with different cognitive, relational and structural backgrounds (e.g. the U.S. international business marketing expert vs. the German physicist) points to the differences in culture, personality traits and work-related needs. Today's knowledge innovations focus too much on technical aspects instead on human motivation and the willingness to share knowledge between experts.⁶ Successful collaboration needs to overcome different barriers and grow "social capital" (trust, social norms, and networks).⁷ But also on the individual dimension barriers exist prohibiting collaboration and knowledge exchange, first motivation and encouragement.⁸

Research during the last decade has focused on different incentive instruments to align employee behavior with organizational goals and better understand the source of human motivation.⁹ Gamification is the latest hype in motivational research.¹⁰

During the last years gamification has become a growing strategy mainly in B2C scenarios (external gamification)¹¹ to increase customer involvement and retention.¹² The potential of internal gamification targeting at the own workforce might go far beyond customer high scores and batches. It can drive engagement and

¹ Michaels et al. 2009. p.6 (compare to table "The War for Talent -The Old Reality / The New Reality")

² For example, product complexity caused by digitalization

³ Rockett 2012. p.1

⁴ Khadir 2020. p.83

⁵ Grant 1996. p.120

⁶ Friedrich et al. 2020. p.341

⁷ Monavvarian et al. 2013.

⁸ Riege 2005. p.31 "Barrier 1: motivation, encouragement, and stimulation of individual employees to purposefully capture, disseminate, transfer, and apply existing and newly generated useful knowledge, especially tacit knowledge;"

⁹ Pink 2010. p.205 (Chapter 2. Seven Reasons Carrots and Sticks (Often) Don't Work: "Carrots & Sticks are so last Century. Drive says for 21st century work, we need to upgrade to autonomy, mastery and purpose."

¹⁰ Zichermann und Cunningham 2011.. p.xiiv("Games are the future of work, fun is the new "responsible," and the movement that is leading the way is gamification.")

¹¹ In this research "external gamification" refers to gamification conducted by an organisation to address customers (B2C), "internal gamification" refers to gamifications mechanics used by organisations to address its own employees

¹² Zichermann und Linder 2010..chapter 10, "Pursuing, Engaging, and Rewarding Customers: The Business of Lifestyles"

innovation to produce positive business results.¹³ Being a powerful driver for goal-oriented behavioral change on the one hand, and a driver of human interaction on the other, gamification has the potential to revolutionize the way people work, collaborate and develop.¹⁴ It targets the very basic needs of people: social belonging, competition, reward, self-expression, fun and recognition thereby making it an interesting instrument for today's knowledge intense organisations in order to coordinate engagement, social capital and knowledge exchange. However, using identical gamification mechanics for every individual has been found to fail.¹⁵

1.1 Prior research and research gap

Researchers in the human-computer interaction community (HCI) have been researching different gamification approaches since nearly two decades and suggested different classifications and frameworks. In 2020 Sailer and Homner conducted a meta analysis of gamification in the context of learning to synthesize the state of research focusing on cognitive, motivational, and behavioral learning outcomes. Their results indicated positive effects of gamification on cognitive, motivational, and behavioral learning outcomes.¹⁶ This is in line with the previous findings of Hamari, Koivisto and Sarsa who also conclude in their meta research that in most cases gamification yields positive effects/outcomes. *"The review indicates that gamification provides positive effects, however, the effects are greatly dependent on the context in which the gamification is being implemented, as well as on the users using it."*¹⁷

Liu et al. point to the fact that gamification design elements must match users' characteristics as basic principle.¹⁸ This differentiation is also addressed by Tondello et al., criticizing that many gamification approaches do not regard individual preferences for internal gamification settings.¹⁹ Thus, only little prior research has been conducted focusing on the specifics of individuals, their needs and preferences regarding internal gamification mechanics. Jia et al. published a study on personality traits and motivational affordances.²⁰ They found that e.g. extravert personalities were motivated by different aspects than introverts and gave gamification design suggestions for specific audiences. Schöbel and Söllner suggested an approach to adapt gamification elements to the individual motivational structures of information system users, their research is still in progress and not yet empirically analyzed.²¹ Focusing on gamified e-learning applications Buckley and Doyle found that individual learning styles and personality traits required different approaches to gamification.²² Tondello et al. conducted the first exploratory study to investigate design elements in gameful systems. They presented a framework for user specific gamification based on personality, observing behavior, or asking for preferences.²³ Hallifax et al. in 2019 summarized that users can be

¹³ Werbach und Hunter 2012. p.9-11

¹⁴ Compare to Yu-kai Chou 2014. ("Human-Focused Design," as opposed to "Function-Focused Design.")

¹⁵ Schöbel und Söllner 2016. ("Despite the positive effects of games in daily life, more gamification projects fail. A possible explanation for this observation is that game elements are often designed without considering the needs of different groups of users.")

¹⁶ Sailer und Homner 2020. p.77

¹⁷ Hamari et al. 2014. p.1

¹⁸ Liu et al. 2017. p.1020

¹⁹ Tondello, G. F., Mora, A., & Nacke, L. E. 2017. p.3

²⁰ Jia et al. 2016.

²¹ Schöbel und Söllner 2016.

²² Buckley und Doyle 2017.

²³ Tondello, G. F., Mora, A., & Nacke, L. E. 2017.

more or less receptive to different gamification instruments, depending on their personality and player profile, however research findings are heterogeneous due to different gamification contexts and typologies.²⁴

This study takes a different approach addressing individual characteristics. First, it is assumed that personality traits as such do not suffice to predict internal gamification element preferences alone. Ghaban et al. agree that several studies indicate the benefit of mapping gamification elements to personality. However, they criticize that this mapping requires a strong understanding of the relationship between gamification elements and personality, which might be more complex (e.g. to situational influences) than adapted by current research.²⁵ Minica researched correlations between the human needs system, personality and human motivation. She concluded that human work-related needs should be regarded more in an organizational context (especially motivational research).²⁶ While recognizing the importance of personality-traits, work-related needs and wants may more precisely adapt to the individual job situation and environment and thus, may act as a better preference predictor and personality trait mediator. In line with these findings, Sulea et al. found that need satisfaction matters more than personal disposition when explaining, engagement and well-being of students.²⁷ *“Results indicate that certain personality factors play a role in well-being, but that the fulfillment of the needs for autonomy, competence, and relatedness is of additional importance.”*²⁸ Consequently, in this research human work-related needs will be matched to according gamification elements to serve as more situational dependent moderators between personality traits and specific preferences. This raises the research question:

- How do work-related needs affect the preference for specific gamification elements?

Costa et al. extend on the differentiation between need- and personality-trait-driven behavior. They found correlations between personality traits and human needs, concluding that *“[...]the behavior of a given individual in a given situation may require a consideration of many motives, often interacting to facilitate or inhibit each other [...]”*.³⁰ They discuss two levels of interpretation and address scope overlap of traits- and needs-inventories pointing out the dynamic structure of needs based on state of the individual. The paper is concluded by pointing out that the correlations between personality inventories and needs provide a rich source source of further hypotheses that should be explored when assessing individuals behaviour. Thus, this research analyses:

- How do personality traits affect individual work-related needs?

Andreş in her related research finds that, *“[e]ach person, depending on his or her specific needs and necessities, and the national and organisational context where they carry on their activity, has aspirations and a set of motivational expectations”*³¹ Thereby addressing another dimension which potentially influences individual motivational preferences which is cultural background. Current research often neglects the potential influence of cultural background on gamification preferences. But national culture is part of every individual and its influence on personality cannot be separated.³² Khaled in 2015 analyzed cultural aspects on a conceptual basis: *“As gamification reaches further conceptual maturity, we need to be deeply*

²⁴ Hallifax Stuart, Audrey Serna, Jean-Charles Marty, Guillaume Lavoué, Elise Lavoué 2019. p.1

²⁵ Ghaban und Hendley 2019. p.1-2

²⁶ Minica 2015. p.109

²⁷ Sulea et al. 2015.

²⁸ Sulea et al. 2015. p.1

²⁹ Compare also to Volodina et al. 2019. “Basic psychological need satisfaction predicted outcomes above personality traits.”

³⁰ Costa und McCrae 1988. p.264

³¹ Andreş 2012.. p.111

³² Triandis und Suh 2002. p.152

thoughtful about cultural and other value biases inherent in gamification design tropes and cognizant of the preferences of the audiences we are designing for to reduce the risk of design failure and the alienation of players."³³ She proposed that game dynamics embody cultural values that tend to reinforce values suited to mastery and hierarchy-focused cultures. Other academics addressed this fact previously, stating that most of the companies which implemented gamification or offer consulting services are US-based and thus might not to the culture of other nations.³⁴ Thus, better understanding culture might be important for comprehending differences in individual behavior. Consequently, another research question is raised:

- How does cultural background affect the preference for specific gamification elements?

So far, two additional constructs have been introduced: Individual work-related needs and wants and cultural background. Both constructs have rarely been researched in the context of user specific internal gamification. Finally, in order to analyze whether these influencing factors on individual gamification preferences also in turn influence the overall intention to use gamification, the final question is raised:

- How does the preference for specific gamification elements affect the intention to use gamification?

This study will analyze possible cause and effect relationships between personality traits, human work-related needs, cultural background, and the preference for specific internal gamification mechanics.

1.2 Goal and research questions

The goal of this work is to analyze possible cause and effect relationships between personality traits³⁵, human work-related needs³⁶, cultural background³⁷ and the preference for specific gamification mechanics³⁸ in order to address motivation and ultimately knowledge flow and collaboration in knowledge-intense organisations. This is addressed by combining and interweaving the status quo of researches in the fields of knowledge management, social capital, motivation, personality, culture, and gamification. Goal of this research model is to measure different effects on the individual's intention to use gamification. Building on this research's results the insights shall help to improve work environments by fostering engagement, social interaction and thus, knowledge creation. Finally, it may add to human resource development on an organizational level. More specific this refers to:

- Better understanding individual's work-related needs and the relationship to personality traits
- Differentiation of gamification mechanics and the relationship to work-related needs, personality traits and cultural background

Based on these goals, the following goal model is derived:

³³ Walz 2015.chapter.1. p.298-318 by Rilla Khaled

³⁴ Schönbohm und Urban 2014. p.93

³⁵ Definition see 2.6 Personality Traits – Big-Five-Inventory

³⁶ Definition see 2.3 Motivation theory

³⁷ Definition see 2.7 Culture

³⁸ Definition see 2.5 Gamification

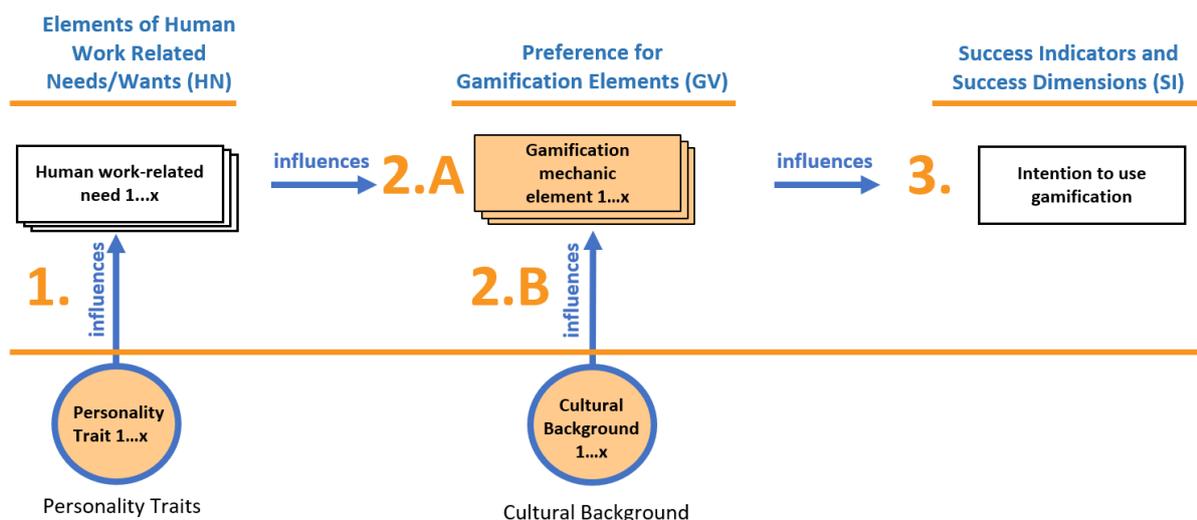


Figure 1 Research goal model³⁹

The goal model visualizes the four potential cause and effects relationships which will be analyzed in this research. It serves as basis for the research model, which will be derived in chapter 2. Every construct shown (personality traits, human work-related needs, gamification elements, cultural background, intention to use gamification) will be separately introduced and explained. At this point in time it shall give a first overview about the goals and related constructs.

The research questions derived from the research gap are:⁴⁰

1. How do personality traits affect individual work-related needs?
- 2.A How do work-related needs affect the preference for specific gamification elements?
- 2.B How does cultural background affect the preference for specific gamification elements?
3. How does the preference for specific gamification elements affect the intention to use gamification?

1.3 Scope of study

Human work-related needs will vary considerably not only depending on personality but also on many other variables (e.g. work environment). The same holds when looking at the constructs of personality traits and cultural background. As will be shown in chapter 2 there are different definitions of personality and culture, thus the focus will already be narrowed in this section to create a common understanding of content and structural differentiation attributes the author had in mind when designing the study. The following figure gives an overview about the differentiation categories and belonging attributes which have been applied in this research to narrow the focus, each category will be explained in the following sections. The differentiation attributes are chosen exemplary to concretize which aspects are covered, partly covered, or out of scope (not covered) by this research.

³⁹ The research model and the belonging research questions 1-4 will be derived subsequently in chapter 2 and 3, they are addressed here to give an overview about the research and its goals

⁴⁰ Compare to 1.1 Prior research and research gap

Differentiation Category	Differentiation Attributes			
Work environment	Knowledge intense enterprises (white collar workers)		Other work environments (e.g. blue collar enterprises)	
Organisational Focus Group	Organisation-wide	Department	Team	Individual
Socio-Technical Focus	Technology	Process	Human	
Individual Personality Traits / Inventories	BIG5 Personal Inventory	Other personality inventories		
Individual Cultural Backgrounds	National culture Germany	National culture India	Other nations / cultural dimensions	
Incentive system	Internal gamification		Other goal or incentive systems (e.g. balanced scorecard)	
Success indicators of research	Knowledge exchange	Social interaction	Individual motivation	Intention to use gamification

Attribute is covered by research

Attribute is partly covered by research

Attribute is not covered by research

Figure 2 Definition of research scope ⁴¹

Work environment

The first structural differentiation is the work environment focusing on knowledge intense organisations employing white collar workers. The reason this differentiation is made is that it was shown that e.g. white-collar workers have different job preferences than blue collar workers. *“Research finds that white collar workers are more concerned about intrinsic values which emanate from the work itself, such as a job be considered important and gives a feeling of accomplishment, whereas blue collar workers are more concerned with the “extrinsic” components of a job, such as its accompanying economic rewards or promotional opportunities.”*⁴²

Organizational Focus Group ⁴³

The organizational focus group is knowledge workers interacting in a face-2face team of about five to fifteen people. With increasing team size (>15) and diversity (e.g. dispersed teams) team members exhibit lower social bonds and complexity rises. Furthermore, next to the team a strong focus is also on the individual person without social influences. The empirical questionnaire part of this study is addressing imaginative conditions (e.g. “intention to use gamification”). Thus, it is by design already explorative. To keep a precise focus for the participants of the study as well as for the readers of this work it is crucial to narrow the scope to a common understanding of a given fictional team setting.

Socio-Technical Focus

⁴¹ Explanation of each item see below

⁴² Weaver 1975. p.167 see also Centers und Bugental 1966 “A selected cross-section of the working population (N = 692) was interviewed with respect to job motivations. The extent to which extrinsic or intrinsic job components were valued was found to be related to occupational level. At higher occupational levels, intrinsic job components (opportunity for self-expression, interest-value of work, etc.) were more valued. At lower occupational levels, extrinsic job components (pay, security, etc.) were more valued.” AND Locke 1973 [Lo73] Locke, E. A.: Satisfiers and dissatisfiers among white-collar and blue-collar employees. In Journal of Applied Psychology, 1973, 58; p p. 67–76.

⁴³ Organisational focus groups refer to a specific group of humans within an organization – the smallest group is the individual the largest group is the whole organization with all employees – in between many groups like teams, departments and divisions exist

Socio-technical theory differentiates human (social), organisational (processes) and technological factors when analyzing systems.⁴⁴ This work is addressing primarily the human (social) dimension (personality-traits, culture, work-related needs). The theoretical part recognizes that incentive systems need to address all three dimensions (technology, processes, and people) however, the first two are not focused in the empirical and result part.

Individual Personality Traits / Inventories

To research the relationship between personality and work-related needs a framework will be applied, which differentiates the complex field of personality and psychology. In terms of personality inventories psychological research offers many validated theories and frameworks⁴⁵ measuring different dimensions of personality. The BIG5 personality trait inventory chosen for this research constitutes a taxonomy of five personality dimensions (openness, conscientiousness, extraversion, agreeableness, neuroticism) and may be regarded as the standard model for personality research being applied by over 3000 research initiatives in the last 20 years.⁴⁶ While critics argue that the BIG5 is based on descriptive concepts that still need to be explicated theoretically it has the advantages that everybody is able to understand and interpret the words defining the factors. Moreover, the BIG5 structure captures at a broad level of abstraction many similarities between different models of personality description and thus can be regarded as an integrative taxonomy.⁴⁷ The personality inventory model is further introduced in the following chapter.⁴⁸

Individual cultural background

Individual cultural background is another important research differentiation in this work. Culture is defined as the way of life, the general customs and beliefs of a particular group of people at a particular time.⁴⁹ This “particular group” may refer to many taxonomies like nationality, religion, gender or generation. Even though nationality represent just one single dimension of culture it has been sufficiently previously researched and classified.⁵⁰ In this research the nations Germany and India will be exclusively analyzed. The reason for that is, that according to Hofstede’s cultural model India and Germany do exhibit some similarities while also showing considerable controversy in some respects.⁵¹ This is valuable when comparing empirical results across the two cultures. Adding additional cultures as control parameters would have been valuable, however for reasons of gathering enough samples for the empirical research only these two cultures are compared.

Incentive system

The most important content-related differentiation is the focus on internal gamification as an organizational incentive system. It is analyzed how human work-related needs trigger preferences for gamification mechanics and how in turn this influences the intention to use such systems. In contrast gamification is often also applied on a single software application to incentivize a very specific activity, not focusing on holistic aspects like motivation and collaboration.

⁴⁴ Baxter und Sommerville 2011. p.4

⁴⁵ See e.g. The Myer-Briggs Type Indicator (MBTI), The Winslow Personality Profile, NASA Process Communication Model

⁴⁶ Oliver P. John, Laura P. Naumann, Christopher J. Soto 2008. p.116.figure.4.1

⁴⁷ Oliver P. John, Laura P. Naumann, Christopher J. Soto 2008. p.148

⁴⁸ See 2.6 Personality Traits – Big-Five-Inventory

⁴⁹ Cambridge 2020.

⁵⁰ Compare to 2.7.2 Hofstede’s cultural differences

⁵¹ Compare to 2.7.4 Cultural differences: Focusing on India and Germany

Success indicators of research

These holistic perspectives are termed success indicators in this research. Since the focus is on knowledge-intensive enterprise with highly skilled labor, important indicators are knowledge exchange and social interaction between team colleagues and motivation and engagement of the individual. These aspects are subsequently discussed in this research, however these indicators are complex to measure and lack generalizability.⁵² Furthermore only very few people today have real life experience with work-related internal gamification systems. For these reasons, the construct “intention to use gamification” is used as proxy construct for success measurement. It’s definition and suitability is derived in section 2.8.2. The applied gamification elements in this work reflect the original constructs.

1.4 Research approach

This research will consider different perspectives: The organizational perspective describing processes and structures as well as the social and technical dimension. Brand and Hartmann describe socio-technical systems as complex, technology-intensive systems with many different stakeholders which need to be addressed in a holistic integrated concept.⁵³ The research fields of motivation, culture, social capital, knowledge management and gamification at the core address social interaction, behavioral aspects as well as processes and belonging technologies.

Furthermore, this research is based on real-life entrepreneurial problems: Companies compete for highly skilled human resources (knowledge workers) to develop innovative products and services.⁵⁴ These team members need to be motivated in order to perform, collaborate and stay satisfied. Personality depend gamification is suggested as goal-alignment mechanism within the organization.⁵⁵ Thus, this work shall add to the mitigation of real-life management problems which should also be reflected by the research approach chosen. Ideally focusing on technical-, organisational- as well as on behavioral-aspects of individuals and their social interaction which in turns leads to complexity and empirical impreciseness (e.g. in terms of generalizability).

Ulrich and Hill introduce the framework of “critical systems thinking” that aims to combine the above-mentioned different requirements.⁵⁶ Bammer summarized critical systems thinking as:

“.. critical systems thinking aims to combine systems thinking and participatory methods to address the challenges of problems characterized by:

- large scale
- complexity
- uncertainty
- impermanence, and
- imperfection.”⁵⁷

⁵² Compare to: Henderson et al. 2009. “Measuring social relationships. The Interview Schedule for Social Interaction” for social relationships, Kelly Skinner 2007 “Developing a tool to measure knowledge exchange outcomes” for knowledge exchange, and Kulikowski 2017 “Doe we all agree on how to measure work engagement? [...]” for motivation and engagement

⁵³ Brandt und Hartmann 1999. p.241 („Sociotechnical systems consist of three closely interconnected sub-systems: people, organisation, and technology”)

⁵⁴ Michaels et al. 2009. p.6 (compare to table “The War for Talent -The Old Reality / The New Reality”)

⁵⁵ Goal alignment in the sense of mitigating the principal-agent conflict

⁵⁶ Ulrich und Hill 1976. p.347

⁵⁷ Bammer G. 2003. p.1

The research process thus may include terminological-descriptive as well as empirical and analytic activities from different perspectives (inductive & deductive) and is therefore chosen for this project.

1.5 Expected contribution

This research shall contribute to the academic gamification community by introducing two new concepts to the research of user specific gamification preferences potentially allowing more precise targeting of the individual. These concepts are “individual cultural background” and “individual work-related needs and wants”. Work-related needs are suggested since it is assumed that personality traits as such do not suffice to predict internal gamification element preferences alone. Ghaban et al. agree that several studies indicate the benefit of mapping gamification elements to personality. However, they criticize that this mapping requires a strong understanding of the relationship between gamification elements and personality, which might be more complex (e.g. to situational influences) than adapted by current research.⁵⁸ Minica researched correlations between the human needs system, personality, and human motivation. She concluded that human work-related needs should be regarded more in an organizational context (especially motivational research).⁵⁹ While recognizing the importance of personality-traits, work-related needs and wants may more precisely adapt to the individual job situation and environment and thus, may act as a better preference predictor and personality trait mediator. Individual cultural background is suggested since current research often neglects the potential influence of culture on gamification preferences. But national culture is part of every individual and its influence on personality cannot be separated.⁶⁰ Khaled in 2015 analyzed cultural aspects on a conceptual basis: *“As gamification reaches further conceptual maturity, we need to be deeply thoughtful about cultural and other value biases inherent in gamification design tropes and cognizant of the preferences of the audiences we are designing for to reduce the risk of design failure and the alienation of players.”*⁶¹

While recognizing that a socio-technical holistic view might show many more potential influencing variables on individual preferences (e.g. short-term situational aspects), this research focuses on introducing these two new promising explanatory variables to the research community.

From a practical perspective focusing on knowledge-intense enterprises this research shall help to better understand, plan, and implement real-life incentive system based on internal gamification to meet the requirements of its users. This research shall help finding the answer to the question whether internal gamification systems have the potential to increase motivation of employees, social interaction, and knowledge exchange within the organisation.

⁵⁸ Ghaban und Hendley 2019. p.1-2

⁵⁹ Minica 2015. p.109

⁶⁰ Triandis und Suh 2002. p.152

⁶¹ Walz 2015.chapter.11. p.298-318 by Rilla Khaled

2 Theoretical background and literature review

The following chapter sheds light on the concept of gamification from a new viewpoint, by focusing on individual characteristics and preferences when applying gamification. The first section (2.1) introduces the knowledge-based theory of the firm, which serves as the underlying theory of this research, since it recognizes the crucial role of knowledge as an asset in today's enterprises. Knowledge transfer often requires collaboration which in turn requires trust and social capital between coworkers. Thus, different types of knowledge transfer and the relationship to social capital as well as the resulting barriers in knowledge exchange will be discussed. Next, motivational theories are presented and summarized based on human work-related needs. Since these needs vary from individual to individual it is hypothesized, that this fact also influences the preferences for specific incentive mechanisms. Section 2.4 then serves as a connector between motivational concepts and the concept of gamification, which is discussed in 2.5. The potentially influencing individual characteristics of personality traits (2.6) and culture (2.7) are introduced. Finally, the goal dimension "intention to use gamification" is explained by introducing technology acceptance models. Throughout the chapter sections called "combining research parts" will be presented. The idea behind this is to step by step introduce the reader to the constructs of this research and visually place them in the research model. Thus, the research model is built subsequently after each section. This shall help to provide a better overview about the different research subject and the expected interrelations.

2.1 Knowledge-based theory of the firm

The knowledge-based theory of the firm states that firms apply knowledge to the production of goods and services. As a result, Grant values knowledge as the most strategically significant resource of a firm.⁶² Knowledge-based capabilities are hard to copy and socially complex⁶³ but are also the major determinants of superior corporate performance. Accordingly, strategic management of these capabilities is essential. Knowledge is created and held by individuals and not by organisations. The reason that organisations exist, is because the market is not able to coordinate the knowledge of individual specialists.⁶⁴ Grant furthermore distinguishes the coordination of specialized knowledge and the importance of common knowledge which is a prerequisite for that coordination.

Since the scope of this research focuses on knowledge-intense enterprises collaboration and motivational respects of employees (regarded as a scarce resource) it is chosen as underlying theory.⁶⁵

Research on organizational theory (e.g. the principal agent theory) has invested a lot of effort in determining the factors which influence cooperation (e.g. goal divergence). But even if assuming perfect cooperation in place, the coordination of specialized knowledge remains difficult. Grant suggests that specialized knowledge is embedded and carried via very different entities of an organisation.⁶⁶ Knowledge is carried and shared via:

- I. **Rules, directives & policies** (e.g. etiquette, social norms, procedures)

⁶² Grant 1996. p.109

⁶³ Compare to Resource Based View attributes a-d

⁶⁴ Grant 1996. p.112 "Hence, production requires the coordinated efforts of individual specialists who possess many different types of knowledge. Yet markets are unable to undertake this coordinating role because of their failure in the face of (a) the immobility of tacit knowledge and (b) the risk of expropriation of explicit knowledge by the potential buyer."

⁶⁵ See also 1.3 Scope of study

⁶⁶ Grant 1996. p.114-115

II. **Routines & Sequencing** (individuals performing their own specialized task)

III. **Group problem solving and decision making** (employees)

For reasons of structuring, this research will apply the three categories of socio-technical systems.⁶⁷



Figure 3 Holistic Knowledge Management

To successfully coordinate specialized knowledge all three layers need to be considered and additionally the presence of common knowledge among the organizational members must be assured. This common knowledge serves as a basic prerequisite to enable specialized knowledge coordination. Important common knowledge is described by Grant as:⁶⁸

1. **Language** (and other symbolic communication e.g. literacy & software)
2. **Commonality of specialized knowledge** (the more specialized knowledge two people have in common the more efficient is their communication to exchange further specialized knowledge)
3. **Shared meaning** (metaphors & analogies are used as common mental models to transfer tacit knowledge)⁶⁹
4. **Recognition of knowledge domains** (knowledge structure: the need to understand which individual which knowledge in order must successfully coordinate)

The ability to manage and share the knowledge held by individuals creates the sustainable competitive advantage. Information technology is an important element in the knowledge-based theory of the firm since information systems (IS) can synthesize, improve, and expedite intra- and inter-organizational knowledge management (KM).⁷⁰

Based on the theory of the KBTF it is derived that knowledge management is a crucial factor in team collaboration and is summarized as follows:

1. **Knowledge is the most important resource of a firm**⁷¹
2. **It is held by individuals (not the firm), thus socially complex**⁷²
3. **Coordination of specialized knowledge requires common knowledge**⁷³

⁶⁷ Brandt und Hartmann 1999. p.241

⁶⁸ Grant 1996. p.116

⁶⁹ Compare to Nonaka & Takeuchi: internalization

⁷⁰ Maryam Alavi und Dorothy E. Leidner 2001. p.131-132

⁷¹ Compare to Omerzel, Doris & Gulev, Rune 2011. p.348. "It is possible for firms to successfully substitute firm resources in the short term, but it is unlikely to be the same for knowledge resources. This is the reason why knowledge meets the criteria for being a source of sustainable competitive advantage."

⁷² Grant 1996. p.109

⁷³ Grant 1996. p.115-116

Criticism on the KBTF refers to the aspects, that it is no research theory as such, due to the fact that the nature of the firm is not sufficiently characterized (e.g. firms and employees are only related via an employment contract and asset-ownership is neglected).⁷⁴ Phelan summarizes his criticism by stating that *“Firms are also incubators (or engines) for future value creation. The property rights associated with ownership play an essential role in creating these benefits of incorporation. The firm is thus more than a nexus of contracts. It is also more than just a superior way of coordinating knowledge and resources among cooperative agents.”*⁷⁵ Even Grant as proponent of the theory stated that KBTF is not a theory of the firm in an economic formal sense, but what the theory offers are insights into aspects of the firm and belonging management issues considering the characteristics of knowledge.⁷⁶ In this sense the theory is applied in this research. This research targets knowledge-intense work environments. To gain a common understanding of the abstract term of knowledge, it will next be broken down into more concrete constructs.

2.2 Knowledge Management

Knowledge exchange (also referred to as knowledge transfer) is one of the success indicators in this research⁷⁷ and fundamental in the underlying knowledge-based theory of the firm. Internal gamification might serve as an enabler for collaboration, social capital and belonging knowledge exchange.⁷⁸ In order to analyze these constructs and possible dependencies, first the broad and somewhat abstract term of “knowledge” needs to be clustered and specified into different knowledge types as well as belonging transfer types. Knowledge transfer may be viewed on an individual level (e.g. by reading a book) or in groups (e.g. teams) within an organization collaborating and thereby sharing knowledge. Focusing on the collaboration in groups, the role of social capital in knowledge exchange will be explained which is relevant in order to avoid so called “barriers to knowledge exchange” introduced in section 2.2.3.

2.2.1 Knowledge exchange – The knowledge spiral

In today’s knowledge-intense enterprises the ability to transform expert knowledge (individual knowledge) into reliable high-tech products and services (collective knowledge) is a key success factor.⁷⁹ In order to support this transformation, it is necessary to take a more detailed perspective on how this transformation occurs. Based on the differentiation of Polanyi⁸⁰ between tacit and explicit (epistemological dimension) and the knowledge level (ontological dimension) differentiating individual and group knowledge transfer, Nonaka and Takeuchi suggest four modes of how knowledge can be transformed (Combination, Socialization, Externalization and Internalization).

Looking at real world knowledge intense companies these four transformation phases do not exist independently but constantly interact. As a consequence, Nonaka introduces the metaphor of the “knowledge

⁷⁴ Foss 1996. p.522-523

⁷⁵ Phelan und Lewin 2000. p.323

⁷⁶ Choo und Bontis 2002. p.135

⁷⁷ Compare to 1.3 Scope of study “Success indicators of this research”

⁷⁸ See also 2.2.2 The relationship between knowledge exchange and social capital and 2.5 Gamification

⁷⁹ Compare to 2.1 Knowledge-based theory of the firm and 2.2.1.2 Individual vs. collective knowledge (ontological dimension)

⁸⁰ Compare to 2.2.1.1 Tacit vs. explicit knowledge (epistemological dimension)

spiral” as dynamic element which visualizes the flow of knowledge from the individual to a group, to an organizational level and finally an inter-organizational level on the ontological dimension. Nonaka characterizes the process of knowledge generation as constant change between tacit and explicit knowledge transformation. The different constructs and dimensions will be introduced subsequently.

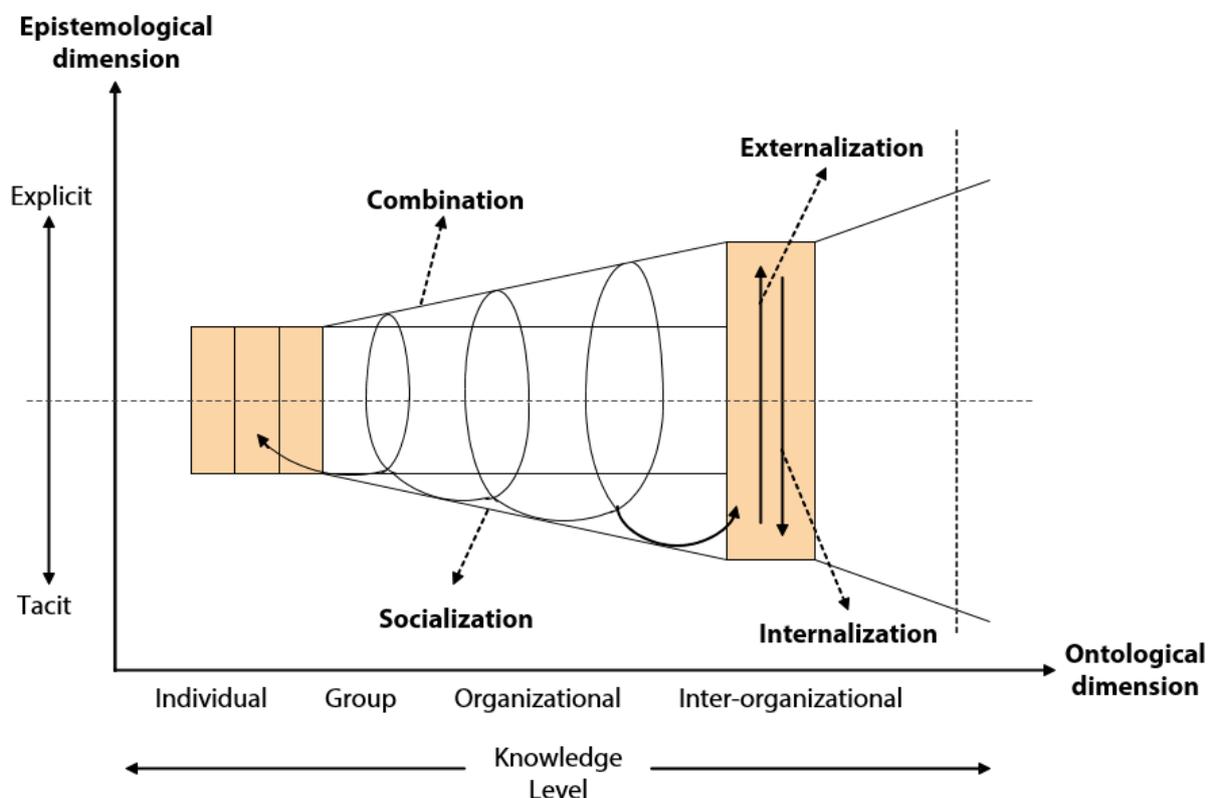


Figure 4 The knowledge spiral ⁸¹

2.2.1.1 Tacit vs. explicit knowledge (epistemological dimension)

Polanyi was the first in 1966 to differentiate between tacit (synonym: implicit) and explicit knowledge. Explicit knowledge is externalized knowledge which is structured and not necessarily bound to persons.⁸² It can be expressed via formal words and easily transferred via data exchange (e.g. in the form of documentations or books). Tacit knowledge is individual knowledge which is highly context-specific and relies on experiences and socialization (common examples are riding a bike or the face expression of a friend).⁸³ It cannot be easily transferred since it does not reside in a codifiable form. It cannot be articulated without the use of metaphors, socialization, or common experiences. Polanyi addresses this phenomenon by stating "[...] owing to the ultimately tacit nature of all our knowledge, we remain ever unable to say all that we know, so also, in view of the tacit character of meaning, we can never quite know what is implied in what we say."⁸⁴ Thorpe visualizes the differences between explicit and tacit knowledge by using the metaphor of an iceberg, stating that explicit (codifiable) knowledge represents just the top of the iceberg (5%) while tacit knowledge is by far more complex and deeper (95%).⁸⁵

⁸¹ Nonaka 1994a. p.20 figure 2

⁸² While e.g. Wilkesmann claims that knowledge cannot exist outside the individual

⁸³ Polanyi und Sen 2009.. p.9-11

⁸⁴ Polanyi 1962 . p.99”

⁸⁵ Ian Thorpe 2010.Blog("KM on a dollar a day"),accessed 28.10.2018 Ian Thorpe 2010 Blog("KM on a dollar a day").accessed 28.10.2018

2.2.1.2 Individual vs. collective knowledge (ontological dimension)

Knowledge of the individual defines itself depending on context and personal experiences as well as interpretation. Cognitive programs of the individual form causal relationships which ultimately result in actions.⁸⁶ Collective knowledge however is not equal to the sum of all individuals. In his book “the Nature and Value of Knowledge” Pritchard argues that the valuable asset for organisations is not knowledge as such but rather “understanding”. Put in the context of this research, which claims knowledge as the most valuable resource for organizations, Pritchard concretizes this to knowledge exchange within the organization. “Understanding” refers to the availability of individuals to create time and space for knowledge exchange (e.g. via shared experiences or socialization) as well as to the ability to agree on value-concepts and causal-relationships.⁸⁷ Via the concept of validating and interlinking individual knowledge elements collective knowledge is formed. One of the biggest challenges for organisations is to constantly transform and update individual knowledge into collective knowledge. The belonging four processes (as illustrated in the knowledge spiral) of knowledge transformation are now explained.⁸⁸

2.2.1.3 Knowledge Exchange Types - Combination

Combination describes the process of combining existing explicit knowledge to create new explicit knowledge.⁸⁹ It is probably the most often practiced form of knowledge transformation. Since explicit knowledge is based on codifiable knowledge modern communication and information technologies can be used to spread, recombine, and interlink knowledge parts. During the combination process different formalized concepts are combined and transformed into one new concept. An example would be the construction of a new car model interlinking the different construction departments. It does not necessarily require direct interaction of individuals and thus can be regarded as less socially complex. Since its output is explicit it is also observable (measurable) at least from a quantitative perspective. This is important, because if enterprise want to support (e.g. incentivize) knowledge transformation the effects should be measurable to judge effectiveness of the incentive.

2.2.1.4 Knowledge Exchange Types – Socialization

Socialization describes the development of tacit knowledge out of already existent tacit resources.⁹⁰ Transferring tacit knowledge between individuals requires socialization. Tacit knowledge can't easily be codified (written down) or verbally communicated. Riding a bike for example needs time and experience, individuals cannot learn it by reading a documentation. But the same also holds e.g. for the management of complex projects in high-tech environments. Nobody will become a reliable project manager just by reading books. It takes time, experience, and a lot of human interaction. During the creation process of tacit knowledge, experiences are exchanged and as a result new knowledge (e.g. a collective mental model of how to handle complex projects and their stakeholders) is created. However, socialization requires collaboration between individuals and this in turn requires i.a. trust⁹¹, making it a socially complex transformation process.

⁸⁶ Compare to Raffael Herrmann 2012.

⁸⁷ Pritchard et al. 2010. Part I. Knowledge and Understanding, Chapter 4.3 Understanding

⁸⁸ Compare to Mittendorf et al. 2006. p.301

⁸⁹ Compare to Nonaka 1994b. p.19

⁹⁰ Compare to Nonaka 1994b. p.19

⁹¹ See also 2.2.2 The relationship between knowledge exchange and social capital

2.2.1.5 *Knowledge Exchange Types – Externalization*

Even more socially challenging is externalization. It represents the process of transforming tacit knowledge into explicit knowledge.⁹² Developing new product concepts or new production processes involves a lot of externalization, since the visions and ideas of domain experts must be combined e.g. into technical drawings or software architectures. Managing this translation requires group efforts (like collective reflexions) and often helping concepts like analogies or metaphors.⁹³ It is the most challenging mode of the four knowledge transformations, since it is socially complex and difficult to measure.

2.2.1.6 *Knowledge Exchange Types – Internalisation*

Finally, internalization represents the transformation of explicit to tacit knowledge. It is best summarized as “learning by doing”.⁹⁴ After learning explicit concepts (e.g. a production workflow) by reading documentation or oral exchange, over time these processes are internalized to routines and mental models.⁹⁵ It is not necessarily socially complex, since individuals determine themselves which knowledge is relevant for internalization. But it is difficult to measure due to the tacitness of the goal dimension.

2.2.1.7 *Knowledge Spiral Criticism*

It is important to note that organisation cannot produce knowledge without accessing individual knowledge. *“The key for this synergetic expansion of knowledge is joint creation of knowledge by individuals and organisations. In this sense, the theory of organizational knowledge creation is at the same time a basic theory for building a truly “humanistic” knowledge society beyond the limitations of mere “economic rationality.”*⁹⁶ The metaphor of the knowledge spiral is needed to give a more detailed picture on the complexity of knowledge transformation within enterprises and the belonging challenges like social complexity and measurability.

While Nonaka and Takeuchi have revolutionized modern knowledge management with their model during the last two decades different criticism have been raised. It is criticized that while Polanyi characterized tacit knowledge as a complex and hard to define entity Nonaka and Takeuchi have trivialised the use of tacit knowledge in their model. Polanyi points to the fact that tacit knowledge can’t be converted to explicit knowledge by definition *“[...] my examples show clearly that, in general, an explicit integration cannot replace its tacit counterpart. The skill of a driver cannot be replaced by a thorough schooling in the theory of the motorcar”*⁹⁷. Nonaka and Takeuchi state that this process is applicable via group reflexion and formalisation.⁹⁸ Furthermore, Aulinger et al. criticize Nonaka’s definition of explicit knowledge as not coherent. While Nonaka uses explicit knowledge on the one hand as description of codified knowledge in the form of books or electronic records it is also used as knowledge residing within the individual but can be easily communicated (e.g. via language). They argue that Nonaka contradicts himself since explicit

⁹² Compare to Nonaka 1994b. p.19

⁹³ Mittendorff et al. 2006. p.301-302

⁹⁴ Compare to Nonaka 1994b. p.19

⁹⁵ Nonaka et al. 1997. p.79

⁹⁶ Nonaka 1994a. p.33”

⁹⁷ Polanyi und Sen 2009. p.68

⁹⁸ Compare to Schreyögg und Geiger 2003. p. 27 *“ Die Diskussion der aktuellen Wissensmanagement-Debatte hat gezeigt, dass die vielerorts geforderten Bemühungen, um die Externalisierung impliziten Wissens, wie sie mit der Wissensspirale populär gemacht worden sind, eine konzeptionell falsche und daher auch wenig fluchtbare Basis für ein Wissensmanagement bilden. Es wurde gezeigt, dass die Konversion von implizitem in explizites Wissen, zumindest wenn man an den in dieser Diskussion als Kronzeugen bemühten Philosophen Polanyi anschließt, schlichtweg unmöglich ist.“*

knowledge on the one hand may only be created by interaction of individuals and thus may not exist without the individual.⁹⁹ Gartzzen summarizes these criticisms by stating that knowledge transactions are generally difficult to observe and measure, and thus should be clustered or complemented by representative measures.¹⁰⁰ Thus, the empirical construct in this research will not try to measure knowledge exchange directly but rather use a proxy construct as success indicator.¹⁰¹

One of the reasons why knowledge transactions are difficult to measure is the discussed social complexity between individuals which favors or hinders knowledge transformation in the group. This is explained next based on the theory of social capital.

2.2.2 The relationship between knowledge exchange and social capital

Social capital theory analyses the significance of relationships as resource for social action.¹⁰² Putnam summarizes the concept as follows: *“Social capital refers to the collective value of all “social networks” [who people know] and the inclinations that arise from these networks to do things for each other [“norms of reciprocity”]”*¹⁰³ It creates benefits allowing for the flow of trust, reciprocity and information for all people who are connected. McElroy puts more emphasis on the dimension of knowledge in social capital. In his definition social capital consist of knowledge and organizational resources that improve individual and collective cooperation in social environments.¹⁰⁴

Monavvarian states that most studies on knowledge management fail to recognize the important role of human-social capital and instead only focus on organizational and technical factors.¹⁰⁵ Lundvall similarly concludes *“there is a need to deepen the understanding of the production, diffusion and use of knowledge. In this connection the focus should be on interactive learning processes and on how ‘social capital’ evolves as a basis for interaction within and across organizational boundaries.”*¹⁰⁶

Stieglitz discusses social capital in the context of virtual communities. He argues that depending on the organizational and cultural background the chances for opportunism vary.¹⁰⁷ A trustful atmosphere between individuals is created by repetitive positive experiences.¹⁰⁸ The behavior of reciprocal-altruism describes that organisms temporarily reduce their fitness while at the same time increasing other organism’s fitness. Expectations are that the other organism will behave in the same manner when needed.¹⁰⁹ Put differently, one should help those people, that have helped before. This behavior fosters the creation of social capital and thereby individual collaboration.¹¹⁰

Nahapiet cites seven researchers who all conclude that those relationships exhibiting high trust will also exhibit more cooperative social interaction, and thus knowledge exchange.¹¹¹ Hirschman calls trust a moral

⁹⁹ Aulinger et al. 2001.

¹⁰⁰ Compare to Gartzzen 2013. p.23-34

¹⁰¹ See also 1.3 Scope of study and 3.3.3 The preference for gamification elements correlates with the intention to use gamification

¹⁰² Janine Nahapiet und Sumantra Ghoshal 1998. p.242 (compare to (Baker, 1990; Bourdieu, 1986; Burt. 1992; Coleman, 1988; Jacobs. 1965; Loury, 1987)

¹⁰³ Putnam 1995. p.13

¹⁰⁴ McElroy et al. 2006. p.124-ff.

¹⁰⁵ Monavvarian et al. 2013. p.5 (5. Conclusions)

¹⁰⁶ Lundvall 2016. p.256 (9.6 Conclusions) Lundvall 2016 p.256 (9.6 Conclusions)

¹⁰⁷ Stieglitz 2009.Pos 419 (Kindle edition); compare also to Ripperger 1998 “Ökonomik des Vertrauens.”. p.99

¹⁰⁸ Picot et al. 2003. p.127 Picot et al. 2003. p.127

¹⁰⁹ Trivers 1971. p.46 ((2) Reciprocal altruism among close kin.)

¹¹⁰ Stieglitz 2009.Pos 427 (Kindle edition)

¹¹¹ Janine Nahapiet und Sumantra Ghoshal 1998. p.254-255

resource, whose supply may well increase rather than decrease through use¹¹². Trust is without question a basic prerequisite for successful knowledge exchange and collaboration. Monavvarian proves the hypothesis, that “*consequently, knowledge management practices such as developing, sharing, coordinating and recycling knowledge would highly take place with existing high degree of trust among organisation’s individuals and groups.*”¹¹³ Stieglitz points to the fact that trust must not necessarily be built between two individuals but can also be adapted from existing third-party relationships. This is referred to as reputation-based trust which is an important asset for initial transactions between individuals.¹¹⁴

Monavvarian also empirically proved in his study that there is a positive relationship between social capital and knowledge creation and sharing.¹¹⁵ More detailed the trust dimension had the largest impact in the research model, underlining how important the relationships between individuals are when it comes to knowledge exchange. Social capital will serve as an enabler for knowledge management complementing formal contracts, monitoring and traditional incentive schemes. Fuchs found that knowledge-oriented companies should not neglect participative management structures (those building social capital via shared visions, participation and feedback) when focusing on knowledge creation and diffusion.¹¹⁶ Existing monitoring and controlling practices even hinder these positive processes resulting in further barriers to knowledge exchange.

2.2.3 Barriers to knowledge exchange

Ajmal and Helo researched critical factors for knowledge sharing success (enablers) and failure (barriers) in project settings.¹¹⁷ A knowledge exchange barrier is thus defined as a factor which prevents the flow of knowledge throughout the organisation. These barriers need to be considered when looking at potential ways to foster (incentivize) knowledge transformation within companies since lowering these barriers has the potential to positively influence intra-organizational knowledge flow. A meta research of Riege¹¹⁸ and Chua¹¹⁹ identified over 30 relevant knowledge exchange barriers in an organizational context, sorted into the socio-technical layers of human-, organizational- and technical-barriers.¹²⁰ Most significant barrier was the absence of incentives for team members to engage in knowledge management activities, followed by suitable IS, a lack of coordination among involved participants and cultural understanding referring to mutual trust and assistance.¹²¹ To overcome the identified knowledge management barriers each dimension of the socio-technical cluster needs to be addressed. The human-oriented dimension is the cluster with the most identified barriers and additional social complexity. Thus, adapting appropriate incentive systematics to build engagement for KM activities seems a promising approach. When thinking about incentive mechanisms to create engagement for specific behaviors motivational theories need to be addressed.

¹¹² Hirschman 1984 p.93

¹¹³ Monavvarian et al. 2013 p.5. (2.5.1 Trust)

¹¹⁴ Stieglitz 2009 Kindle Edition Pos 409-428 (see also: Ripperger, T. (1998): *Ökonomik des Vertrauens. Analyse eines Organisationsprinzips.* Mohr, Tübingen.)

¹¹⁵ Monavvarian et al. 2013 p.8 Table II Rotated Component Matrix

¹¹⁶ Fuchs 2006 p p. 165 “Ich gehe davon aus, dass Vertrauen ebenso wie Sozialkapital von einer Reihe mikro-organisationaler Variablen [...] wie z. B. idiosynkratischer Arbeitsinhalt, partizipationsfördernde Managementstrukturen, feedbackorientierte Managementstrukturen, Fehlerakzeptanz in der Unternehmung, partizipative Managementstrukturen, individualisierte Entgeltsysteme und individuelle Leistungskontrolle, Stress und Kontrolle, bestimmt werden.“

¹¹⁷ Ajmal et al. 2010 p.156-168

¹¹⁸ Riege 2005 p.18-35

¹¹⁹ Chua und Lam 2005 p.6-17

¹²⁰ The values in brackets show the corresponding attributes of figure 5 having either a positive (mitigating) impact on the barrier (+) or negative (worsening) impacting on the barrier (-)

¹²¹ Ajmal et al. 2010 p.166

2.3 Motivation theory

So far it has been argued how valuable knowledge flow is for today's high-tech companies: The necessity to successfully combine specialized know-how is a key to competitive advantage in a world which transforms towards a "knowledge-based society".¹²² This knowledge creation and exchange within teams (groups) requires social capital (i.a. trust) to enable collaboration.¹²³ Furthermore, the most significant barrier identified for individuals to foster knowledge management activities is the absence of organizational incentive mechanisms.¹²⁴ Organizational incentive mechanisms in turn try to trigger the motivation of the individual to achieve a behavioral change (e.g. a goal-alignment between the firm and the individual). Gamification mechanisms can be a powerful driver for goal-oriented behavioral change and a driver of human interaction.¹²⁵ But before Gamification is addressed in detail, the underlying principles of motivation and behavior will be explained from a psychological viewpoint.

2.3.1 Motivation and Behavior

Psychology studies the description, explanation, prediction and control of human experiences and behavior.¹²⁶ However, there is no common definition of motivation in psychology. The following table provides an overview over 50 years of academic definitions:

Definition	Author
Motivation is a hypothetical construct in order to explain behavior.	Heider, 1958
Motivation is "a drive or desire is a deficiency or need that activates behavior aimed at a goal or an incentive"	Morgan, 1959
Motivation is a common classification of many processes living beings choose based on expectation of the consequences and needed effort.	Heckhausen, 1989
Motivation is process-based action-aiming at goals which are to be reached via certain behavior and experiences.	Schneider, Schmalt, 2000
Motivation makes a person want to work towards a goal. It makes people want to take action. Motivation is the purpose or psychological cause of an action.	Schacter, 2011
Motivation describes human goal-oriented behavior. Relevant dimensions are the focus, persistence and intensity of the goal-driven behavior combined with cognitive and psychological processes.	Brandstätter, 2013
Condition of a person that causes him/her to choose a certain action alternative in order to achieve a certain result that ensures that this person maintains his/her behaviour in terms of direction and intensity.	Maier & Kirchgeorg, 2018

Table 1 Definition of motivation over time ¹²⁷

Heider (1958)¹²⁸, Morgan (1959)¹²⁹, Heckhausen (1989)¹³⁰, Schneider, Schmalt (2000)¹³¹, Schacter (2011)¹³², Brandstätter (2013)¹³³Maier & Kirchgeorg (2018)¹³⁴

¹²² Rockett 2012 p.2

¹²³ Monavvarian et al. 2013 p.8 Table II Rotated Component Matrix

¹²⁴ Compare to Riege 2005 p.18-35

¹²⁵ Compare to Yu-kai Chou 2014

¹²⁶ Rosenstiel 1999. p.47-49

¹²⁷ adapted from Zaunmüller. p.53

¹²⁸ Heider 1958 p.19

¹²⁹ Morgan C.T. 1959

¹³⁰ Heckhausen p. p.10

¹³¹ Schneider und Schmalt 2000 p.34

¹³² Schacter DL et al. 2011. p.325

¹³³ Brandstätter et al. 2013

¹³⁴ Günter W. Maier, Manfred Kirchgeorg 2018

Considering the behavioral implication in these definitions Rosenstiel points out that human behavior is determined by two factors: On the one hand by the situation and on the other hand by the individuum. The situation allows for differentiation of social “Do’s and Dont’s” (norms and rules) influences by inhibiting or intensifying situational stimuli. The individuum differentiates between “Wants” (motivation and values) and “Skills” (capabilities). Between these four dimensions interdependencies occur which finally determine the resulting behavior.

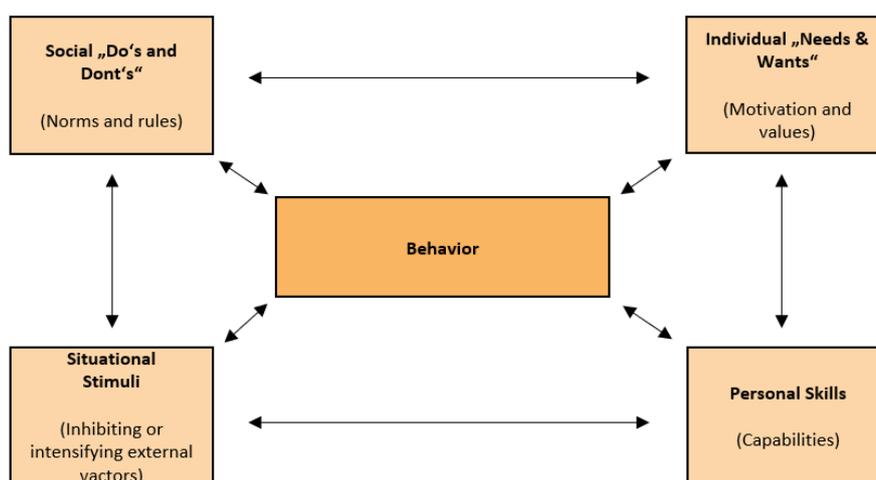


Figure 5 Behavior and dependencies ¹³⁵

According to Rosenstiel motivational psychology predominantly focuses on individual needs and wants.¹³⁶ Based on this conclusion, this research uses individual needs and wants as key influencing factor of behavior.¹³⁷ Since this research focuses on work-related motivational and behavioral aspects only the individual’s work-related needs and wants are focused on.

2.3.2 Work-related aspects in motivational theories

To be able to cluster and measure work-related needs and wants a short meta-research of seven motivational theories focusing on human needs will be conducted. All identified theories address motivation from different viewpoints (e.g. practice-focus vs. science-focus). These are not necessarily only work-related but have been subjectively filtered to the job relevant needs and wants which are crucial to this study. Maslow for example but biological and physiological needs at the fundament of his pyramid, but these are not relevant for work-related motivational questions, but could be considered as a necessary precondition.¹³⁸ The goal is to derive a comprehensive set of human work-related needs and wants which can be applied in the empirical part in order to determine in how far these needs influence the preference for different incentive systematics. Finally, in section 2.3.10 Combining Motivational Research the seven theories are presented in a combined list.

The following list gives an overview about all identified theories:

¹³⁵ Rosenstiel 1999. p.48

¹³⁶ Rosenstiel 1999 p.48 “Dieses Wollen, unsere Triebfedern, Strebungen, Bedürfnisse, Wünsche oder wie immer wir dies alltagsprachig bezeichnen wollen, entwickelt sich zum einen im Zuge der Reifung und der individuellen Lerngeschichte und wird zum anderen durch wahrgenommene Besonderheiten der Situation aktiviert.”

¹³⁷ Compare to 2.3.11 Combining research parts

¹³⁸ Compare to 2.3.4 Maslow, Hierarchy of Needs

1. **Expectancy Value Theory of Motivation**, McClelland (1C), 1978 139
2. **Hierarchy of needs**, Maslow (2M), 1943 140
3. **Two Factor Theory**, Herzberg (3H), 2008 141
4. **The Theory of 16 Basic Desires**, Reiss (4R), 2004 142
5. **Explorations in personality**, Murray (5U), 1938¹⁴³
6. **Self Determination Theory**, Deci/Ryan (6S), 2000¹⁴⁴
7. **Drive - The Surprising Truth About What Motivates Us**, Pink (7P), 2010 145

Each theory will now be briefly summarized, and the relevant need dimensions will be extracted and presented in a concluding box.

2.3.3 McClelland, Expectancy Value Theory of Motivation (1C)

McClelland defines motivation as a recurrent concern for a state or condition which drives and selects the behavior of an individual.¹⁴⁶ In his theory the core motives are the need for achievement, the need for affiliation and the need for power. These needs are non-sequential but are used in relation to one another.

“[...] , most people possess and portray a mixture of these needs: those with a high need for achievement have an attraction to situations offering personal accountability; individuals with a dominating need for authority and power have a desire to influence and to increase personal status and prestige; and finally, those with a great need for affiliation value building strong relationships and belonging to groups or organisations.”¹⁴⁷

In 1958 McClelland et al. expanded the initial motivational theory from 1951 by focusing on job competencies publishing “Talent and society”.¹⁴⁸ By conducting interviews with employees McClelland et al. tried to understand the employee’s intent instead of just focusing on observing his or her behavior. They identified different skills, traits and motives which differentiated high performers from less effective performers in different job profiles.

Mentioned work-related needs and wants in this theory (1C):

(1) Social Exchange / Belonging, (2) Image / Recognition, (3) Influence / Power, (4) Competition, (5) Achievement Reward, (6) Mastery / Advancement, (7) Self-Expression, (10) Autonomy / Independence, (11) Structure / Security / Stability / Order

2.3.4 Maslow, Hierarchy of Needs (2M)

Maslow derived his hierarchy of needs from experiments with apes. His core observation was that certain needs are prior to others depending on the current situation. If the animals were hungry and thirsty, they

¹³⁹ McClelland 1978 [Mc78] McClelland, D. C.: Managing motivation to expand human freedom. In American Psychologist, 1978, 33; p p. 201–210.

¹⁴⁰ Maslow 1943 [Ma43] Maslow, A. H.: A theory of human motivation. In Psychological Review, 1943, 50; p p. 370–396.

¹⁴¹ Herzberg 2008. [He08] Herzberg, F.: One more time: How do you motivate employees? Harvard Business Press, Boston, Mass, 2008.

¹⁴² Reiss 2004. [Re04] Reiss, S.: Multifaceted Nature of Intrinsic Motivation: The Theory of 16 Basic Desires. In Review of General Psychology, 2004, 8; p p. 179–193.

¹⁴³ Murray 1938 [Mu38] Murray, H. A.: Explorations in personality. Oxford Univ. Press., Oxford, England; 1938.

¹⁴⁴ Deci und Ryan 2000 [DR00] Deci, E. L.; Ryan, R. M.: The ‘what’ and ‘why’ of goal pursuits: Human needs and the self-determination of behavior. In Psychological Inquiry, 2000, 11; p p. 227–268.

¹⁴⁵ Pink 2010. [Pi10] Pink, D. H.: Drive. The surprising truth about what motivates us. Canongate, Edinburgh, 2010.

¹⁴⁶ McClelland 1978 p.201

¹⁴⁷ Stead 1972. p.804

¹⁴⁸ McClelland 1958 p.255-256

first took care of their thirst. Without food the species can survive weeks, without water only days. Thus, thirst is a stronger need than food. However, when choking, breathing can become quickly the most important need, suppressing all other influences. Maslow summarizes as follows:

"It is quite true that man lives by bread alone — when there is no bread. But what happens to man's desires when there is plenty of bread and when his belly is chronically filled? At once other (and "higher") needs emerge and these, rather than physiological hungers, dominate the organism. And when these in turn are satisfied, again new (and still "higher") needs emerge and so on. This is what we mean by saying that the basic human needs are organized into a hierarchy of relative prepotency"¹⁴⁹

Maslow refined (and extended) his theory over the years and presented the pyramid in different layouts consisting of five to eight hierarchical dimensions grouped in three categories: basic needs, psychological needs and self-fulfillment needs. The order of the need is not fixed it may vary with external stimuli and circumstances. It is also important to note that resulting behavior may not only be triggered by one need at a time but rather simultaneously triggered by many.

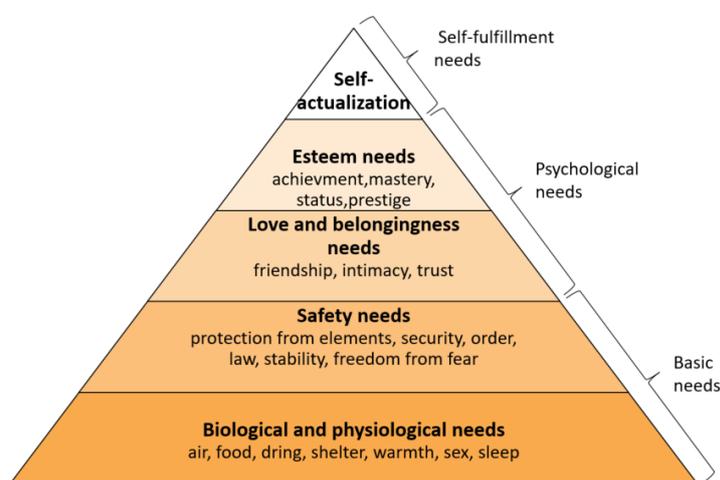


Figure 6 Maslow Hierarchy of Needs (5 dimensions) ¹⁵⁰

Mentioned work-related needs and wants in this theory (2M):

(1) Purpose / Goals / Responsibility, (2) Social Exchange / Belonging, (3) Image / Recognition, (4) Achievement Reward, (5) Mastery / Advancement, (6) Self-Expression¹⁵¹, (7) Relevance / Idealism¹⁵², (8) Structure / Security / Stability / Order

2.3.5 Herzberg, Two-factor theory (3H)

Herzberg argues that job satisfaction and job dissatisfaction are independent constructs and may both act at the same time. There are two types of factors creating job satisfaction or dissatisfaction, the so called "Motivators" (e.g. achievement and recognition) as well as "Hygiene factors" (e.g. salary, work conditions). Motivators refer to the intrinsic content of the work while hygiene factors are extrinsic and refer

¹⁴⁹ Maslow 1943. p.376-377

¹⁵⁰ Maslow und Frager 1987. p.76

¹⁵¹ Derived from self-actualization

¹⁵² Derived from self-actualization

to the context of work.¹⁵³ Hygiene factors can not cause job satisfaction on their own, but they can prevent the rise of dissatisfaction. Motivators act vice versa, they influence the motivation to perform and stem from the content of the work itself. Thus, motivators affect satisfaction directly, however their absence does not necessarily result in dissatisfaction.

1. **Motivators:** achievement, recognition, work itself, challenging work, responsibility, involvement in decision making, opportunity to do something meaningful, advancement, growth
2. **Hygiene factors:** salary, vacation, company policy, administration, supervision, relationships with colleagues, work conditions, personal life, status, security

“The very nature of motivators as opposed to hygiene factors is that they have a much longer- term effect on employees attitudes.”¹⁵⁴ While hygiene factors should be used to eliminate dissatisfaction, motivators shall be used to create motivation. In 2008 Herzberg et al. published a meta study of 12 job attitude investigations using a wide variety of populations (e.g. different political systems). The findings of the studies were in line with the two-factor theory. The figure shows the results for 1685 employees including all kinds of industries and hierarchical positions. They were asked what job events had led to satisfaction or dissatisfaction from their perspective.

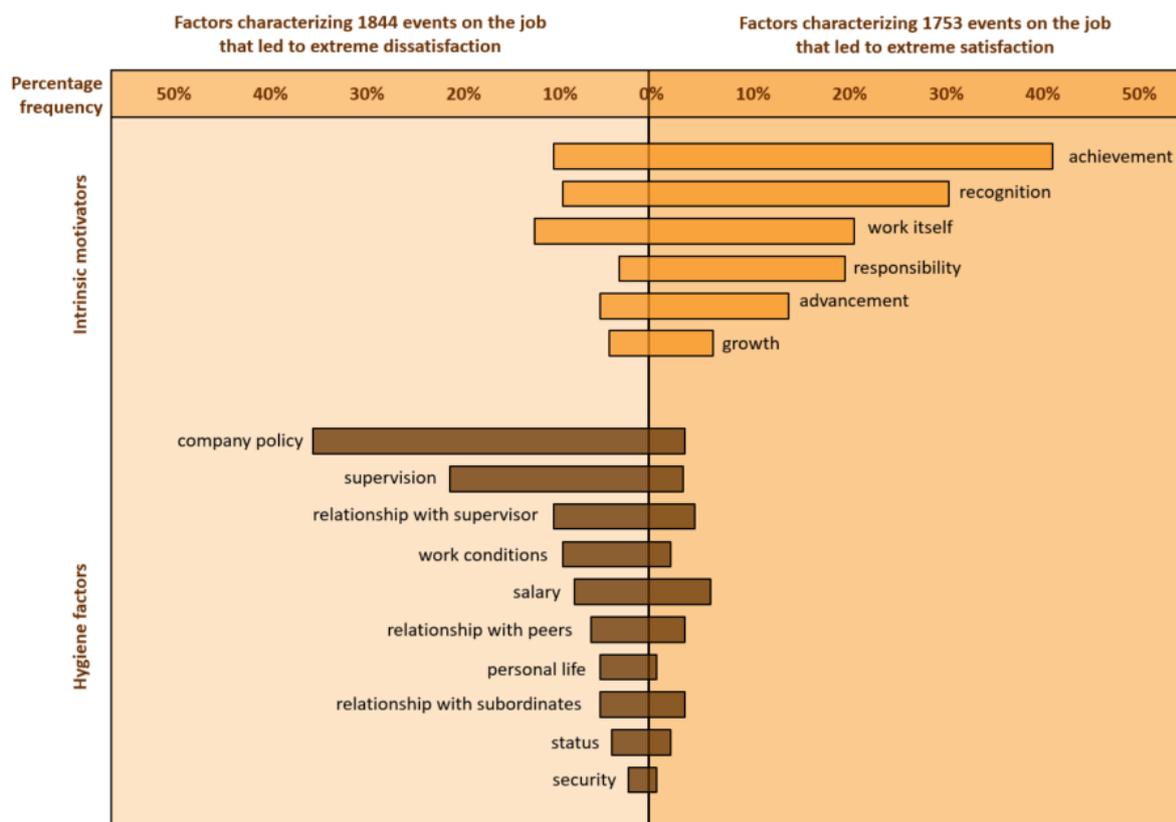


Figure 7 Herzberg Factors affecting job attitudes as reported in 12 investigations ¹⁵⁵

¹⁵³ Herzberg et al. 2017. p.113-120 Part III Chapter 12 Motivation versus Hygiene “Let us summarize briefly our answer to the question, “What do people want from their jobs?” When our respondents reported feeling happy with their jobs, they most frequently described factors related to their tasks, to events that indicated to them that they were successful in the performance of their work, and to the possibility of professional growth. Conversely, when feelings of unhappiness were reported, they were not associated with the job itself but with conditions that surround the doing of the job.”

¹⁵⁴ Herzberg 2008. p.96

¹⁵⁵ Herzberg 2008 adapted from p.90 exhibit 1

Mentioned work-related needs and wants in this theory (3H):

(1) Purpose / Goals / Responsibility, (2) Social Exchange / Belonging¹⁵⁶, (3) Image / Recognition, (4) Achievement Reward, (5) Mastery / Advancement, (6) Relevance / Idealism¹⁵⁷, (7) Structure / Security / Stability / Order

2.3.6 Reiss, Theory of 16 Basic Desires (4R)

Steven Reiss's concept of motivation consists of the "Theory of 16 Basic Desires" and the belonging personal inventory (Reiss Profile). Reiss developed the concept with students and employees by brainstorming a list of 400 items consisting of needs, goals and values. The list was subjectively reduced to 328 relevant items (e.g. eliminating thirst as a relevant need). In an empirical study Reiss et al. conducted a survey among 401 US adults asking how much they like or dislike each item.¹⁵⁸ Using factor analysis and widening the sample to over 6000 people the results were clustered into the 16 items of basic desires. Each of these desires can show a neutral, strong or weak impact. Reiss 16 basic desires:

1. **Recognition & Acceptance** - the need to avoid criticism and refusal
2. **Social contact** - the need for friendship & relationship
3. **Power** - the need to control others
4. **Honor** - the need to be faithful to the values of an ethnic group, family or clan
5. **Eros** - the need for sex
6. **Eating** - the need for food
7. **Family** - the need to raise children
8. **Idealism** - the need for social justice
9. **Physical activity** - the need to exercise
10. **Curiosity** - the need to gain knowledge
11. **Order** - the need for conventional environments and stability
12. **Vengeance** - the need to strike back
13. **Tranquility** - the need to be secure and protected
14. **Saving** - the need to accumulate materialistic objects
15. **Social status** - the need for social significance
16. **Independence** - the need to be distinct and self-reliant

According to Reiss it is possible to predict human behavior based on these individual motives and desires. It is important to point out that the 16 basic desires have not been derived from new motivational research but rather by statistics (factor analysis). Reiss does not give sufficient transparency on his research methods, but many constructs have been adopted from other psychologists (e.g. Mc Dougall). Pelz concludes that Reiss does not offer a motivational theory but rather a subjective typology which only has descriptive character.¹⁵⁹

Mentioned work-related needs and wants in this theory (4R):

(1) Social Exchange / Belonging, (2) Image / Recognition, (3) Influence / Power, (4) Achievement Reward, (5) Relevance / Idealism, (6) Structure / Security / Stability / Order

¹⁵⁶ Derived from relationship needs

¹⁵⁷ Derived from work itself

¹⁵⁸ Reiss 2000. [Re00] Reiss, S.: Who am I? The 16 basic desires that motivate our behavior and define our personality. Jeremy P. Tarcher/Putnam, New York, 2000.

¹⁵⁹ Pelz 2017

2.3.7 Murray’s theory of psychogenic needs (5U)

Murray in 1938 developed a personality theory that consisted of needs, presses and motives. In his understanding needs represents the readiness to respond under given circumstances in a certain way.¹⁶⁰ Thus, a personality reflects behaviors which is controlled by human needs. Needs vary in terms of sustainability, some are constantly changing, other are deeply rooted in an organism’s nature. Murrays constitutes these psychogenic needs on a mostly unconscious level however they play a major role in human personality.¹⁶¹ According to his theory there are two types of needs:

1. **Primary needs:** biological needs like oxygen food and water ¹⁶²
2. **Secondary needs:** psychological needs like independence, achievement and nurturing.

Secondary needs are not necessary for biological survival, but they are important determinants of psychological wellbeing. The following table gives an overview of needs differentiated by Murray:

Need for...	Explanation
Abasement	To surrender and submit to others, accept blame and punishment. To enjoy pain and misfortune
Achievement	To accomplish difficult tasks, overcoming obstacles and becoming expert
Acquisition	Obtaining things
Affiliation	To be close and loyal to another person, pleasing them and winning their friendship and attention
Aggression	To forcefully overcome an opponent, controlling, taking revenge or punishing them
Autonomy	To break free from constraints, resisting coercion and dominating authority. To be irresponsible and independent
Blame avoidance	Stifling blameworthy impulses
Cognizance	Understanding: To be curious, ask questions and find answers
Construction	Building something
Contrariance	Being oppositional
Counteraction	To make up for failure by trying again, seeking pridefully to overcome obstacles.
Defendance	To defend oneself against attack or blame, hiding any failure of the self. Explain or excuse
Deference	To admire a superior person, praising them and yielding to them and following their rules.
Dominance	To control one's environment, controlling other people through command or persuasion
Exhibition	To impress others through one's actions and words, even if these are shocking.
Exposition	Delivering information to others
Harm avoidance	To escape or avoid pain, injury and death.
Infavoidance	Concealing a handicap or a failing
Infavoidance	To avoid being humiliated or embarrassed.
Nurturance	To help the helpless, feeding them and keeping them from danger
Order	To make things clean, neat and tidy
Play	To have fun, laugh and relax, enjoying oneself
Recognition	Describing accomplishments
Rejection	To separate oneself from a negatively viewed object or person, excluding or abandoning it.
Retention	Hoarding things
Sentience	To seek out and enjoy sensual experiences.
Sex	To form relationships that lead to sexual intercourse.
Succorance	To have one's needs satisfied by someone or something. Includes being loved, nursed, helped, forgiven and consoled

Table 2 Murray’s needs¹⁶³

¹⁶⁰ Murray 1938.

¹⁶¹ Flett 2007. p.234-ff. (chapter 6)

¹⁶² Compare to Maslow, Hierarchy of Needs

¹⁶³ Murray (in Friedman und Schustack 2012. p.463 chapter 15)

Mentioned work-related needs and wants in this theory (5U):

(1) Social Exchange / Belonging¹⁶⁴, (2) Image / Recognition, (3) Influence / Power, (4) Competition¹⁶⁵, (5) Achievement Reward, (6) Mastery / Advancement¹⁶⁶, (7) Autonomy, (8) Structure / Security / Stability / Order

2.3.8 Deci, Ryan Self-determination theory (6S)

Self-determination theory (SDT) basic assumption is that individuals have a natural, inborn tendency to grow and elaborate a unified sense of self.¹⁶⁷ Put differently, when sufficiently supported, humans will invest effort, learn and master new skills matching their talents. SDT is based on universal psychological needs to which an individual adapts to comply with his or her socio-cultural environment. It concerns the motivation behind choices people make independently (without external influences). The theory assesses the degree by which an individual behaves self-determined.¹⁶⁸ According to SDT motivation and resulting behavior is always based on three core needs:

1. The need for **competence** (control outcome / mastery)
2. The need for **psychological relatedness** (connect / belong / care)
3. The need for **autonomy** (act in harmony with own will)

*“[...]if the social contexts in which such individuals are embedded are responsive to basic psychological needs, they provide the appropriate developmental lattice upon which an active, assimilative, and integrated nature can ascend. Excessive control, nonoptimal challenges, and lack of connectedness, on the other hand, disrupt the inherent actualizing and organizational tendencies endowed by nature, and thus such factors result not only in the lack of initiative and responsibility but also in distress and psychopathology.”*¹⁶⁹ Consequently, SDT emphasizes that challenges (if they are attainable) can stretch people’s skills to a new level thereby creating perceived competence. Vice versa, e.g. negative feedback can thwart perceived competence leading to lowered intrinsic motivation.

2.3.8.1 Intrinsic and Extrinsic Motivation

SDT differentiates between two different types of motivation: intrinsic vs. extrinsic motivation.

1. **Intrinsic motivation** describes individuals that carry out tasks because of inner fulfillment, interest and/or enjoyment inherent to that task.
2. **Extrinsic motivation** is external to a task. Individuals carry out the task to reach another goal (e.g. obtaining a reward, gain status, or avoid being punished).

Lu and Wu summarize motivational theories to two main conclusions. *“[...] needs-based motivations are the primary impetus for people to engage in various behaviors, and such motivations can be broadly*

¹⁶⁴ Derived from Succorance and Deference and Nurture

¹⁶⁵ Derived from Aggression and Exhibition

¹⁶⁶ Derived from Construction and Counteraction

¹⁶⁷ Deci und Ryan 2002

¹⁶⁸ Ryan und Deci 2000. p.227 “Self-determination theory (SDT) maintains that an understanding of human motivation requires a consideration of innate psychological needs for competence, autonomy, and relatedness.”

¹⁶⁹ Ryan und Deci 2000. p.76

categorized into two major groups: *extrinsic and intrinsic*¹⁷⁰. Intrinsic motivation drives people's behavior without external stimulus while extrinsic motivation always involves external inducement (e.g. carrot and stick metaphor). In most working environments extrinsic rewards (e.g. monetary bonuses when achieving predefined goals) are common nowadays. However, SDT states that extrinsic and intrinsic motivation are not independent but under certain circumstances may negatively affect each other. This effect has been subject to dedicated research called "Motivation Crowding Theory"¹⁷¹

Mentioned work-related needs and wants in this theory (6S):

(1) Purpose / Goals / Responsibility, (2) Social Exchange / Belonging, (3) Mastery / Advancement, (4) Relevance / Idealism, (5) Autonomy

2.3.9 Pink, Drive – The Surprising Truth About What Motivates Us (7P)

Pink in his book "Drive" also criticizes the potential negative effects of extrinsic motivators: *"Carrots & Sticks are so last Century. Drive says for 21st century work, we need to upgrade to autonomy, mastery and purpose."*¹⁷² He does not provide an academic motivational theory in his book. However, since the book summarizes motivational academic research of the last 40 years on the one hand and holds real-life business examples on the other its extract is included in this research.

Pink states that in the evolutionary process of humans and their work environment parameters have changed. While in the last decade working processes were broadly incentivized by a reward and punishment mentally focusing on extrinsic regulation. For today's work environments Pink suggests that these extrinsic models have become incompatible to how work is organized and conducted.¹⁷³ Frey and Jegen proved this theory in 2001 by conducting a meta literature review identifying 16 empirical researches which support the crowding-out effect.¹⁷⁴ *"The Motivation Crowding Effect suggests that external intervention via monetary incentives or punishments may undermine, and under different identifiable conditions strengthen, intrinsic motivation."*¹⁷⁵ Pink underlines the crowding out effect by stating, that rewards and punishment can extinguish intrinsic motivation, diminish performance, hinder creativity or even support unethical behavior and short-term thinking (e.g. by maximizing self-interests).

While accepting extrinsic regulation for rule-based routine tasks creative tasks and problems require non-contingent rewards. Compliance needs to be replaced by engagement, which is the only path to sustainable mastery: *"Mastery is a mindset: It requires the capacity to see your abilities not as finite, but as infinitely improvable. Mastery is a pain: It demands effort, grit, and deliberate practice. And mastery is an asymptote: It's impossible to fully realize, which makes it simultaneously frustrating and alluring."*¹⁷⁶

¹⁷⁰ Lu und Wu 2013. p.156 see also p.170 "[...] we find that, in the context of utilitarian IT, extrinsic motivators are more important than intrinsic motivators, whereas, in the context of hedonic IT, intrinsic motivators play a more critical role than extrinsic motivators."

¹⁷¹ Frey und Jegen 2001

¹⁷² Pink 2010. p.203 (Twitter Summary)

¹⁷³ Pink 2010. p.204-207

¹⁷⁴ Frey und Jegen 2001. [FJ01] Frey, B. S.; Jegen, R.: Motivation Crowding Theory. In Journal of Economic Surveys, 2001, 15; p p. 589–611.

¹⁷⁵ Frey und Jegen 2001. p.598

¹⁷⁶ Pink 2010. p.207

Autonomy allows professionals to focus on their intrinsic motivators determining tasks (what), time (when), team (who) and techniques (how) which meets the requirements of today’s business problems. Companies that offer a surplus of self-determination (autonomy) are often outperforming their competitors.¹⁷⁷ Business purpose has traditionally been equal to profit maximization. A modern business purpose motive should express itself in three ways:

- In goals that use profit to reach purpose
- In words that emphasize not only self-interest
- In policies that give people more freedom to pursue purpose on their own terms

Rethinking business from profit maximization to purpose maximization has the potential to redesign the way work processes are designed.¹⁷⁸

Mentioned work-related needs and wants in this theory (7P):

(1) Purpose / Goals / Responsibility, (2) Mastery / Advancement, (3) Relevance / Idealism, (4) Autonomy / Independence

2.3.10 Combining Motivational Research

The following table gives an overview about all identified work-related human needs and the belonging researchers. The needs have been derived from the previously discussed seven theories.

Pos	Human Needs / Wants (Work Related)	Addressed by the following theories
HN01	Purpose / Goals / Responsibility	M H P S
HN02	Social Exchange / Belonging	U R M H C S
HN03	Image / Recognition	U R M H C
HN04	Influence / Power	U R C
HN05	Competition	U C
HN06	Achievement / Reward	U M H C
HN07	Mastery / Advancement	U M H C P S
HN08	Self-Expression	M C
HN09	Relevance / Idealism	R M H P S
HN10	Autonomy / independence	U R C P S
HN11	Structure / Security / Stability / Order	U R M H C

U =Murray 1938 (Explorations in personality)¹⁷⁹
R = Reiss 2004 (The Theory of 16 Basic Desires)¹⁸⁰
M = Maslow 1943 (Hierarchy of needs)¹⁸¹

¹⁷⁷ Pink 2010, p.80

¹⁷⁸ Pink 2010, p.207 “Within organisations, this new “purpose motive” is expressing itself in three ways: in goals that use profit to reach purpose; in words that emphasize more than self-interest; and in policies that allow people to pursue purpose on their own terms. This move to accompany profit maximization with purpose maximization has the potential to rejuvenate our businesses and remake our world.”

¹⁷⁹ Murray 1938 [Mu38] Murray, H. A.: Explorations in personality. Oxford Univ. Press., Oxford, England., 1938.

¹⁸⁰ Reiss 2004. [Re04] Reiss, S.: Multifaceted Nature of Intrinsic Motivation: The Theory of 16 Basic Desires. In Review of General Psychology, 2004, 8; p p. 179–193.

¹⁸¹ Maslow 1943 [Ma43] Maslow, A. H.: A theory of human motivation. In Psychological Review, 1943, 50; p p. 370–396.

H = Herzberg 2008 (Two Factor Theory)¹⁸²
 C = McClelland 1978 (1. Expectancy Value Theory of Motivation)¹⁸³
 S = Deci/Ryan 2000 (SDT)¹⁸⁴
 P = Pink 2010 (Drive)¹⁸⁵

Table 3 Human work-related needs

All presented theories/typologies agree that internal and external factors affect the individual's behavior. According to Seaborn and Fels these can be summarized as follows: „[...]breaking it down into intrinsic motivation – where a behavior is enacted or an activity is undertaken because it aligns with one's inner values – and extrinsic motivation – where external rewards such as money or status are offered in exchange for engagement in particular behaviors or activities.”¹⁸⁶

However, during the last years psychologists are questioning the effects of extrinsic rewards when it comes to more complex conceptual and creative tasks.¹⁸⁷ Pink states that extrinsic incentivized people narrow their focus hindering high performance when working in conceptual jobs, only on straight forward tasks these mechanisms worked. Autonomy, mastery and purpose are the key for 21th century intrinsic incentive systematics.¹⁸⁸ While literature about intrinsic motivation in the past has focused primarily on aspects of joy, intrinsic motivation stems from many other factors.¹⁸⁹

When combining psychologists motivational research on work-related needs from the early 1940s until today many of Pink's younger findings were present for decades. Taking this into account it seems difficult to understand why organisations over the last decades did not at least combine their incentive systematics of sole extrinsic, utilitarian nature with more intrinsic, hedonistic aspects.

2.3.11 Combining research parts

The combined findings of the human work-related needs and wants are now fitted in the preliminary research model. The following illustration will be extended during the chapter, helping the reader to easily follow the constructs and relationships formulated by this research. Greyed out fields will be added in the following sections.

¹⁸² Herzberg 2008. [He08] Herzberg, F.: One more time: How do you motivate employees? Harvard Business Press, Boston, Mass, 2008.

¹⁸³ McClelland 1978 [Mc78] McClelland, D. C.: Managing motivation to expand human freedom. In American Psychologist, 1978, 33; p p. 201–210.

¹⁸⁴ Deci und Ryan 2000 [DR00] Deci, E. L.; Ryan, R. M.: The 'what' and 'why' of goal pursuits: Human needs and the self-determination of behavior. In Psychological Inquiry, 2000, 11; p p. 227–268.

¹⁸⁵ Pink 2010. [Pi10] Pink, D. H.: Drive. The surprising truth about what motivates us. Canongate, Edinburgh, 2010.

¹⁸⁶ Seaborn und Fels 2015. p.16

¹⁸⁷ See also Frey und Jegen 2001

¹⁸⁸ Pink 2010. p.44

¹⁸⁹ Lowry et al. 2013. p.31-32

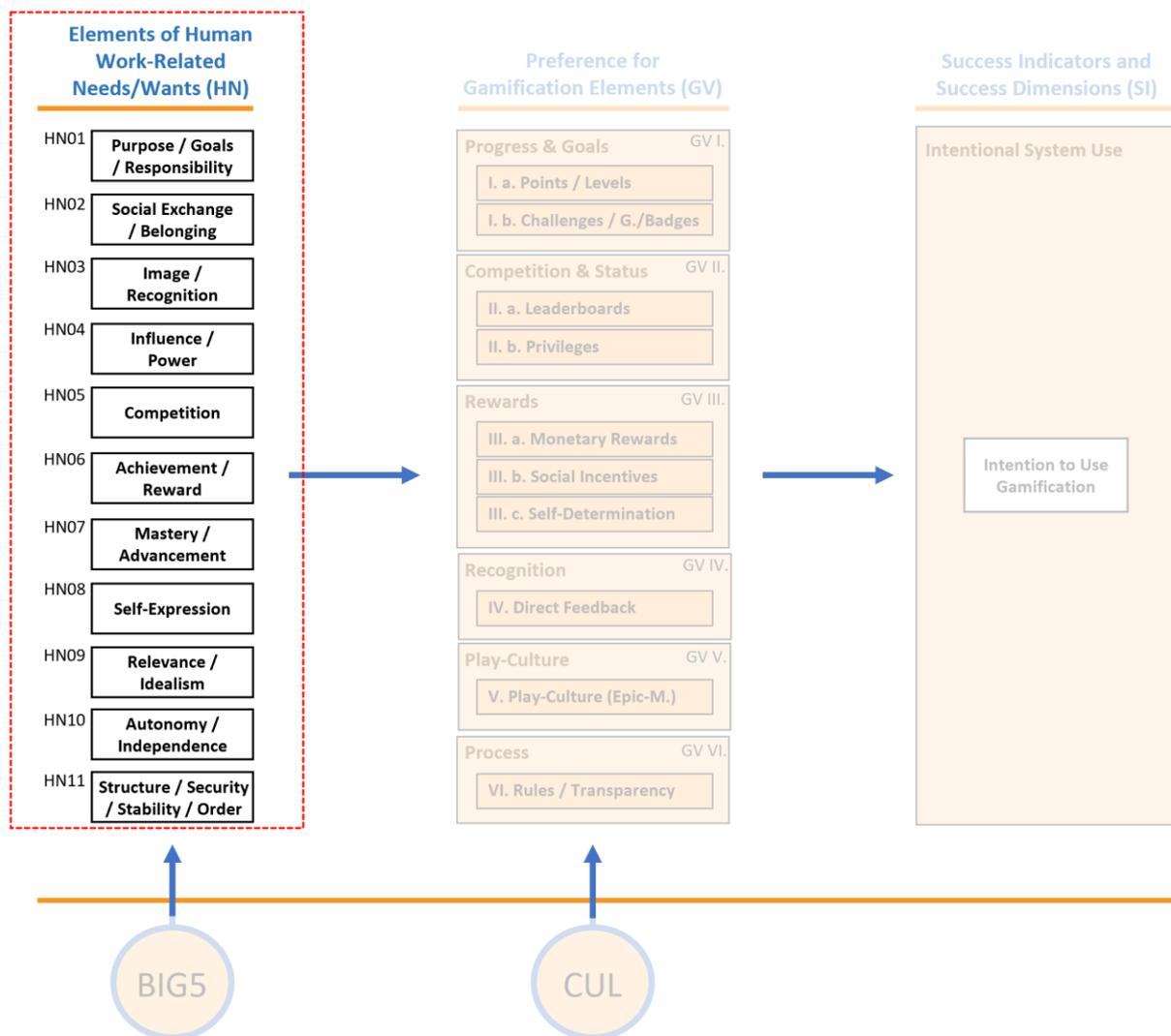


Figure 8 Combining Research Parts I

After deriving human work-related needs and the concepts of motivation incentive schematics are introduced next to influence intrinsic and extrinsic motivation.

2.4 Hedonistic vs. Utilitarian incentive schematics

Lowry states that “[t]angible rewards, deadlines, directives, and threats (common to extrinsic motivation) are examples of factors that undermine perceptions of self-efficacy and control (and of related joy and satisfaction)”¹⁹⁰. To counter this challenge information systems can be designed focusing on hedonistic or utilitarian motivation systems.

According to Merriam-Webster hedonism is a philosophical approach, stating that fun and joy are most important in life.¹⁹¹ Transferring this to information systems, hedonistic systems focus on self-fulfillment and pleasure-oriented experiences (perceived enjoyment).¹⁹² In order to create pleasure and enjoyment different content can be added to systems (e.g. animations, sounds) as well as usability aspects can be

¹⁹⁰ Lowry et al. 2013. p.6

¹⁹¹ Merriam-Webster 2003.accessed 04.11.2020

¹⁹² van der Heijden 2004. p.701

taken into account. Hedonic systems primarily address intrinsic motivation thereby playing an important role to increase system acceptance and sustainable usage.

Utilitarian systems are productivity-oriented and thus address the user’s task performance and efficiency.¹⁹³ The system represents an added-value in terms of productivity by keeping the user as focused as possible to the specific task (avoid distraction). Instead of perceived enjoyment perceived usefulness is put first. Thus, utilitarian systems do not focus on sustainable system usage by creating joy but rather on increased performance and output addressing extrinsic motivation.

Figure 9 Incentive systematics and gamification provides an overview how different incentive systematics split between intrinsic and extrinsic systems focusing on pleasure or productivity. Hamari found that gamification as instrument can help turning solely utilitarian systems into more hedonically oriented ones.¹⁹⁴ Information technology can be used for both productivity and pleasure at the same time representing a form of dual- purposed motivation system combining the utilitarian and hedonistic dimension.¹⁹⁵

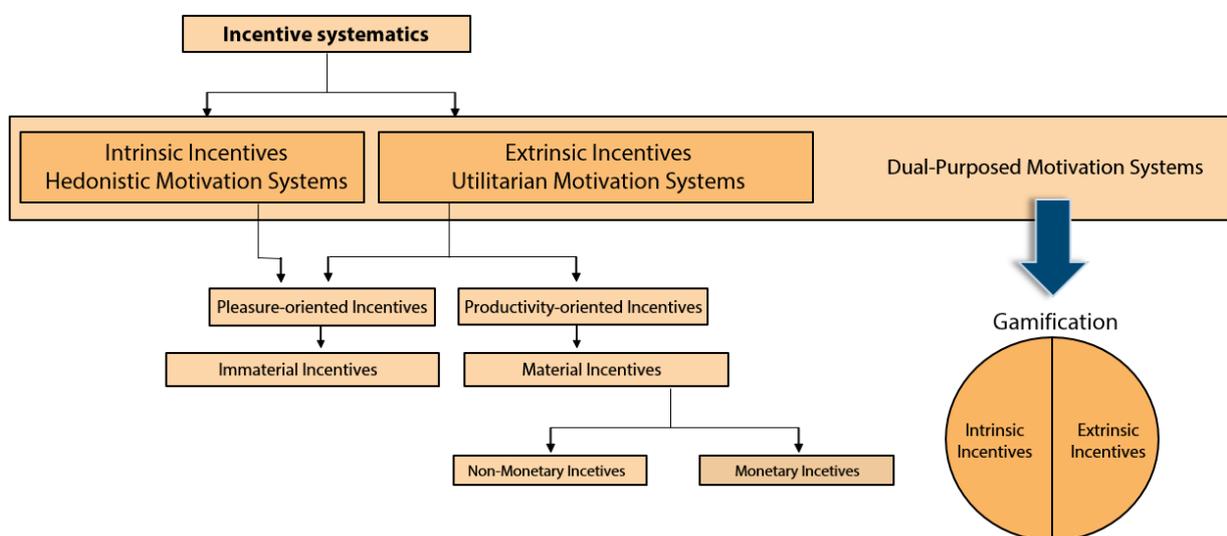


Figure 9 Incentive systematics and gamification¹⁹⁶

Based on these observations gamification can be applied as a motivational system meeting work-related needs and foster collaboration to counter the identified barriers to knowledge exchange.¹⁹⁷

2.5 Gamification

Deterding refers to gamification as “the use (rather than the extension) of design (rather than game-based technology or other game related practices) elements (rather than full-fledged games) characteristic for games (rather than play or playfulness) in non-game contexts (regardless of specific usage intentions, contexts, or media of implementation).”¹⁹⁸

Gamification shall help to align organizational and employee objectives which according to the principal-agent theory do differ depending on the relevant objectives. While organisations strive for revenue and

¹⁹³ van der Heijden 2004. p.696

¹⁹⁴ Hamari 2013 p.239

¹⁹⁵ Chesney 2006 p.225

¹⁹⁶ Combined from Zaubmüller 2005. p.40.Abbildung3.2 and Lu und Wu 2013. p.161.Figure 1

¹⁹⁷ Compare to 2.2.3 Barriers to knowledge exchange

¹⁹⁸ Deterding et al. 2011 p.5 Situating “Gamification”

resource maximization, employees try to maximize their utility. The abstract concept of utility can be translated into the previously identified work-related needs and wants.

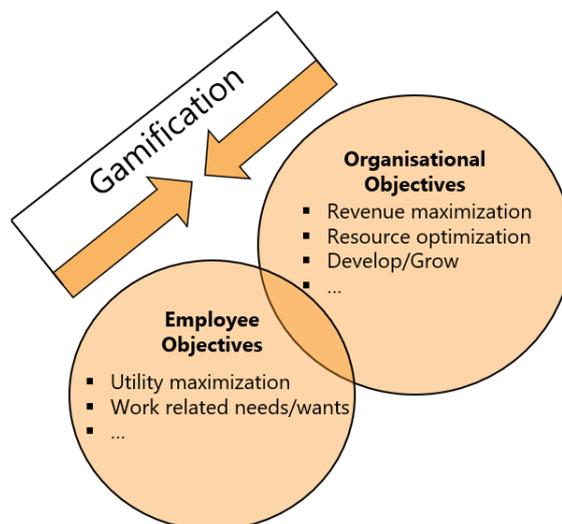


Figure 10 Gamification and principal-agent theory

Organisations should understand gamification as a strategy to design behavior, foster innovation and develop human resources.¹⁹⁹ Gamification can

1. shorten feedback cycles (from year to day)²⁰⁰
2. offer clear goals and transparent rules (objectivity)²⁰¹
3. foster autonomy, mastery and purpose²⁰²⁻²⁰³
4. create engagement, attention and interaction (teambuilding)²⁰⁴
5. align intrinsic motivation and extrinsic rewards²⁰⁵
6. foster innovation (by supporting creativity and trial & error)²⁰⁶
7. strengthen enterprise knowledge diffusion²⁰⁷

However, when analyzing the status quo of real-life internal (enterprise) gamification applications these promising effects often do not yet live up to these expectations. One of the main reasons for gamification failure identified is insufficient game design.²⁰⁸ Business tasks or incentive systems do not become successful in the long-run simply because “points” or “batches” are added to a software tool. Bogost criticizes

¹⁹⁹ Gartner 2012 p.5

²⁰⁰ Jung et al. 2010. p.724-742

²⁰¹ Schönbohm und Urban 2014. p.77

²⁰² Pink 2010 Chapter 4-6

²⁰³ Stieglitz 2015 p.5 section 3.3

²⁰⁴ Zichermann und Cunningham 2011 p.94

²⁰⁵ Zichermann und Cunningham 2011 p.29 “A good extrinsic motivation is a good map to intrinsic motivation. The better a designer knows his players, resulting in a better game design, the less it will feel to the player like being on a wheel, and the more it will feel like it was her idea to begin with. That’s the holy grail of gamification: a game so well designed that the player’s actions just feel normal.”

²⁰⁶ Walz 2015 p.21 “Being playful is the engine of innovation and creativity: as we play, we think about thinking and we learn to act in new ways. As a cultural form, games have a particularly direct connection with play.”

²⁰⁷ Stieglitz 2015 p.4 “In den vergangenen Jahren haben Unternehmen damit begonnen, ihre Kommunikations- und Kollaborationsinfrastruktur zu modernisieren und einheitliche zentrale Lösungen für das gesamte Unternehmen zu schaffen. In diesem Zusammenhang spielen Enterprise Social Networks eine immer größere Rolle (Stieglitz u. Meske 2012). Diese Plattformen stellen an das Management große Herausforderungen, da Mitarbeiter zu einer sinnvollen Nutzung motiviert werden müssen und das entstehende Wissen in einer Form abgelegt werden

²⁰⁸ Stampfl 2012 p.113 “Das Loblied auf Gamification ertönt vernehmbar, aber selten kommen die »spielifizierten« Anwendungen dann über die Vergabe von Punkten oder irgendwelcher Abzeichen und Statusmerkmale hinaus. Dabei verspricht Gamification Großes zu leisten – doch der Verdacht kommt auf, dass das, was heute als Gamification bezeichnet wird, weit hinter seinen Potenzialen zurückbleibt”

the marketing term “gamification”, while trying to create positive emotions by using the term “game” there often is no further relation to the positive effects a game has in real-life.²⁰⁹

Nicholson created a user-centric theoretical framework for meaningful gamification. The core assumption is that for gamification to work employees’ needs and goals need to be put over the goals of the organisation. *“If users have a positive and meaningful game-based experience that is well connected to the underlying non-game setting, then the organisation will benefit in the long term.”*²¹⁰ The critical success factor for a gamification system is the integration of **user-centered game design elements** instead of organisation-centered designs. Companies should substitute some traditional reward-schemes by connections between non-game activities and employees work-related needs to create deeper engagement. In order to understand how to achieve this effect, it is crucial to understand why people play.

Deterding defines gamification as *“the use of design elements, characteristic for games, in non-game contexts”* (e.g. in enterprise incentive systems for employees).²¹¹ He underlines that gamification can’t be just added as a simple add-on to existing processes, but it should be the core concept. On the other hand, gamification should not be understood as a full-fledged game which is played just out of playfulness, since it does have a real-life, non-game (work) context.²¹² This hybrid nature of work and game is what differentiates gamification from serious games. Serious games are conducted in a pure game context however they do have a double purpose (e.g. winning the game and learning effects).²¹³

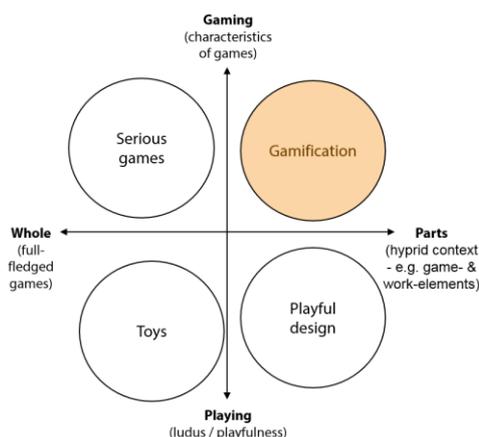


Figure 11 Gamification vs. serious games²¹⁴

Internal vs. External Gamification

In this study external gamification refers to gamification conducted by an organisation to address customers (e.g. B2C). Internal gamification refers to gamification mechanics used by organisations to address its own employees (using it inside the enterprise vs. outside for customers). Thus, the term gamification refers to internal gamification mechanics applied by enterprises to influence the behavior of its employees.

²⁰⁹ Bogost 2011 accessed 12.12.2016 “Game developers and players have critiqued gamification on the grounds that it gets games wrong, mistaking incidental properties like points and levels for primary features like interactions with behavioral complexity.”

²¹⁰ Nicholson 2012 p.6

²¹¹ Deterding et al. 2011. p.1

²¹² Deterding et al. 2011. p.5 „To summarize: “Gamification” refers to, *the use* (rather than the extension) *of, design* (rather than game-based technology or other gamerelated practices), *elements* (rather than full-fledged games), *characteristic for games* (rather than play or playfulness), *in non-game contexts* (regardless of specific usage intentions, contexts, or media of implementation).”

²¹³ Deterding et al. p.2-4, compare also to Walz 2015 p.9 Figure I.1 (Hamari et al. 2014)

²¹⁴ Adapted from Deterding et al. 2011. p.5 Figure 1. “Gamification” between game and play, whole and parts

2.5.1 The roots of playing

When trying to avoid the pitfall of poorly designed gamification systems, it seems obvious to research why people “play”. Playing games has always been cultivated by society.²¹⁵ Playing games goes back to ancient times and is part of all cultures worldwide. Thus, playing seems to be deeply enrooted in human behavioral patterns. Roger Caillois in 1982 identified four core drivers for games:

1. **Agon** (Competition)
2. **Alea** (Chance)
3. **Ilinx** (Flush / Flow)
4. **Mimikry** (Masking)

He defined as basis requirement for playing that playing must be unproductive and on a volunteer basis. Csikszentmihalyi in his concept of “flow” describes how people deeply engage in activities (game or non-game related) if the following requirements are met, the “flow” effects show:

Flow (R)requirement or (E)ffect	Description
(R)	Clear goals
(R)	A high degree of concentration
(R)	Direct and immediate feedback
(R)	Balance between ability level and challenge
(R)	A sense of personal control over the situation or activity
(R)	The activity is intrinsically rewarding
(E)	A lack of awareness of bodily needs
(E)	A loss of the feeling of self-consciousness
(E)	Distorted sense of time, one’s subjective experience of time is altered
(E)	Absorption into the activity

Table 4 Flow requirements and effects ²¹⁶

Even though the flow theory dates to 1997 when the concept of gamification was still unknown, most of the requirements and effects are reflected in today’s gamification instruments.

2.5.2 Gamification instruments (coordination variables)

The following gamification instruments (termed coordination variables in the research model) have been identified, grouped and sorted based on a meta research by Thiebes.²¹⁷ A major issue when trying to empirically measure singular gamification effects is that they often exhibit high complexity and interdependencies. For example, not every individual likes games, and those who do, do not like the same game mechanisms. Furthermore, when moving from sole individual instruments (like private score/point mechanisms) to more group integrated mechanisms (like leaderboards or feedback instruments) many emotional and psychological issues interact causing high complexity and prohibit a clear cause-and-effect-

²¹⁵ Walz 2015 p.50

²¹⁶ Csikszentmihalyi 1997

²¹⁷ Scott Thiebes, Sebastian Lins, Dirk Basten 2014 p.11-12. Appendix A

relationship study. Consequently, the chosen gamification instruments have been subjectively sorted ascending in terms of expected interdependency and social complexity. They have been grouped by expected resulting effects and will be introduced in the next section.

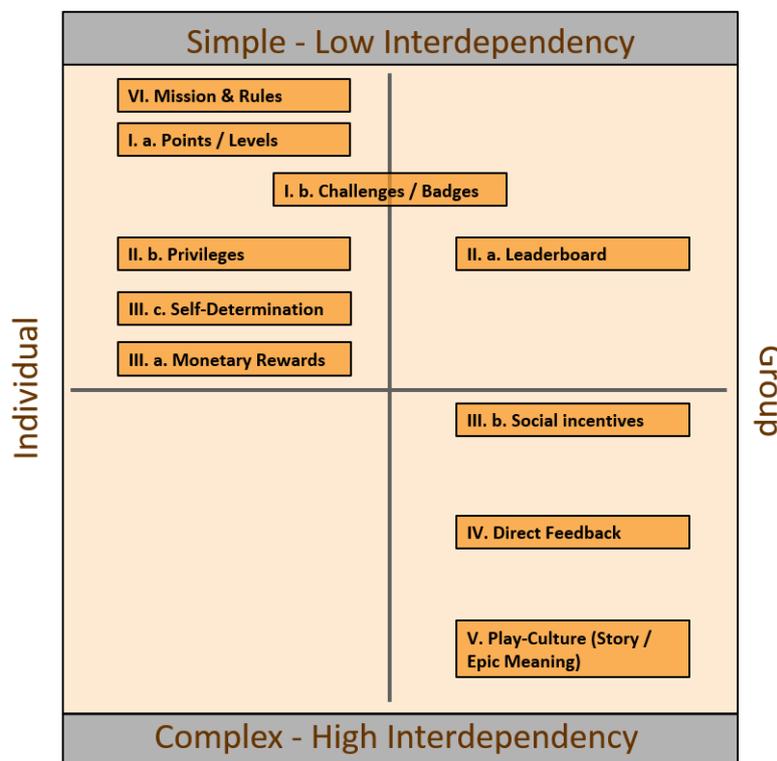


Figure 12 Selected gamification instruments (coordination variables)²¹⁸

It is important to note, that instruments in this figure may exhibit different complexity when applied in a private (individual) setting or a transparent group setting. Thus, the order of the elements may change depending on the specific use case. This will be explained in the following definitions.

2.5.2.1 Group I (Progress, Goals)

I.a. Points and Levels

*“Points are a running numerical value given for any single action or combination of actions.”*²¹⁹ They are given if desired behaviors are practiced to provide frequent and clear feedback to users. The cumulative nature of points keeps users attracted.²²⁰ Points and Levels in their basic function allow to track progress and give a feeling of the individual progress and reward. People like to take “baby steps” which become visible to users as soon as they receive even small amount of points. Progressing into higher levels gives positive feedback to the user (achievement / satisfaction).

Points and levels if not communicated public (between users) can be characterized as a progress- and goal-indicator, arguably they can be a reward. It seems questionable whether private points and levels alone will be able to create reward feelings in the long-run. If communicated between

²¹⁸ Wiegand und Stieglitz 2014

²¹⁹ Ong 2013 p.5

²²⁰ Ong 2013 p.5

users transparently, points and levels can represent status. By this transparency becoming more powerful but also more complex (e.g. social emotions: enviousness, unfairness). Stampfl states that points are important to create competition, but they may never be the core of the game.²²¹

It has been criticized widely, that gamification has often been interpreted as “pointsification”.²²² Pointsification represents the misconception of simply adding points to any existing system and term the result gamification. Nicholson criticizes that “points-based gamification focuses on the goals and leaves the play behind”²²³. Duggan and Shoup state in order to make points more interesting and effective over longer time-periods it can make sense to apply different point categories (e.g. “experience points” which move only up, “reputation points” which move up and down or also redeemable points).²²⁴

I.b. Challenges / Badges

Challenges are tasks or goals which if successfully completed by users result in a badge reward. A badge consists of a small picture (e.g. a trophy) and a title (e.g. “Master Diplomat”). If badges are not visible to other users, they are comparable to levels (with a specific focus). They allow to reward for user action and address collector’s instinct. However, they become powerful, but also socially complex as soon as they are visible to others. In that case status becomes visible to others which is a powerful motivator. The military uses the principle of badges and status for centuries.²²⁵ When deploying badges it is important, to understand that badges must be meaningful, they should become progressively more challenging to earn and they should never be earned all.²²⁶

2.5.2.2 Group II (Competition, Status)

II.a. Leaderboards

A leaderboard shows the top performers ordered by rank to all users (e.g. based on points). Leaderboards are without question one of the most powerful competition-creating and status-representing gamification instruments. However, they also bear many pitfalls if not deployed wisely. The long-term perspective must be taken into account, since if the scoring is not bound to a certain timeframe it might soon become frustrating for “lower-performers”. Nicholson in a gamification classroom experiment found that after the novelty of leaderboards had worn off, engagement faded for most students while a few top-performers were fighting for the top. “[...] students later reflected that the leaderboards were a demotivating factor; once the gap grew between the leaders and the rest of the class, there was little reason to pursue more of these points.”²²⁷ Duggan advises to design leaderboards in a way that they can be reached by every user and should be sliced by time, category, experience level and locality.²²⁸

II.b. Privileges

²²¹ Stampfl 2012 p.25-27

²²² Nicholson 2012 p.1

²²³ Nicholson 2012 p.1

²²⁴ Duggan und Shoup 2013 p.94-101

²²⁵ Ong 2013 p.5

²²⁶ Stampfl 2012 p.113-115

²²⁷ Nicholson 2013 p.2

²²⁸ Duggan und Shoup 2013 p.102

Privileges are classified as non-monetary rewards which are earned in combination with other instruments (e.g. by reaching a certain score, level or badge). The power of privileges can be seen in the real world when looking at different frequent-flyer-bonus programs or credit-card types. Here privileges rise with turnover (e.g. from priority boarding to being exclusively shuttled to the aircraft with a limousine). It's a combination of social status and something money can't always buy (e.g. the limousine shuttle or access to a special lounge). Still, it also bears some risk of social complexity (e.g. jealousy / inequality) as soon as the privileges become transparent to other users.

2.5.2.3 *Group III (Rewards)*

III. a. Monetary Rewards

Monetary bonus payments are the “old-fashioned” reward structure of today's business world. Arguably they don't belong to gamification instruments since they undermine intrinsic motivations and might lower performance. However depending on the intensity of innate desires²²⁹ and user characteristics it might well be that there is room for monetary rewards in gamification. In this research the effect as reward instrument shall be measured against reward alternatives in order to clarify its position.

III. b. Social Incentives (Events)

Social Incentives should be understood as social events which are conducted as reward for achievements. Even though they do cost monetary and time resources they are interesting, since they offer a lot of design flexibility and aim at creating social capital and bonds via social exchange. Design alternatives could be e.g. dinner vouchers (with the management or other winners) but might as well weekend for the whole team (regardless of performance) combined with some privileges (e.g. choice of destination for winners).

Social incentives foster social exchange, belongingness and trust thereby creating valuable social capital. Since the importance of social capital for successful knowledge exchange has been stressed throughout this paper “Social incentives” seem as a promising gamification reward even though exhibiting more social complexity than e.g. monetary rewards.

III. c. Self-Determination

Self-Determination here should be understood as an alternative individual reward by giving a person a surplus of autonomy and independence. It follows the intrinsic motivation path by giving people freedom of choice in their working setting. This might be as simple as a random day off but might also be freedom of choice to work on selected topics in order to address other needs like relevance, self-expression or mastery. Even though used as a reward, it addresses other needs than social incentives, monetary rewards or privileges.

2.5.2.4 *Group IV (Recognition)*

IV. Direct Feedback

²²⁹ Compare to Gears 2013 [Ge13] Gears, D.: Gamification in Business: Designing Motivating Solutions to Problem Situations. In CHI'13 France, 2013.

Brim and Asplund found in a U.S. employee survey 2009 that “[e]mployees receiving predominantly negative feedback from their manager are over 20 times more likely to be engaged than those receiving little or no feedback.”²³⁰ Continuous feedback (not only from management but from a 360° viewpoint) seems to have a huge impact on employee engagement. According to Csikszentmihalyi’s flow theory immediate feedback is a central requirement to dive into the flow (deeply engage in an activity).²³¹ Positive feedback is received as recognition and goal alignment. Negative feedback bears the risk of social emotions but as stated by Brim and Asplund is still the better alternative compared to no feedback. Moreover, direct feedback as gamification instrument (with a 360° viewpoint) also fosters social capital (at least in the positive form). But it must be classified as social complex with high interdependencies.

2.5.2.5 Group V (Purpose, Relevance)

V. Playculture (Story / Epic Meaning)

Playculture focuses on integrating an interesting gameplay and story at the core of the gamification system. Badgeville states that “epic meaning” in a gamification system is necessary to let the users feel they are working on something big and meaningful. That in turn will increase engagement, loyalty, influence and fun.²³² Playculture, if being able to deeply engage users in the game, has the potential to overcome cultural barriers (by building an own in-game-culture). This can help overcome different beliefs and intensify social exchange, thereby also fostering trust and social capital. Gameplay can give transparent guidelines how users should develop as individuals and as team. Furthermore, it offers room for self-expression (e.g. via avatars).

According to Ian Kuo most recent gamification system (termed gamification 1.0) are missing this central element of meaning, story and play. Kuo describes gamification 2.0 as follows: “[...] we need to combine our learning from Gamification 1.0 and look at real world business pain points and map core management activities and operations to gamified actions ... Points, leaderboards and badges and other such pure game elements are the fundamental building blocks, but we need to look beyond ... This promises to fundamentally change the way we work, bringing fun and excitement back into the mundane as well as the critical, resulting in business success and benefit to all stakeholders.”²³³

Being undoubtedly a key instrument for meaningful gamification playculture bears as many risks as chances. Due to the high specificity of each story and the differences in perceptions of users regarding “epic meaning” as well as the interdependencies to all previously mentioned instruments playculture is the most complex gamification instrument.

2.5.2.6 Group VI (Process, Structure, Security, Stability, Order)

VI. Rules / Transparency

²³⁰ Brim und Asplund 2009 accessed 27.04.2014

²³¹ Csikszentmihalyi 1997

²³² Badgeville Inc. accessed 27.04.2014

²³³ Kuo 2013 accessed 23.02.2014

Rules and transparency do not stem from the human-oriented dimension but belongs to the organizational/process dimension. It addresses tasks, processes and time-resources which in term reflect the work-related human need for structure, stability and order in working life. Thereby playing a crucial role in supporting the gamification system.

2.5.3 Combining research parts

The previous section has classified different gamification elements (mechanics) distributed over five groups (GV I.-VI.). The graphical representation is shown below:

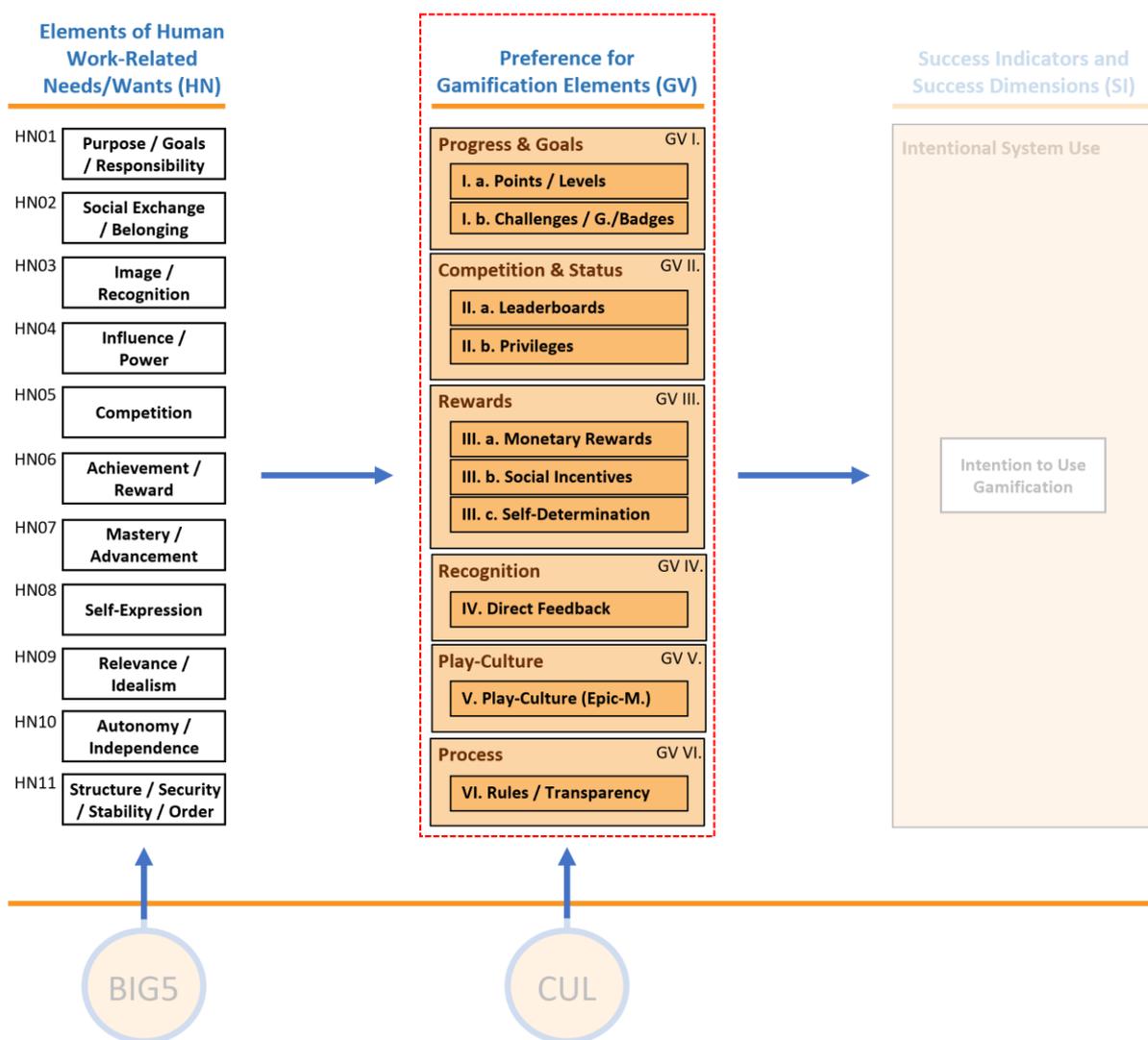


Figure 13 Combining Research Parts II

The blue arrow between the elements of human work-related needs (HN) and the gamification elements (GV) indicates a suspected interrelation. In other words, it is presumed that individuals which shows different work-related needs will also prefer different gamification elements. This assumption is derived

from the findings of prior research conducted by Jia²³⁴ and Tondello²³⁵ who already identified a direct impact of personality-traits on gamification element preference. This presumed relationship will be statistically analyzed in the empirical research chapter. The theoretical source of this supposed relationship is introduced and discussed next.

2.5.4 Personality Traits and Gamification

Tondello, Mora, and Nacke in 2017 examined differences in the perception of gamification elements depending on personality traits. They found that depending on the personality type the preferences for gameful design elements vary.²³⁶ Buckley and Doyle (2017) in their research concluded that extravert personalities evaluated gamification more positively due to their preference for external stimulation and outgoing nature. On the other hand, conscientious personalities perceived gamification more negatively.²³⁷ Conscientious people prefer clear structures and are well organized, they might perceive gamification elements as destruction of a stable system. Also, conscientious people might feel that game elements in a non-game context are inappropriate. Neurotic personalities might be discouraged by the competitive character of gamified environments since they are very systematic and plan behavior. Performance of these personalities was shown to decrease when gamification was applied. Since neuroticism implies low emotional stability the competitive character might lead to a fear falling behind or becoming overly emotionally involved. This in turn influences the actions and decisions of the individual leading to a decrease in performance. Jia et al.(2016) found that gamified systems increase motivation for extravert personalities but decrease motivation for people exhibiting low values of neuroticism (highly emotional stable people).²³⁸ Halifax et al. in 2019 summarized that users can be more or less receptive to different gamification instruments, depending on their personality and player profile, however research finding are heterogenous due to different gamification contexts and typologies.²³⁹

Consequently, a measurable influence of personality traits on the perception of gamification elements exists and has been identified by research. *“Our findings indicate that personality traits do play a role in people’s perceived preferences on gamification, and they highlight opportunities to engage users—or, at a minimum, limit frustration and disengagement—by (1) tailoring the design of gamified applications based on users’ personality traits or (2) making informed design choices that are not perceived as being demotivating by a large portion of an app’s audience”*²⁴⁰

The research results presented all relied on the same personality inventory, called the BIG5.

²³⁴ Jia et al. 2016

²³⁵ Tondello, G. F., Mora, A., & Nacke, L. E. 2017

²³⁶ Tondello et al. 2017. p.8 Table 4. Bivariate correlations between the groups of gameful design elements and the Big 5 personality traits.

²³⁷ Buckley und Doyle 2017 p.53

²³⁸ Jia et al. 2016 p.9

²³⁹ Halifax Stuart, Audrey Serna, Jean-Charles Marty, Guillaume Lavoué, Elise Lavoué 2019 p.1

²⁴⁰ Jia et al. 2016 p.10

2.6 Personality Traits – Big-Five-Inventory

Previous research has shown that personality traits do have an important influence on technology acceptance models²⁴¹ and on human needs.²⁴² Thus, to be able to answer the first research question it is necessary to choose a model which differentiates personality traits. In academic research there are three popular models of personality types: (1. “Eysenck’s theory of personality”, 2. “Myers Briggs Type Indicator” 3. “Big Five personality”).²⁴³ This research adapts the Big Five personality model since all considered comparable research projects are based on the BIG5 framework and their results shall be, discussed, extended and differentiated.²⁴⁴ However, if a different framework is chosen previous findings can hardly be but in relation, especially in the somewhat vague field of personality dimensions.

Individuals differ in perception and behavior of situations, conflicts or opportunities. Research has long-windedly discussed these differences and ascribed them to the variation in personality traits.²⁴⁵ As a result the Five Factor Model was developed, classifying personality traits into five dimensions: Conscientiousness, Agreeableness, Neuroticism, Extraversion and Imagination/Openness.

BIG5 Dimension	Big Five factors can represent the tendency to...
Conscientiousness	...actively plan, organize and carry out tasks
Agreeableness	...help others and expect help in return
Neuroticism	...be fearful, sad, embarrassed, distrustful, and have difficulty managing stress
Extraversion	...seek out new opportunities and excitement
Imagination/ Openness	...devise novel ideas, hold unconventional values, and willingly question authority

Figure 14 BIG5 factors and tendencies²⁴⁶

Rammstedt describes extraversion as a dimension that includes characteristics such as sociability, activity, communicativeness, and assertiveness on the one hand (higher values) while lower values represent silent and reluctant behavior. Agreeableness is particularly important for team collaboration. High values for this factor describe persons as altruistic, cooperative and compliant. Such persons tend to exhibit high levels of interpersonal trust (social capital). Persons with lower values in this dimension can be characterized as cold and mistrusting. Conscientiousness distinguishes disciplined and reliable personalities (high values) from those that are indifferent and unstable (low values). Neuroticism represents how emotionally unstable personalities react. A high score on neuroticism indicates that people tend to be insecure, nervous, anxious or depressed. Personalities exhibiting a high score on openness are considered to be imaginative, intellectual, and artistically interested, while people with lower levels tend to have narrow minded views are conservative and only show little interest in change.²⁴⁷

²⁴¹ Rosen und Klumper 2008. p.8 “Three of the six relationships between Big Five and TAM constructs were significant, including extroversion to perceived ease of use, extroversion to perceived usefulness, and conscientiousness to perceived ease of use.”

²⁴² Costa und McCrae 1988 p.263 Table 3 and Table 4

²⁴³ Ghaban und Hendley 2018 p.4

²⁴⁴ Compare to Tondello et al. 2017, Jia et al. 2016 Ghaban und Hendley 2018 Halifax Stuart, Audrey Serna, Jean-Charles Marty, Guillaume Lavoué, Elise Lavoué 2019 Buckley und Doyle 2017

²⁴⁵ Gustavsson et al. 2003 p.69-89

²⁴⁶ Jia et al. 2016 p.3

²⁴⁷ Rammstedt et al. 2013 p.233-234

Criticism on the BIG5 framework

Boyle summarizes several problems within the BIG5 concept. First, it does not provide good coverage of a normal personality trait domain. Furthermore, it has no established theoretical basis. Replicability of results across different samples is not consistent, which is also a threat to this research and needs to be regarded as a limitation.²⁴⁸

BIG5 instruments

The BIG5 items are evaluated with a questionnaire. There are different versions of questionnaires. The most commonly known instrument for measurement is the NEO-Personality Inventory, which has been translated to many languages.²⁴⁹ The questionnaire contains 240 items in its original version, while short forms like the NEO-Five Factor Inventory are shortened to 60 items. The shortest reliable scale to measure the BIG5 inventory is the BFI-10 consisting of only 10 items (2 per questions per dimension). It was derived and validated by Rammstedt in 2012²⁵⁰ and will be applied in the empirical part of this work.

²⁴⁸ Boyle 2010 p.20. "other mentioned criticism which are not directly relevant for this research are: "[The BIG5] is not linked to underlying physiological mechanisms or to neurochemical brain processes; it postulates heterogeneous broad traits which are too few in number to enable highly accurate predictions; it provides a static account of regularities in behaviour; [...]"

²⁴⁹ For example the German translation by Ostendorf & Angleitner, 2004 Rezension des "NEO-Persönlichkeitsinventar nach Costa und McCrae (NEO-PI-R)"

²⁵⁰ Rammstedt Beatrice et al. 2012 "Mit der zunehmenden Etablierung des Fünf-Faktoren-Modells der Persönlichkeit werden die sogenannten „Big Five“-Persönlichkeitsdimensionen vermehrt auch in Anwendungskontexten außerhalb der Psychologie und insbesondere auch in der Large-Scale-Forschung erhoben. Da jedoch gerade in diesen Bereichen die Untersuchungszeit oft stark begrenzt ist, sind die herkömmlichen Verfahren zur Erfassung der Fünf Faktoren in der Regel zu umfangreich. Speziell für solche Kontexte wurde das ultra-ökonomische BFI-10 entwickelt, das die fünf Dimensionen mit insgesamt zehn Fragen bzw. einer durchschnittlichen Bearbeitungsdauer von circa einer Minute erfasst. Das BFI-10 wurde in der vorliegenden Studie an einer umfangreichen, bevölkerungsrepräsentativen Stichprobe validiert. Die Ergebnisse belegen zufriedenstellende psychometrische Kennwerte für das BFI-10. Darüber hinaus konnten die Konstrukt- und die Kriteriumsvalidität des Verfahrens empirisch untermauert werden."⁴⁴

2.6.1 Combining research parts

The concept of the BIG5 personality traits has been introduced and is now fitted into the preliminary research model (on the lower left):

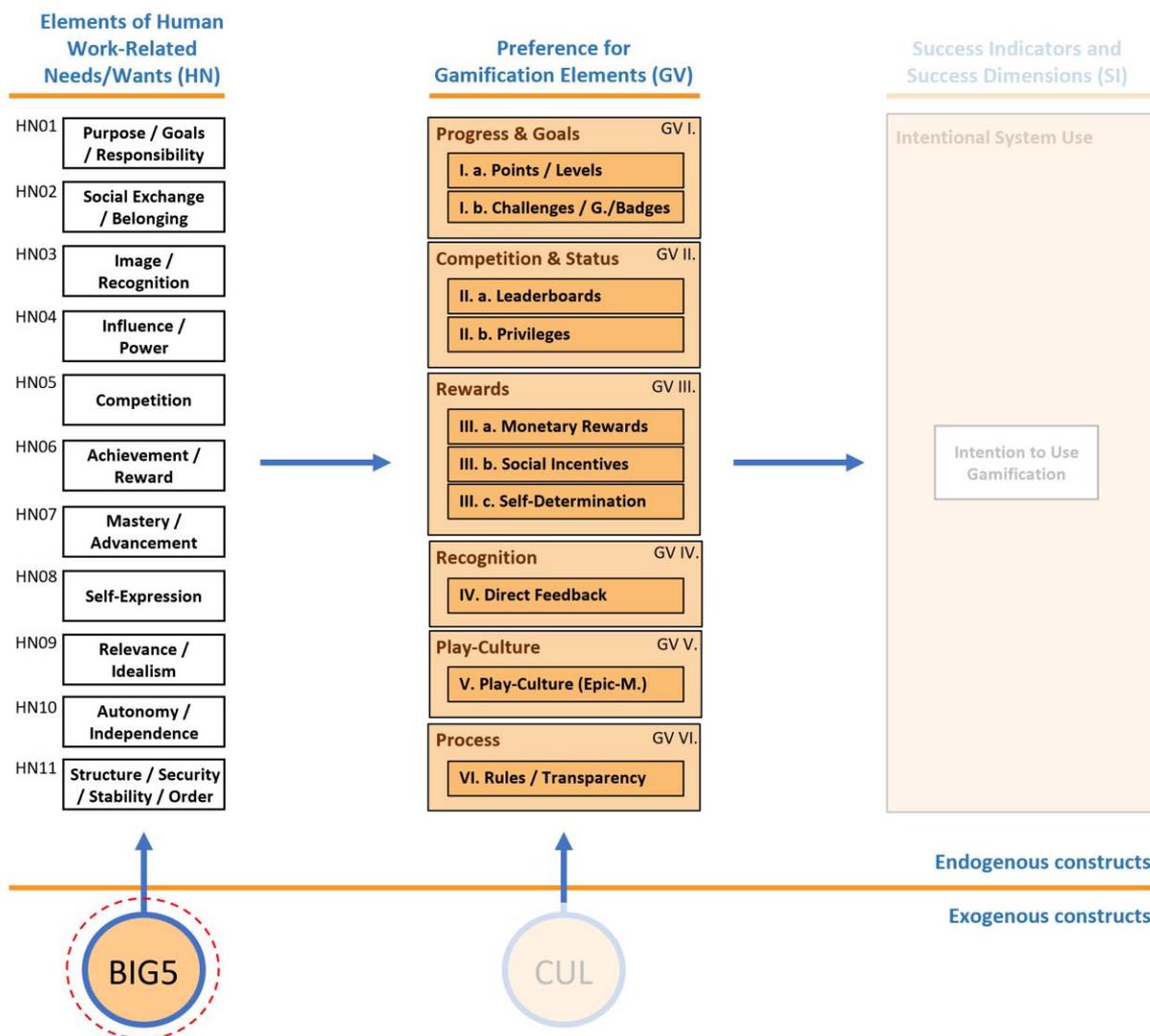


Figure 15 Combining Research Parts III

Previous research has already hypothesized interrelations between BIG5 personality traits and the preference for different gamification mechanics.²⁵¹ However, in this research an additional step is taken. The BIG5 personality traits are hypothesized against human work-related needs which then in turn are hypothesized against the different gamification elements. The idea behind this construct is, that it is not primarily personality traits influencing the preference for different gamification elements, but rather work-related needs which i.a. are more dependent on situational circumstances and external influences than solely personality traits. It is presumed that the BIG5 personality traits might influence these needs and wants. BIG5 is here introduced as the first exogenous construct, while the others were endogenous constructs. The difference will be explained in detail in section 3.6.1.

²⁵¹ Compare to Buckley und Doyle 2017

Besides personality traits and human work-related needs, cultural background is the third construct needed to answer the research questions. National culture is part of every individual and its influence on personality cannot be separated.²⁵²

2.7 Culture

In order to answer the research question in how far cultural background might affect the preference for specific gamification elements, Khaled in 2015 analyzed cultural aspects on a conceptual basis: *“As gamification reaches further conceptual maturity, we need to be deeply thoughtful about cultural and other value biases inherent in gamification design tropes and cognizant of the preferences of the audiences we are designing for to reduce the risk of design failure and the alienation of players.”*²⁵³ She proposed that game dynamics embody cultural values that tend to reinforce values suited to mastery and hierarchy-focused cultures. Other academics addressed this fact previously, stating that most of the companies which implemented gamification or offer consulting services are US-based.²⁵⁴ Yet, it remains questionable whether this western gamification approach will be accepted by other cultures without changes. Streck in 2012 states that in the US it is normal to reward people for doing a good job (mostly based on performance), in the Netherlands this would create a wrong competitive atmosphere. Dutch employees are normally not put in the spotlight at all. It is normal to do a good job.²⁵⁵

Taylor was the first in 1873 to publish a definition of culture in context of his book “Primitive culture”: *“Culture, or civilization, taken in its broad, ethnographic sense, is that complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society”*.²⁵⁶ Taylor put forward the theory that cultures evolve with time and becomes increasingly complex. Ecologies form cultures and in turn cultures form personalities. National culture is part of every individual and its influence on personality cannot be separated.²⁵⁷ However, culture can be shared, learned and classified on different levels (e.g. national vs. organizational).²⁵⁸ The recognized cultural models to achieve this are introduced next.

2.7.1 Hall’s cultural differences - High-context versus low-context

In his work on cultural differences Hall differentiates high-context messages from low-context messages. This differentiation is relevant to understand the implications cultural background might have on gamification preferences comparing the western and the eastern world.

Context is the information which encompasses all events (e.g. communication) and cannot be interpreted separately. *“A high-context (HC) communication or message is one where most of the information is already in the person, while little is in the coded, explicit part of the message.”*²⁵⁹ When interacting in a high context setting little explicit information is required. Background knowledge (tacit information) and the context allow deducting the specific meaning. People live in a sea of information with much non-

²⁵² Triandis und Suh 2002. p.152

²⁵³ Walz 2015.chapter.11. p.298-318 by Rilla Khaled

²⁵⁴ Schönbohm und Urban 2014. p.93

²⁵⁵ Streck 2012.accessed 12.05.2016

²⁵⁶ Taylor 2010. p.22

²⁵⁷ Triandis und Suh 2002. p.152

²⁵⁸ Hofstede 1984. p.72

²⁵⁹ Hall 1976. p.91

verbal coding. Strong interpersonal bonds, high commitment and reserved reactions characterize the information exchange. Examples for “high-context” nations are Japan, south Europe, Arab countries, India (eastern world). “A low-context (LC) communication is just the opposite; the mass of information is vested in the explicit code.”²⁶⁰

When interacting in a low context setting much additional explicit information (many details) is needed to clarify the message. Low commitment and fragile interpersonal bonds characterize the information exchange. Examples are Germany and the USA (western world).

High Context	Low Context
<p>Time</p> <ul style="list-style-type: none"> ▪ Everything has its own time ▪ Time not easily scheduled ▪ Needs of people interfere with keeping to time ▪ What’s important is that the activity gets done ▪ Things rooted in the past, slow to change and stable ▪ Time belongs to others and to nature 	<p>Time</p> <ul style="list-style-type: none"> ▪ Things are scheduled to be done at a particular time ▪ One thing should be done at a time ▪ What’s important is that the activity should be done efficiently ▪ One can make quick changes and see immediate results ▪ Time can be spent, saved. One’s time is one’s own.
<p>Space</p> <ul style="list-style-type: none"> ▪ People stand close, share same space 	<p>Space</p> <ul style="list-style-type: none"> ▪ People are further apart, space compartmental divided and privately owned, privacy important
<p>Interaction & Communication</p> <ul style="list-style-type: none"> ▪ One talks around and abolishes the point ▪ How things get done depends on one’s relationship with people and attention to group process 	<p>Interaction & Communication</p> <ul style="list-style-type: none"> ▪ One speaks things out exactly ▪ Things get done following procedures and attention to a goal

Table 5 Hall – Time and space orientation ²⁶¹

2.7.2 Hofstede’s cultural differences - Culture as “software of the mind”

For Hofstede “culture” is the “*collective programming of the mind distinguishing the members of one group or category of people from others*”.²⁶² His model has been included in this research, since it allows to structure the somewhat vague and complex concept of “culture” into categories (like national culture). As a consequence his six dimensional cultural model is criticized for over simplification and arbitrary decisions, which will be discussed and put in context to the implications to this research.

In his book “Cultures and Organisations – Software of the mind”²⁶³ Hofstede compares the way computers are programmed to the character patterns of human beings. A fundamental difference is that people will vary in their thinking, feelings and reactions based on their individual creativity. Culture is taught, not

²⁶⁰ Hall 1976. p.91

²⁶¹ Hall 1976. p.85-120.chapter 6-8

²⁶² Hofstede 1984

²⁶³ Hofstede et al. 2010. p.6 Figur 1.1 Three Levels of Uniqueness in Mental Programming

inborn, the source to each individual mental program is embedded in the social surrounding in which humans interact. Thus, culture is always a collective phenomenon.

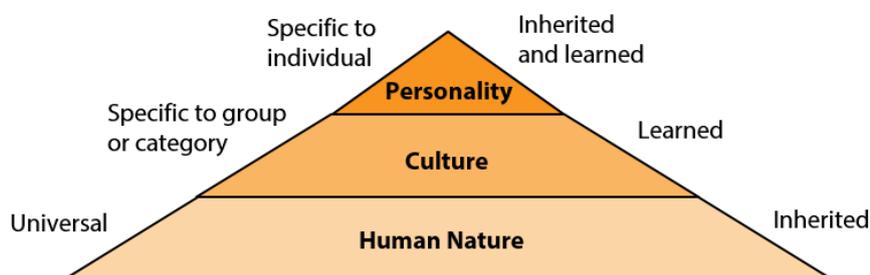


Figure 16 Three levels of uniqueness in human mental programming²⁶⁴

Hofstede differentiates three levels in human programming. Human nature is the universal layer of all human beings. It includes the ability to feel angry, sad, scared or loved. Personality on the opposite is a unique combination of mental programs, which creates a “one-of-a-kind” person, based on different character features and individual experiences. The third level is culture, which ranges between the two other levels, however there are no clear borders where each level ends and the other begins. However, to empirically research the impact of the cultural dimension Hofstede needed to separate culture into clearly measurable dimensions which resulted in his 6-D model.

2.7.2.1 The 6-D Model

Hofstede conducted an extensive survey (over 100.000 questionnaires in 50 countries) at IBM in the mid 1970's investigating influence of national culture on organizational culture. Hofstede's statistical results were presented five years later and consisted out of four dimensions which allow to classify different cultures respectively:²⁶⁵

1. Power Distance

Power distance refers to the unequal distribution of power within a society and the acceptance of that fact by the less powerful members. Societies with a high score accept large power differences while low scores reflect the view that everyone should have the same rights. Nevertheless, large power differences also lead to less communication (e.g. suggestions and feedback) between subordinates and superiors. Latin America and Arab nations for example exhibit a very large power distance while Scandinavian countries score very low.

2. Individualism / Collectivism

Individualism addresses the extent to which people act individually or predominantly as part of a group (collectivism) when prioritizing their needs and goals. Latin American countries score very low (collectivism) while the U.S.A. scores extremely high (individualism). These examples illustrate the negative correlation which exists between power distance and individualism.

²⁶⁴ Übelacker 2013, p.2048 (Source: Geert Hofstede. Lokales Denken, globales Handeln. Beck-Wirtschaftsberater im dtv, 2. edition, 2001)

²⁶⁵ Hofstede 1984

3. Masculinity / Femininity

The masculinity index refers to the traditional values of male and females. Masculine cultures (e.g. Japan) mostly exhibit attributes like, power, domination and achievement while femininity-based cultures (e.g. Sweden) focus on team building, relationships and quality of life.

4. Uncertainty avoidance

Uncertainty avoidance reflects in how far societies try to avoid uncertainty by planning, structuring and creating clear rules. A high score states, that countries try to regulate all possible situations to minimize uncertainty and obtain structure and control, people are not comfortable taking risks and prefer their known systems. On the other hand, low scores show that societies are able to cope with uncertainty and change, they are willing to take risks.

Michael H. Bond a professor in Hong Kong collaborated with Hofstede in 1984 and together they extended the model in 1991 by the fifth dimension “time orientation” reflecting Chinese Confucian culture.²⁶⁶

5. Pragmatism / Time orientation

Time orientation (short-term vs. long-term) describes whether society focuses on the present situation or future developments. Distinguishing attributes in this context are “thrift” or “perseverance” as well as respect for long-term tradition. In general, eastern countries tend to have a long-term orientation while western countries focus on the short term.

Michael Minkov in 2007 laid ground for the extension of Hofstede’s country scores to a total of 93 countries.²⁶⁷ As a result of the data analysis in 2010 Hofstede and Minkov add a sixth dimension: “indulgence vs. restraint”.²⁶⁸

6. Indulgence vs. Restraint

Indulgence vs. restraint describes the preference of people to control their needs and desires. While indulgent societies allow more freedom and enjoyment, restraint societies follow strict social norms. While indulgence scores are high in Africa, Latin America and northern Europe, restraint is predominant in eastern parts of the world (Eastern Europe to East Asia).

Criticism

While the significance of Hofstede’s research has been proven and honoured by the academic society all over the world, limitations and criticism exist as well. McSweeney as one of the harshest critics states that “*his project could be dismissed as a misguided attempt to measure the unmeasurable*” in his article calling Hofstede’s model “*A triumph of faith – a failure of analysis.*”²⁶⁹ It is pointed out that Hofstede made some arbitrary decisions in order to put his home country (the Netherlands) closest to the norm. Furthermore, the grouping of nations did not consider different cultural aspect (e.g. two languages) within

²⁶⁶ Geert Hofstede, Michael H. Bond 1984. p.429 Table 6

²⁶⁷ Minkov 2007. p.114-118 “Indulgence versus restraint as a cultural dimension”

²⁶⁸ Hofstede et al. 2010. p.277-296 “Light or Dark?”

²⁶⁹ McSweeney 2002. p.89-118

one nation. Nations are regarded as non-specific homogenous clouds instead of recognizing national heterogeneities within societies. Regarding the generalizability of the study it is criticized that Hofstede only took data from employees of one globalized company (IBM) supposing that IBM exhibits a singular, uniform organizational culture. He neglects the fact that extensive literature has argued for an organic multidimensional culture of organisations. McSweeney sums up criticism by concluding that *“fallacious assumptions necessarily lead to inaccurate empirical descriptions regardless of the quantity of data and statistical manipulation used”*²⁷⁰. Regarding this research this criticism bears limitations which needs to be considered when interpreting the results of “classified cultures”.

2.7.3 Problems in classifying culture

A core problem when trying to define one specific culture is that there are no definite criteria which characterize a cultural area. “National borders” for example are complicated when looking at the recent (the last two centuries) historic developments (e.g. Germany vs. Austria, India vs. Pakistan). “Language” also does not qualify as criteria since in India many different languages coexist while the culture is very similar, in other cases cultures vary strongly even though the language is identical. Comparable definition problems exist for many different classification parameters, like “value systems”, “religion”, “customs and practice” or “place of residence”. Partly these concepts can be used to distinct cultural (sub)groups however, most often they fail to exhibit general validity.²⁷¹ A reason for this problem is that a lot of people are members of many different cultural areas at a time depending on the definition (e.g. the Indian “Green Card Holder” living in New York). Thus, culture can be understood in many ways (nationality, religion, ethnicity or gender). Even though nationality represent just one single dimension of culture it has been sufficiently previously researched and classified.²⁷² In this research the nations Germany and India will be exclusively analyzed. The reason for that is, that according to Hofstede’s cultural model India and Germany do exhibit some similarities while also showing considerable controversy in some respects.²⁷³ This is valuable when comparing empirical results across the two cultures. Furthermore, Germany (western world – low-context culture) and India (eastern world – high-context culture) qualify as proxy variables for Hall’s cultural differences. As a consequence, this research is not solely depending on Hofstede’s cultural theory but allows for a broader picture when interpreting results. Adding additional cultures as control parameters would have been valuable, however for reasons of gathering enough samples for the empirical research only these two cultures are compared.

2.7.4 Cultural differences: Focusing on India and Germany

Hofstede offers his statistical results on his homepage where different nations can be queried and compared. Querying the database yields the following results and explanations for both countries:²⁷⁴

²⁷⁰ McSweeney 2002. p.112 “Hofstede’s apparently sophisticated analysis of extensive data necessarily relies on a number of profoundly flawed assumptions to measure the ‘software of the mind’ as did Morton’s measurement of the hardware, as it were, of the mind. Hofstede’s claims

²⁷¹ Strohschneider 2001. p.6

²⁷² Compare to 2.7.2 Hofstede’s cultural differences

²⁷³ Compare to 2.7.4 Cultural differences: Focusing on India and Germany

²⁷⁴ Geert Hofstede 2020

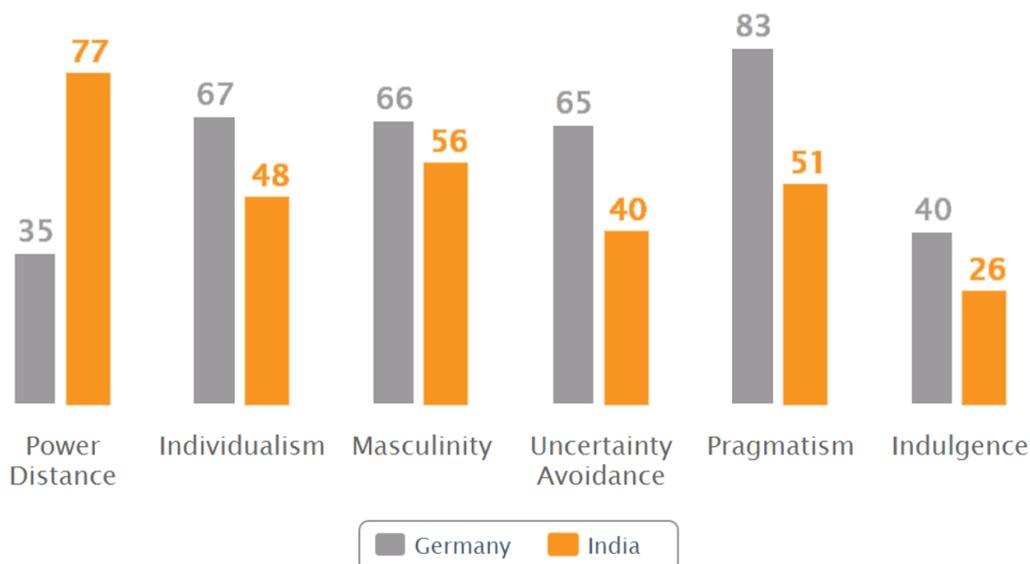


Figure 17 Hofstede's cultural dimensions – Germany in comparison with India²⁷⁵

1. Power Distance: Germany 35 / India 77 – World average 57 –

Due to its large middle class and decentralized organisation, Germany represents a lower power distance country. Participative leadership and a direct communication style (*“be honest even if it hurts”*) are common in Germany as well as co-determination rights of subordinates. Expertise is more important than hierarchy. India with 77 points exhibits a traditional top-down, hierarchical structure. Control is accepted in India and employees expect clear and direct commands. Negative feedback does not go bottom-up.²⁷⁶

2. Individualism / Collectivism: Germany 67 / India 48 – World average 44 –

Germany scores an index of 67, underlining their strong individuality, while the score of India 48 is substantially lower and comparative with the world average of 44. These results show that India is more group oriented (collectivistic) than Germany which focuses on the individual. Carmel and Tija claim a strong correlation between wealth and individualism, pointing to the fact that people from wealthy nations want more personal freedom, privacy, time and challenges.²⁷⁷ For India group harmony (family, clan, organisation) is most important and thus the key to personal identity. As a result, collectivists depend more on the company and exhibit a stronger desire for non-financial rewards. Furthermore, relationships are especially important to collectivist thereby requiring special efforts to build friendships.²⁷⁸

3. Masculinity / Femininity: Germany 66 / India 56 – World average 50 –

²⁷⁵ Hofstede 2018, accessed 01.11.2018

²⁷⁶ Compare to Hofstede 2018 Power Distance

²⁷⁷ Carmel und Tija 2005, p.175-197 chapter 9 Dealing with cross-cultural issues

²⁷⁸ Hofstede 2018 Individualism

The Hofstede index shows that both nations lie above the world average of 50. Germany scores 66 while India is slightly above average with an index of 56. It can be concluded that both nations are quite similar focused in their exhibition and valuation of achievement, success and power. However, both scores are not very above average which underlines the existence of the mentioned femininity-based values (e.g. team building). In both countries performance is highly valued, and children are trained to this system starting with early school. The measurement of success and progress with materialistic status symbols is stronger in Germany than it is in India.²⁷⁹

4. Uncertainty avoidance: Germany **65** / India **40** – World average **65** –

Germany exhibits an index of 65 for uncertainty avoidance which is also the world average. It can be interpreted as a rather low tolerance for ambiguity thus trying to minimize uncertainty and obtain structure. India on the other hand scores 40, stating that the country is less worried about uncertainty thus showing more tolerance for a variety of options. India accepts imperfection and exhibits high degrees of patience and tolerance. If future developments go into another direction it is a break from monotony. Indians know how to adjust to new systems and how to “adjust” the system itself.²⁸⁰

5. Pragmatism / Time orientation: Germany **83** / India **51** – World average **n.a.** –

Germany is regarded as pragmatic country respecting that truth is multidimensional as well as an ability to change depending on environmental conditions. While western countries normal score low in this dimension (exhibiting a short-term focus) Germany with its high investment and saving rates focuses on a long-term approach to life. During the redesign from five dimensions to six dimensions “time orientation” has been renamed to “pragmatism”. The values shown for “pragmatism” stem from Michael Minkov younger research (2007-2010). When looking at the values for “time orientation” in 2005, Germany scores an index of 31 while India reaches 61. Thus, back in 2005 India exhibited a long-term approach to life and business while Germany focused on short term developments. These scores fitted into the classical western/eastern pattern. The scores from 2018 thus state at least partly the opposite of the earlier findings. Underlying how careful and critical the scores, scopes and definitions must be assessed.²⁸¹

6. Indulgence **40** / India **26** – World average **n.a.** –

Germany and India both must be classified as restrained cultures, exhibiting patterns of pessimism and strong control of leisure desires. Social norms of constant effort and thriftiness characterize common values. “Societies with a low score in this dimension have a tendency to cynicism and pessimism.”²⁸²

²⁷⁹ Hofstede 2018 Maculitinty

²⁸⁰ Hofstede 2018 Uncertainty Avoidance

²⁸¹ Hofstede 2018 Long Term Orientation

²⁸² Hofstede 2018 Indulgence

2.7.4.1 *The connection between India's and Germany's culture*

“Europeans permanently put themselves in the decision: yes or no; the Hindu lives in the ambivalence of yes and no.”

Jean Grenier, “About India”

Germany and India are connected by a long and rich tradition of mutual cultural exchange and understanding. Many famous German philosophers dedicated work to the Indian way of thinking (e.g. Schopenhauer, Hesse, Max Weber, Albert Schweitzer) and German universities have educated a lot of well-respected India experts (e.g. Max Müller). But it is not only the academic community who is fascinated by the respective other country but also non-academic communities like the “Maharishi Yogi Movement”. Starting in the 1970s this community has found a lot of supporters and still today “meditation journeys” to India are very popular in the western world.

Cultural research in general focuses on strong contrasts, because these allow to examine the object of interest with clear distinctions. The existence of such strong contrasts is the only legitimating factor to conduct cultural research in foreign environments, instead of researching within one national culture.

Contrasts between India and Germany:²⁸³

- Economically India remains a third world country (despite the tremendous success and growth within the last decades) while Germany belongs to wealthiest nations in the world.
- Socially India is still characterized by its caste system which has led to an extreme power distance within the population – Germany does not accept such given social hierarchical structures
- India is a country of large families who plan their entire lives into smallest detail with a lot of reflexion, with a tradition of over 5000 years the culture is much older as compared to Germany
- Germany focuses on individual identity instead of group (e.g. family) thinking.
- While Germans tend to avoid uncertainty whenever possible, Indians show more tolerance for different options
- Hinduism, which is the largest religion within India (80% of the population are Hindus), strongly differs from the Christian philosophy (Germany) of life
- The general difference in time orientation (short-term – western world vs. long-term – eastern world) is also mirrored by the two countries

But still India's culture remains close enough to Germany's culture for Germans to understand the Indian way of living.

- India's university system is the third largest in the world thereby creating a well-educated society at least in the urban areas²⁸⁴
- Due to the 16 different official languages and over 100 accents which are spoken throughout India, “English” has emerged as the unofficial state language. This to a huge extent solves the basic communication problem since nearly all Indians speak English.

²⁸³ Strohschneider 2001 [St01] Strohschneider, S.: Kultur - Denken - Strategie. Eine indische Suite. Huber, Bern, 2001.

²⁸⁴ Annual Report Ministry of Human Resource Development, Government of India 2006-2007

- Both countries exhibit an above average masculinity index²⁸⁵ stating that traditional values like achievement, success and power are rooted in both nations.

It can be concluded that the German and Indian culture exhibit a lot of fundamental differences (e.g. group vs. individual) as well as some important basic similarities (e.g. achievement drive). On the one hand this explains why Germans and Indians are interested in each other since they comprehend the other people’s aims or are fascinated by certain values the own culture does not exhibit. On the other hand, the fundamental differences are the cause of many problems when interacting, especially in work settings. This underlines how important the cultural aspect is when analyzing incentive systems and the impact on individual preferences.

2.7.5 Combining research parts

The concept of culture (cultural background) is added to the research model (lower middle):

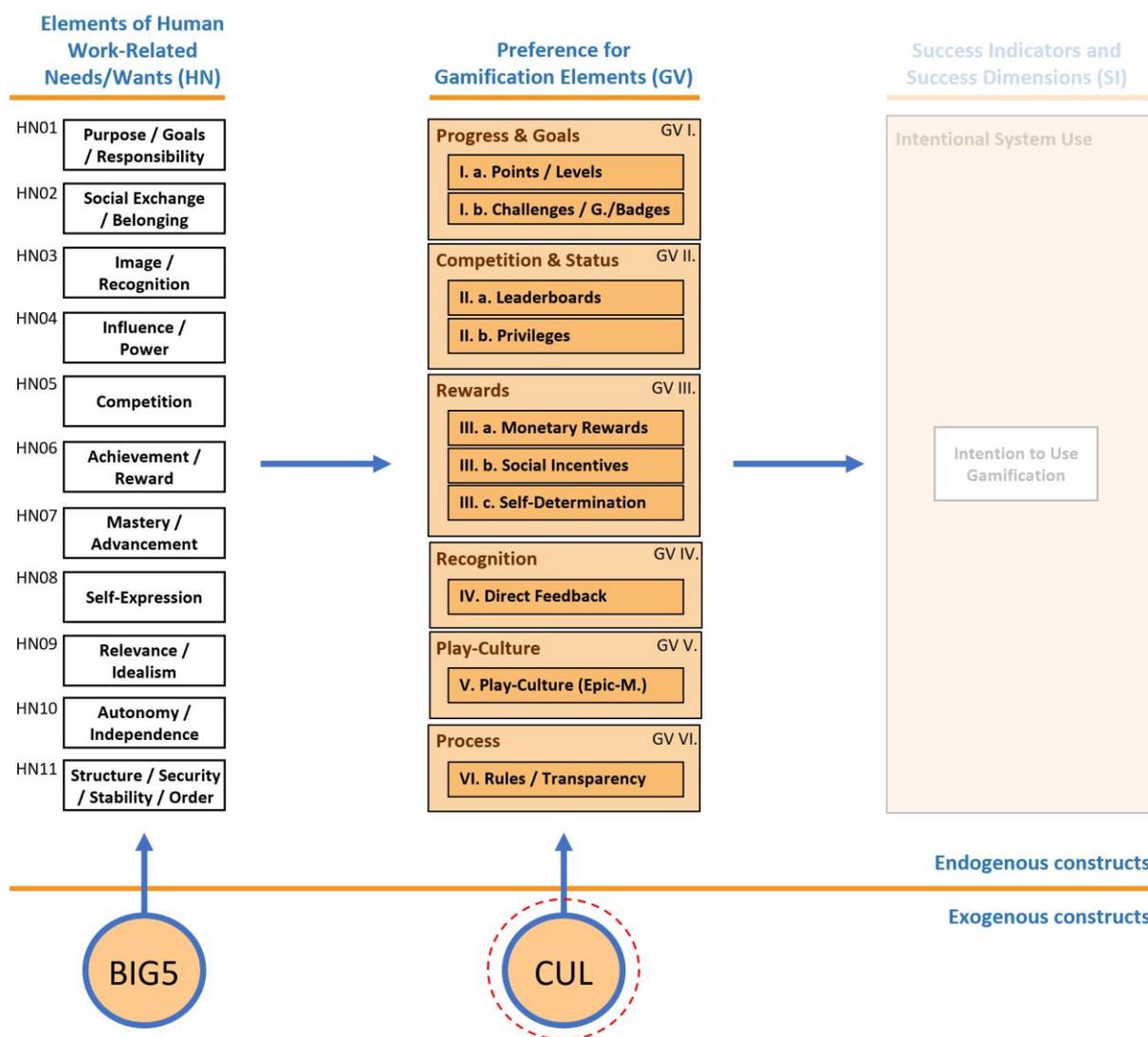


Figure 18 Combining Research Parts IV

²⁸⁵ Compare to Hofstede’s masculinity dimension 2.7.2

Culture as exogenous construct is hypothesized to have an influence on the preference for gamification elements. Based on the analysis of Streck in 2012²⁸⁶ the construct of cultured is measured directly against the gamification elements and in turn against the intention to use gamified systems. Now only the success dimension is missing in the research model. Success indicators in this dimension should provide quantifiable measures to determine the potential influences of the introduced constructs. The concept of “intention to use” and thus the final construct of the preliminary research model is introduced next.

2.8 Technology acceptance models

If the constructs and systems researched are already well known and adapted in the real world, effects can be measured e.g. via questionnaires, asking probands about their experiences. If technology is involved (e.g. specific applications), another possibility would be to track user’s system usage based on defined performance indicators. However, in the field of human-computer interaction, constructs and systems researched are often new to the world and there are only very few probands, who can add quantifiable real-life experiences to analyze influences or effects. This also holds for the field of internal gamification which is still completely new to most people in the labor market.

However, to make new concepts and technologies like internal gamification successful in the long run, they must be sustainably adopted by their users. Technology acceptance models allow to measure imaginative constructs by predicting an actual system use via predictor variable like “Behavioral Intention to Use”, which is also used in this research. These variables, however, are at the same time is their greatest weakness and point for criticism.

The two most used models are the Technology Acceptance Model (TAM, developed by Davis in 1989) and the Unified Theory of Acceptance and Use of Technology (UTAUT, developed by Venkatesh et al. in 2003). Since the construct of “Behavioral Intention to Use” is comparable in both theories and UTAUT integrates other constructs which are not relevant in this use case only the TAM framework will be introduced.

2.8.1 TAM

“Computer systems cannot improve organizational performance if they aren’t used.” Davis ²⁸⁷

The technology acceptance model analyses why users adopt or decline new technologies. Furthermore it takes into account how useful the technology is for its specific context (e.g. work) and how easy its usage is.²⁸⁸ The core assumptions stem from the theory of reasoned action (TRA) which was designed to explain human behavior and intention in many different domains.²⁸⁹ TAM is more specific tailored to computer usage behavior by incorporating IS research and focusing on simple measures taken after brief periods of system usage. The model shall predict “actual system use” by incorporating four other variables.²⁹⁰

²⁸⁶ Compare to 3.13 and Streck 2012b.

²⁸⁷ Davis et al. 1989. p.982

²⁸⁸ Davis et al. 1989. p.983

²⁸⁹ Ajzen und Fishbein 1980. p.4

²⁹⁰ Davis et al. 1989. p.985

2.8.1.1 Perceived Usefulness (U)

Perceived usefulness (U) represents the user's subjective probability that using a technology, application or system will increase her or his job performance.

2.8.1.2 Perceived ease of Use (E)

Perceived ease of use (EOU) describes how easily accessible a target system is, so that the prospective user needs as little effort as possible in order to use it.

2.8.1.3 Attitude toward Use (A)

The attitude toward a specific behavior (use) is described as an individual's positive and negative feelings which lead to an evaluative effect about performing the target behavior (use).²⁹¹

2.8.1.4 Behavioral Intention to Use (BI)

The theory of reasoned action defines behavioral intention (to use) as a sum of a person's attitude and subjective norms concerning the behavior in question. Subjective norms are characterized as *"the person's perception that most people who are important to him think he should or should not perform the behavior in question"*²⁹²

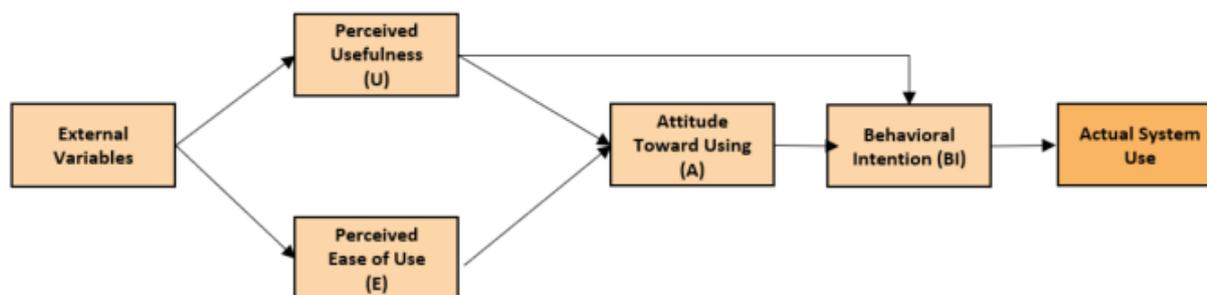


Figure 19 Technology Acceptance Model (TAM) Version 1 ²⁹³

Criticism

However, also shortcomings of TAM have been addressed in science. Bagozzi in 2007 stated: *"TAM [...] seems to have reached a turning point. On the one hand, it is too simple and leaves out important variables and processes. On the other hand, recent extensions of TAM (e.g. the UAUT) have been a patchwork of many largely unintegrated and uncoordinated abridgements."*²⁹⁴ Other researcher criticized the fact that "Intention to Use" is the only predictor variable which likely can't explain overall usage patterns as a single construct, which is an important limitation in this study.²⁹⁵

²⁹¹ Ajzen und Fishbein 1980. p.216

²⁹² Ajzen und Fishbein 1980. p.302

²⁹³ Davis et al. 1989. p.984

²⁹⁴ Bagozzi 2007. p.252

²⁹⁵ Wu 2011. p.178

Still, TAM is widely accepted in social science and has proven its practical application. Hsu et al. 1999 were able to explain 40% of the variance of technology usage in a quantitative study.²⁹⁶ The relevant construct in this research is “(behavioral) intention to use [gamification]”.

2.8.2 The construct “intention to use”

TAM derives the construct of (behavioral) “intention to use” which predicts “actual system use”. This is important to note, since it is presumed that only some respondents of the survey will have actual (real-life) experience with gamification systems. Thus, it is necessary to use a model allowing to make usage/acceptance predictions based on theoretical situations and resulting intentions. However, only the “intention to use” construct will be adopted thereby neglecting perceived usefulness and perceived ease of use. The “attitude towards use” as is covered as it is the predecessor construct describing an individual’s positive and negative feelings which lead to an evaluative effect about performing the target behavior (intention to use).

²⁹⁶ Hsu und Lu 2004. p.853-ff.

2.8.3 Combining research parts

The (behavioral) “intention to use” concept as defined will be applied in this research as success dimension:

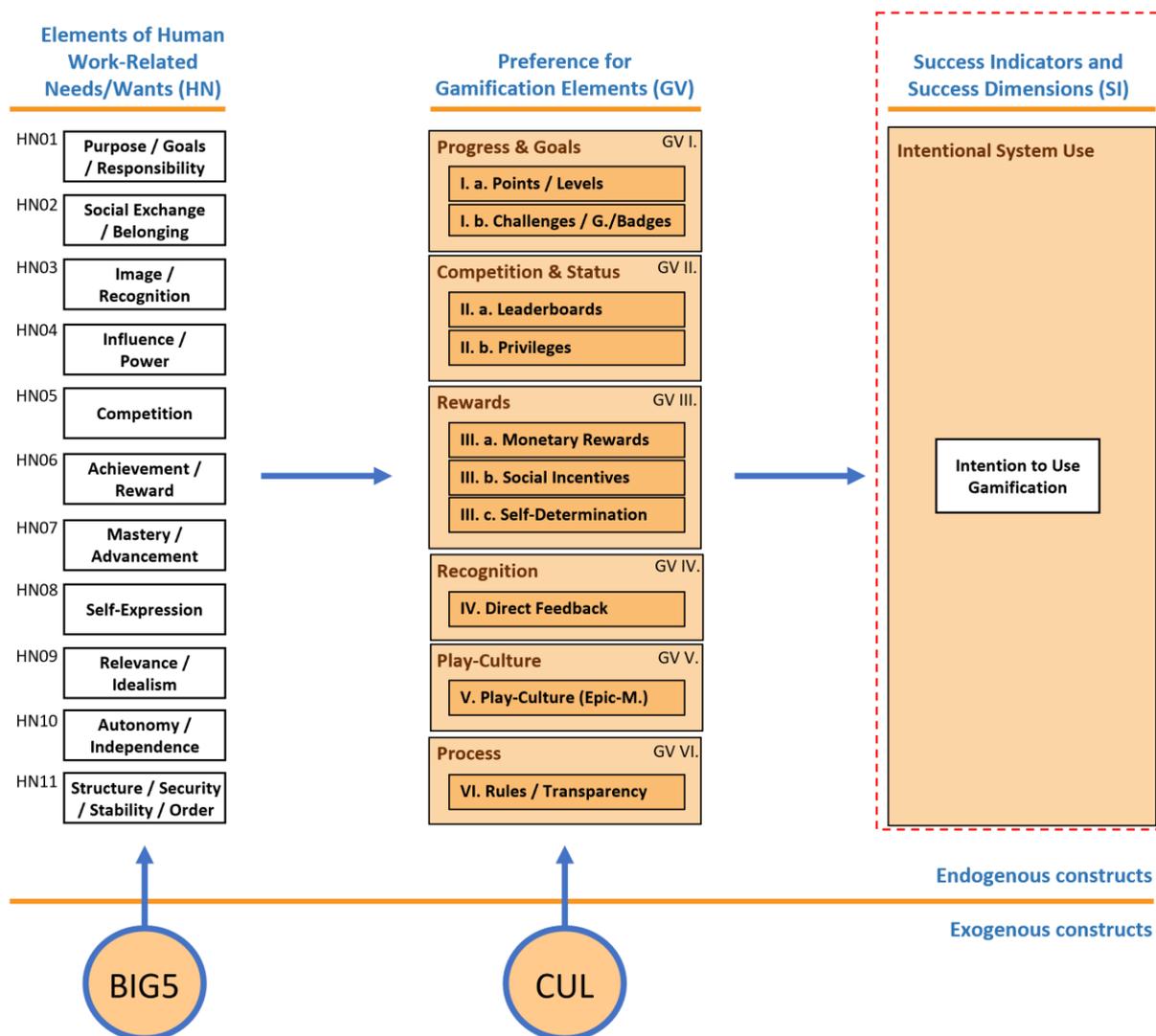


Figure 20 Combining Research Parts V

The preliminary research model is completed, presuming that personality traits influence elements of human work-related needs which in turn influence the preference for gamification elements. This preference is additionally influenced by the exogenous construct of culture. Finally, the preference for gamification elements is measured against the intentional gamification system use. The translation of the preliminary research model into measurable constructs will be introduced in the next chapter.

2.9 Interim summary

The aim of this research is to analyze possible cause and effect relationships between personality traits, human work-related needs, cultural background and the preference for specific gamification mechanics in order to address motivation and ultimately knowledge flow and collaboration in organisations. This is addressed by combining and interweaving the status quo of researches in the fields of knowledge man-

agement, social capital, motivation, personality, culture, and gamification. Goal dimensions of this research model is to measure different effects on the individual's intention to use gamification. Building on this research's results the insights shall help to improve work environments by fostering engagement, social interaction and hence, knowledge flow and creation.

The research questions derived:²⁹⁷

- 1.** How do personality traits affect individual work-related needs?
- 2.A** How do work-related needs affect the preference for specific gamification elements?
- 2.B** How does cultural background affect the preference for specific gamification elements?
- 3.** How does the preference for specific gamification elements affect the intention to use gamification?

The knowledge-based theory of the firm states that knowledge is the most important resource of a firm. It is held by individuals (not firms), thus socially complex. Successful knowledge exchange needs to overcome different barriers and grow "social capital" (trust, social norms and networks). This requires a holistic approach, taking into account technical-, organizational- and human-oriented factors aligned by an intelligent goal (incentive) system.

Analyzing the relationship between social capital and knowledge exchange it was shown that social capital serves as an enabler for knowledge management and both have a positive reinforcing relation. Across researchers trust was identified as the key resource for building social capital, underlining how important the relationships between individuals are when it comes to knowledge exchange. Without trust communication between team members is restricted since the fear of potential misuse of shared knowledge prevails. Knowledge intense companies should not neglect participative management structures with an open feedback culture if focusing on knowledge creation and diffusion.²⁹⁸

Today's monitoring and controlling practices often hinder these processes and build barriers to knowledge exchange. Knowledge exchange barriers are defined as factors which prevent the flow of knowledge throughout the organisation. Most significant barrier was the absence of incentives for team members to engage in knowledge management activities, followed by suitable IS, a lack of coordination among involved participants and cultural understanding referring to mutual trust and assistance.²⁹⁹ In order to overcome the identified KM barriers the human-oriented dimension is most important but also most challenging (due to social complexity). Adapting appropriate incentive systematics to build engagement for KM activities seems a complex but promising approach.

When trying to foster engagement motivational theory needs to be considered. Combining motivational theories from the early 1940's until today it seems puzzling that many organisations follow only traditional extrinsic reward schemes (carrot & stick mechanism). Pink recently stated that extrinsic incentivized people narrow their focus hindering high performance when working in knowledge intense jobs.

²⁹⁷ Compare to 1.1 Prior research and research gap

²⁹⁸ Compare to Fuchs 2006, p.165 "Ich gehe davon aus, dass Vertrauen ebenso wie Sozialkapital von einer Reihe mikro-organisationaler Variablen die ich im weiteren ausführlich bespreche - wie z. B. idiosynkratischer Arbeitsinhalt, partizipationsfördernde Managementstrukturen, feedbackorientierte Managementstrukturen, Fehlerakzeptanz in der Unternehmung, partizipative Managementstrukturen, individualisierte Entgeltsysteme und individuelle Leistungskontrolle, Stress und Kontrolle, bestimmt werden."

²⁹⁹ Ajmal et al. 2010, p.166

According to Pink autonomy, mastery and purpose are the key for 21st century intrinsic incentive systematics.³⁰⁰ When combining motivational research in order to find the roots (human work-related needs and wants) of intrinsic human motivation 11 work-related needs have been identified of which social exchange, recognition and status and relevance/meaning are found most often. Intrinsic motivations are driven by these varying needs. If those needs can be fulfilled by “extrinsic” incentives a contradiction rises, which no longer allows to classify a single incentive as purely intrinsic or extrinsic in a universal sense. Inner motivational levels (intensity of innate desire) always interact and change with external stimuli, and do not exist per se. In contrast to this finding Deci et al. analyzed 128 studies on the effects of extrinsic rewards on intrinsic motivation. They conclude that engagement-contingent, performance-contingent and completion-contingent rewards undermine free-choice intrinsic motivation.³⁰¹ Thus, intrinsic motivators are more effective than extrinsic ones, but extrinsic motivators can reinforce intrinsic ones if combined wisely.

Zichermann recognizes the interaction by stating that “[g]ood gamification design seeks to understand and align an organisation’s objectives with a player’s intrinsic motivation. Then, through the use of extrinsic rewards and intrinsically satisfying design, move the player through their journey of mastery.”³⁰²

Being a powerful driver for goal-oriented behavioral change on the one hand, and a driver of human interaction on the other, gamification as incentive system has the potential to revolutionize the way people work, collaborate and develop. Gamification shall help to align organizational and employee objectives which according to the principal-agent theory do differ depending on the relevant objectives. While organisations strive for revenue and resource maximization, employees try to maximize their utility. However, Hamari found that gamification as instrument can help turning solely utilitarian systems (productivity-oriented) into more hedonically (pleasure-oriented) ones, thereby addressing intrinsic motivation.³⁰³ Information technology can be used for both productivity and pleasure at the same time representing a form of dual-purposed motivation system combining the utilitarian and hedonistic dimension. “Addressing both utilitarian and hedonic benefits has recently become a necessity in a large number of IS research topics”³⁰⁴.

However, today’s gamification systems often lack a sufficient game design. According to Kuo most recent gamification system are missing this central element of meaning, story and play.³⁰⁵ In this context Nicholson created a user-centric theoretical framework for meaningful gamification. The core assumption is that for gamification to work employees’ needs and goals need to be put over the goals of the organisation.³⁰⁶

Gamification addresses the previously identified motivations via different instruments. Ten gamification instruments are derived which have the expected potential to serve as stimulators between the identified human work-related needs (fostering intrinsic motivation) and the knowledge-exchange barriers (lower-

³⁰⁰ Pink 2010. p.203

³⁰¹ Deci et al. 1999”As predicted, engagement-contingent, completion-contingent, and performance-contingent rewards significantly undermined free-choice intrinsic motivation ($d = -0.40, -0.36, \text{ and } -0.2.8$, respectively), as did all rewards, all tangible rewards, and all expected rewards. Engagement-contingent and completion-contingent rewards also significantly undermined self-reported interest ($d = -0.15, \text{ and } -0.17$), as did all tangible rewards and all expected rewards. Positive feedback enhanced both free-choice behavior ($d = 0.33$) and self-reported interest ($d = 0.31$).”

³⁰² Gabe Zichermann 2011

³⁰³ Hamari 2013. p.239

³⁰⁴ Santhanam und Liu 2015. p.29

³⁰⁵ Kuo 2013

³⁰⁶ Nicholson 2012

ing the barriers). These instruments (also termed coordination variables) are clustered and sorted depending on their expected social complexity (individual vs. group) and their expected interdependency on other external variables. One of these external variables is personality.

Previous research has shown that personality traits do have an important influence on technology acceptance models³⁰⁷ and on human needs.³⁰⁸ Individuals differ in perception and behavior of situations, conflicts or opportunities. Research has long-windedly discussed these differences and ascribed them to the variation in personality traits.³⁰⁹ As a result the Five Factor Model was developed, classifying personality traits into five dimensions: Conscientiousness, Agreeableness, Neuroticism, Extraversion and Imagination/Openness. Recent research found some measurable influence of personality traits on the perception of gamification elements (e.g. for extroverts vs. introverts).³¹⁰ In this research, human work-related needs will be matched to according gamification elements to serve as more situational dependent moderators between personality traits and specific preferences. Thus, it shall be researched whether personality traits influence human work-related needs and in turn together with national cultural background influence the preference for different gamification mechanics.

Cultural influence on gamification has rarely been addressed by the academic community. But national culture is part of every individual and its influence on personality cannot be separated.³¹¹ Understanding culture is important for comprehending differences in individual behavior. But culture can be shared and learned on different levels (e.g. national vs. organizational).³¹² Geert Hofstede addresses culture as “*collective programming of the mind distinguishing the members of one group or category of people from others*”. In order to operationalize the construct “cultural background” and narrow the reference frame, this research focuses on the Indian and German culture which exhibit a lot of fundamental differences (e.g. group vs. individual) as well as some important basic similarities (e.g. achievement drive). As second cultural theory Hall differentiates high-context cultures (eastern world – proxy India) from low-context cultures (western world – proxy Germany). Thereby differentiating the dimension time, space, interaction, and communication. It is more general in its assumptions (less dimensions and only two groups: western-world vs eastern-world) but allows for a second perspective (besides Hofstede) when interpreting the empirical results.

To measure these effects on a theoretical basis the technology acceptance model (TAM) is applied and the construct of “intention to use” is introduced. This is important to note, since it is presumed that only some respondents of the survey will have actual (real-life) experience with gamification systems. Thus, preference for certain gamification elements will be measured against the intentional gamification system use. The translation of the preliminary research model into measurable constructs will be introduced in the next chapter.

³⁰⁷ Rosen und Kluemper 2008. p.8 “Three of the six relationships between Big Five and TAM constructs were significant, including extroversion to perceived ease of use, extroversion to perceived usefulness, and conscientiousness to perceived ease of use.”

³⁰⁸ Costa und McCrae 1988. p.263 Table 3 and Table 4

³⁰⁹ Gustavsson et al. 2003. p.69-89

³¹⁰ Compare to Jia et al. 2016 and Tondello et al. 2017. p.8 Table 4. Bivariate correlations between the groups of gameful design elements and the Big 5 personality traits. and Buckley und Doyle 2017. p.53

³¹¹ Triandis und Suh 2002. p.152

³¹² Hofstede 1984. p.72

3 Research Design

Based on the theoretical findings of the previous chapters the generic research model is presented in section 3.1. The research model is the basis of the academic research and represents the underlying assumptions and analysis. Afterwards the applied empirical research method as well as the survey design are explained to create a common understanding for the belonging general hypothesis. These are formulated in section 3.3. Section 3.4 conceptualizes and operationalizes all identified needs and belonging gamification elements into a total of 11 specific research models. While the basic structure remains identical across all models, the specific needs, variables, and constructs differ. The goal of this research is to analyze the impact of personality traits and cultural background on human work-related needs and preferences for gamification elements resulting in an overall intention to use gamification. To achieve this, simple univariate analysis will first describe the eye-catching differences in the sample. However, to explain more interactions between the different variables and constructs explanatory models shall be applied. With the intention of learning from the complex interactions and relationships a multivariate analysis will be conducted. The belonging method of structural equation modelling (SEM) is introduced in detail in section 3.6.

3.1 Overview of the generic research model

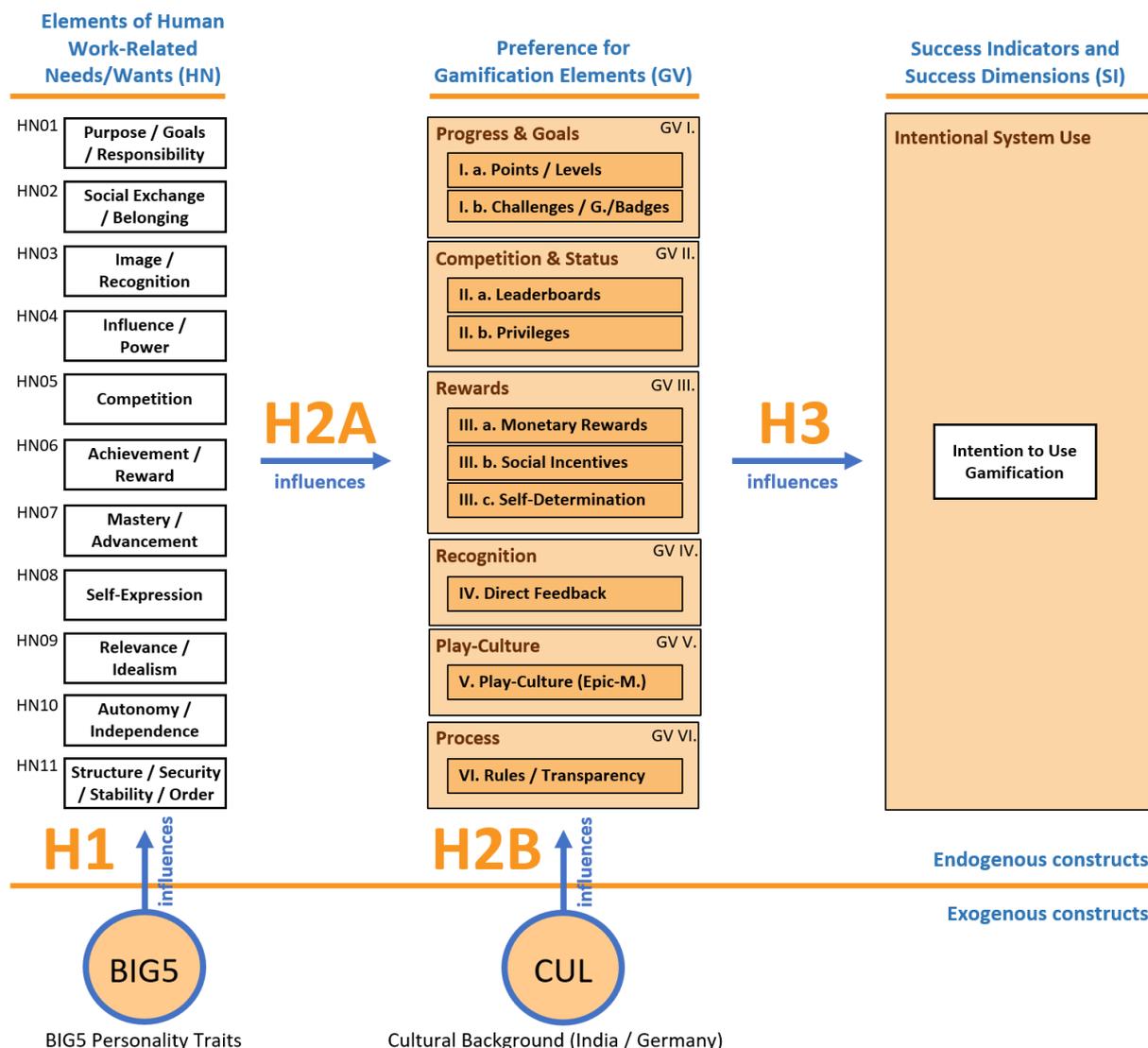


Figure 21 Overview of the research model

3.1.1 Explanation of the model’s relationships

1. BIG5 → HN – Relationship between BIG5 personality traits and elements of human work-related needs

Previous research has already hypothesized interrelations between BIG5 personality traits and the preference for different gamification mechanics.³¹³ However, in this research an additional step is taken. The BIG5 personality traits are hypothesized against human work-related needs which then in turn are hypothesized against the different gamification elements. The idea behind this construct is, that it is not primarily personality traits influencing the preference for different gamification elements, but rather work-related needs which i.a. are more dependent on situational circumstances and external influences than solely personality traits. It is presumed that the BIG5 personality traits might influence these needs and

³¹³ Compare to Buckley und Doyle 2017

wants. BIG5 is here introduced as the first exogenous construct, while the others were endogenous constructs. The difference will be explained in detail in section 3.6.1. Belonging generic hypothesis:

H1: A correlation between a **BIG5** dimension and a **NEED** is significant.³¹⁴

2. HN→ GV - Relationship between elements of human work-related needs and the preference for gamification elements

The blue arrow between the elements of human work-related needs (HN) and the gamification elements (GV) indicates a suspected interrelation. In other words, it is presumed that individuals which shows different work-related needs will also prefer different gamification elements. This assumption is derived from the findings of prior research conducted by Jia³¹⁵ and Tondello³¹⁶ who already identified a direct impact of personality-traits on gamification element preference. Belonging generic hypothesis:

H2A: A correlation between a **NEED** and a **PREFERENCE FOR GAME ELEMENTS** is significant.³¹⁷

3. CUL→ GV - Relationship between cultural background and the preference for gamification elements

Besides personality traits and human work-related needs, cultural background is the third construct needed to answer the research questions. National culture is part of every individual and its influence on personality cannot be separated.³¹⁸ Culture as exogenous construct is hypothesized to have an influence on the preference for gamification elements. Based on the analysis of Streck in 2012³¹⁹ the construct of cultured is measured directly against the gamification elements and in turn against the intention to use gamified systems. Belonging generic hypothesis:

H2B: A correlation between **CULTURAL BACKGROUND** and a **PREFERENCE FOR GAME ELEMENTS** is significant.³²⁰

4. GV→ IS - Relationship between the preference for gamification elements and success indicators

Success indicators in this dimension should provide quantifiable measures to determine the potential influences of the introduced constructs. The intention to use gamification as defined in section 2.8.2 will be applied in this research as success dimension. Thus, the preference for specific gamification elements is measured against the intentional gamification system use of the individual. Belonging generic hypothesis:

H3: A correlation between a **PREFERENCE FOR GAME ELEMENTS** and the **INTENTION TO USE GAMIFICATION** is significant.³²¹

3.2 Method and survey design

Univariate and multivariate analysis represents statistical methods to investigate relationships in data samples. Univariate analysis is used to research a distribution of one variable from distributions of other

³¹⁴ See next section 3.3.1 BIG5 personality traits correlate with human needs

³¹⁵ Jia et al. 2016

³¹⁶ Tondello, G. F., Mora, A., & Nacke, L. E. 2017

³¹⁷ See section 3.3.2 Preferences for gamification elements correlate with human needs and cultural background

³¹⁸ Triandis und Suh 2002. p.152

³¹⁹ Compare to Streck 2012

³²⁰ See section 3.3.2 Preferences for gamification elements correlate with human needs and cultural background

³²¹ See section 3.3.3 The preference for gamification elements correlates with the intention to use gamification

(several) variables. Thus, univariate analysis represents a one-dimensional measurement category. In contrast multivariate analysis can use more variables to discover relationships.

The focus of the multivariate analysis is to analyze the causal dependencies of specific variables being influenced by other factors at the same time. The conception of the belonging model is based on the researcher's logical considerations as well as theoretical findings and deductions. Structural equation modelling is especially suitable in empirical research contexts where there are complex interdependencies of different variables and constructs, since it offers insights and conclusions on belonging relationships.³²²

Thus, structural equation modelling seems optimal in the context of the research goals defined. Due to the sample size and quality requirements for parameter estimation this research uses variance-based path modelling where smaller sample sizes can produce valid results. The results are verified by using the quality criteria discussed with discriminant validity being the predominant quality criteria. Furthermore, significance tests (t-test) will be applied via the bootstrapping approach. Content validity is ensured by the operationalization of constructs. The method of SEM will be explained in detail in section 3.6.

An online survey will serve as data basis for the univariate and multivariate analysis. The survey consists of five sections. First questions about the demographic and cultural background of the participant (age, gender, education, occupation) are gathered. Next, individual preferences regarding needs, wants and the working environment are asked. The third section collects information about the personality traits of the participant using the Big Five Inventory (10 Item Scale). Section four addresses questions about attitudes and the status quo with regard to knowledge management in the working context of the participant. The last section covers gamification experiences, preferences and the intention to use gamification. It distinguishes between real-life gamification experience and imaginative descriptions of gamification mechanics. Variables used for SEM will be measured using an equidistance ordinal, interval or ratio scale (most times 5 scale Likert questions) all precoded.³²³ Core concept are three survey blocks addressing a total of 13 different gamification elements, each targeted by three items (variables):

1 item addressing the participant directly GE_P1: *"You are able to collect points during work (e.g. constructive contributions in meetings)"*

1 item addressing the third person view GE_P2: *"Points for the employees will be received by completion of single or multiple desired activities."*

1 item addressing the competitive dimension of the element GE_P3C: *"Achieved points will be visible for some colleagues to allow comparisons among themselves."*

The gamification section closes with questions asked in order to judge the intention to use gamification at the workplace in the future and the likeliness of recommendation the concept to friends.

The survey on average took between 10 and 20 minutes to complete and was hosted by SurveyMonkey³²⁴.

³²² Homburg und Pflesser 1999. p.636

³²³ See limitations "cultural background" 2.7.3 and 5.4.2.3

³²⁴ SurveyMonkey Europe UC. accessed 24.11.2018

3.2.1 Survey Participant Recruitment

The survey was conducted during summer 2016 (13.07.2016-24.07.2016) and yielded 418 samples (of which 360 were regarded as valid). 143 samples were collected via the research team's social network (e-mail invitation) and 275 samples were collected via response panels executed in India and Germany (the respondents were incentivized to fill-out the questionnaire). Respondi AG is member of the ESOMAR formerly known as The European Society for Opinion and Market Research applying its quality standards. The quality standards in terms of sample recruiting, sampling, validation and compliance are explained in detail in the appendix section Appendix C - Respondi AG ESOMAR Surveying Quality Standards.

The target audience for the survey was defined as follows:

1. Method: ad hoc sampling
2. Sample size: 100-200 samples per country (Germany, India)
3. Survey length (approx. 20 minutes)
4. Demographics:
 - a. 18-55-year-old women and men
 - b. Full-time or part-time employed
 - c. Focus industries / job fields (white-collar) Germany
 - i. Manufacture of computer software, web development
 - ii. Manufacture of computer hardware and equipment
 - iii. Manufacture of electric and electronic products
 - iv. Manufacture of vehicles, vehicle parts, ships, boats, rail vehicles
 - v. Mechanical and Plant Engineering, Machine and System repairs
 - vi. Data processing, IT
 - vii. Telecommunications
 - viii. Advertising, Market research, PR
 - d. Focus industries / job fields (white-collar) India
 - i. Advertising
 - ii. Automotive
 - iii. Communications/Information
 - iv. Computer Hardware
 - v. Computer Reseller
 - vi. Computer Software
 - vii. Consumer Electronics
 - viii. Information Technology
 - ix. Telecommunications
5. Field time: 2 weeks (summer 2016)

The researcher's sample was raised using his social network (by e-mail invitation). However, the same demographic target audience filters were applied. In case participants did not match the target criteria the sample was dismissed. For details on sampling methods see 8.3 Appendix C - Respondi AG ESOMAR Surveying Quality Standards.

3.2.2 Invalid samples

Out of 418 total responses, 23 responses were deleted since they didn't fit into the defined reference frame (e.g. blue-collar workers/industries, not employed, cultural background, etc.)³²⁵. 18 responses were deleted since time for completing the survey in SurveyMonkey was tracked, in case the survey was completed in less than 5 minutes total (average time approximately 15m) the results were not considered as reliable. Finally, 17 results were deleted since people did not complete the questionnaire³²⁶ and the partial results were disregarded. Leaving a result set of 360 responses (152 responses with Indian cultural background and 200 with German cultural background and 8 with a mixed cultural background³²⁷).

3.3 General Conceptualization (Hypothesis)

3.3.1 BIG5 personality traits correlate with human needs

Personality traits do have an important influence on technology acceptance models³²⁸ and on human needs.³²⁹ Costa et al. in their research found strong and clear relations between the NEO-PI (Big5 NEO Personality Inventory) and the PRF (Personality Research Form / Murray's needs)³³⁰

When looking at the example of extraversion, psychology research has shown that extraversion is strongly correlated with increased happiness and overall satisfaction.³³¹ Furthermore extravert people seek new experiences and create social bondings and affection. As a result, they are perceived more positive by their social surrounding than other people. Introverts are also looking for appreciation but are not as motivated to look for new opportunities and social exchange. Current gamification research has focused on analyzing the impact of personality traits on the preference of gamification mechanics.

This research assumes that personality traits as such do not suffice to predict internal gamification element preferences alone. Ghaban et al. do agree that several studies indicate the benefit of mapping gamification elements to personality. However, they criticize that this mapping requires a strong understanding of the relationship between gamification elements and personality, which might be more complex (e.g. to situational influences) than adapted by current research.³³² Minica researched correlations between the human needs system, personality and human motivation. She concluded that human work-related needs should be regarded more in an organizational context (especially motivational research).³³³

Costa et al. extend on the differentiation between need- and personality-trait-driven behavior. They found correlations between personality traits and human needs, concluding that “[...]the behavior of a given individual in a given situation may require a consideration of many motives, often interacting to facilitate or inhibit each other [...]”³³⁴ They discuss two levels of interpretation and address scope overlap of traits- and needs-inventories pointing out the dynamic structure of needs based on state of the individual. The

³²⁵ Compare to 1.3 Scope of study

³²⁶ A response was considered as completed when 95% of the questions were answered

³²⁷ Compare to section 3.3.2 for details on cultural background definition

³²⁸ Rosen und Kluemper 2008. p.8 “Three of the six relationships between Big Five and TAM constructs were significant, including extroversion to perceived ease of use, extroversion to perceived usefulness, and conscientiousness to perceived ease of use.”

³²⁹ Costa und McCrae 1988. p.263 Table 3 and Table 4

³³⁰ Murray 1938

³³¹ McGonigal 2011. pos.1560-ff.

³³² Ghaban und Hendley 2019. p.1-2

³³³ Minica 2015. p.109

³³⁴ Costa und McCrae 1988. p.264

paper is concluded by pointing out that the correlations between personality inventories and needs provide a rich source source of further hypotheses that should be explored when assessing individuals behaviour. Thus, it shall be researched whether BIG5 personality dimension influence human work-related needs:

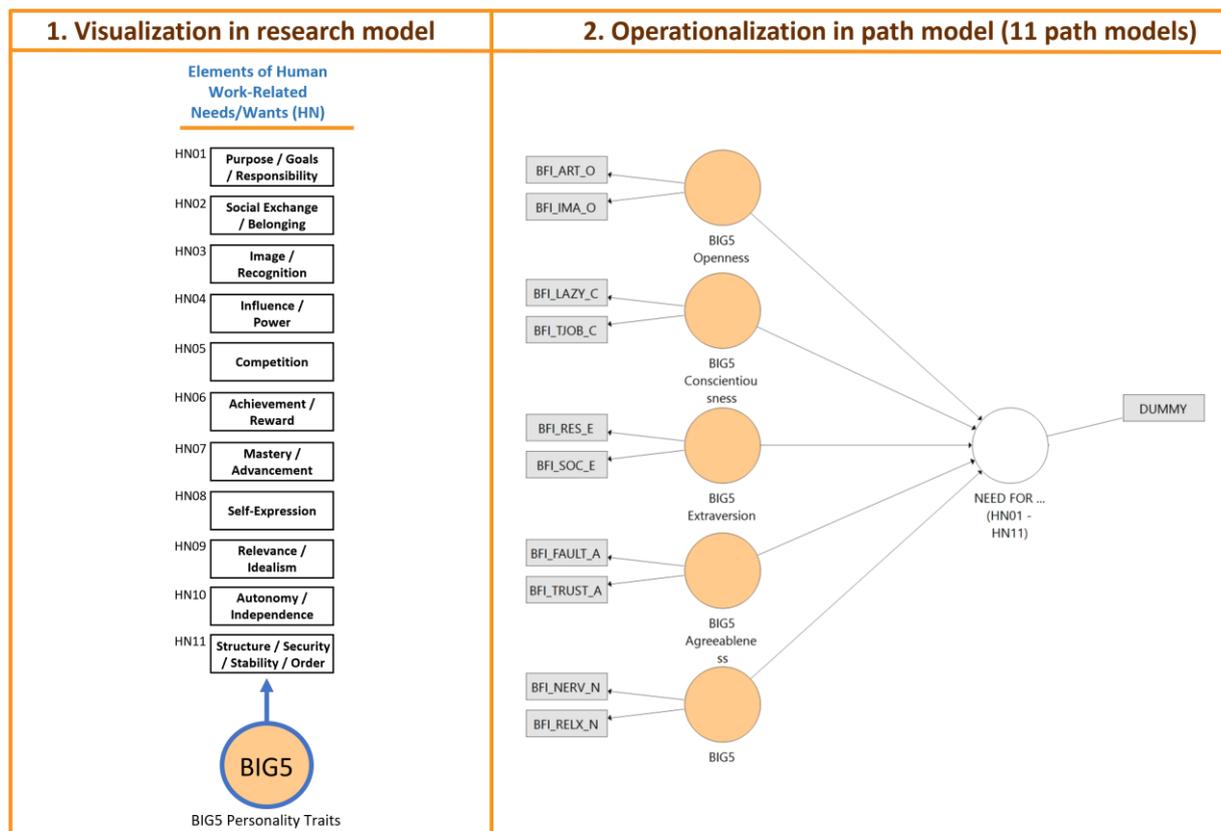


Figure 22 Operationalization of personality traits (BIG5) on needs

3.3.1.1 General Hypothesis

H1: Hypothesis BIG5(O,C,E,A,N) on NEED(HN01-HN11):

A correlation between a BIG5 dimension and a NEED is significant.

3.3.1.2 General Operationalization

Personality Traits

Personality Traits are based on the Big-Five-Inventory-10 (BFI-10).³³⁵

Specification: Reflective construct

Scale: Likert 1-5 (Strongly disagree | Disagree a little | Neither agree nor disagree | Agree a little | Agree strongly)

	BFI	I am someone who...	Operationalized to (personality trait)
63	BFI		
64	BFI_RES_E	Is reserved.	BIG5 Extraversion
65	BFI_FAULT_A	Tends to find fault with others.	BIG5 Agreeableness

³³⁵ Rammstedt Beatrice et al. 2012. p.9

66	BFI_TJOB_C	Does a thorough job.	BIG5 Conscientiousness
67	BFI_TRUST_A	Is generally trusting.	BIG5 Agreeableness
68	BFI_LAZY_C	Tends to be lazy.	BIG5 Conscientiousness
69	BFI_RELX_N	Is relaxed, handles stress well.	BIG5 Neuroticism
70	BFI_IMA_O	Has an active imagination	BIG5 Openness
71	BFI_SOC_E	Is outgoing, sociable.	BIG5 Extraversion
72	BFI_NERV_N	Gets nervous easily.	BIG5 Neuroticism
73	BFI_ART_O	Has few artistic interests	BIG5 Openness

Human work-related needs

Human work-related needs are measured via two categories. First rating (likert) scale questions are used in Block “WE” afterwards the ranking scale question blocks “NEED / NEED2 / NEED3” are used to prioritize needs.

Block “WE” refers to the perfect working environment and is adapted and extended from a survey conducted by Schönbohm et al. in 2014.³³⁶

Specification: Reflective construct

Scale: Likert 1-5 (Not important | Slightly important | Moderately important | Important | Very important)

14	WE	Imagine your perfect working environment. How much importance do you assign to each individual job characteristic?	Operationalized to (need)
15	WE_SD	Possibility to influence when and which projects I'm working on	(→ HN10)
17	WE_IF	Instant feedback from coworkers and superiors	(→ HN03)
18	WE_COMP	Competition among teams and co-workers	(→ HN05)
19	WE_IR	Immediate recognition for well-done projects / tasks	(→ HN03)
20	WE_OL	Ongoing learning and further training possibilities	(→ HN07)
21	WE_RM	Adequate bonus payments for above average performance.	(→ HN06)
22	WE_RSI	To spend time with my favorite colleagues outside the office.	(→ HN02)
23	WE_EM	To work on something full of meaning and purpose.	(→ HN01) (→ HN09)
24	WE_PRIV	Personal privileges at work for above average performance. (Examples: amenities or special access rights)	(→ HN03)
25	WE_CT	Clear rules and transparency at my workplace	(→ HN11)
26	WE_PP	Promotion prospects	(→ HN07) (→ HN04)

Blocks “NEED / NEED2 / NEED3”³³⁷ are based on a ranking algorithm. Ranking questions ask respondents to rank a list of options in the order they prefer using numeric dropdown menus or drag-and-drop. The advantage of ranking questions is that respondents must set their individual prioritisation and can't choose that all items (needs) are equally important /unimportant. Yet, this also must be considered as a

³³⁶ Schönbohm und Urban 2014, p.60 for detailed references and adaptations please see the appendix

³³⁷ Compare to questionnaire Appendix

limitation to the interpretation of the results since respondents can't rank multiple items with an equal score within one group. Another disadvantage of ranking questions is that they take three times longer to answer (as compared to rating (Likert) questions.³³⁸ The order of the items within the three groups was randomized for each questionnaire. Yet, the fixed assignments of different needs (5 per group) into the three ranking question must be considered as further limitation. The reason for subdividing the 15 items is twofold: First, more ranking items in one group increase the difficulty of answering disproportionately as more choices are added.³³⁹ "Respondents with 10 elements perceived that the task was more difficult and they were less accurate than those with 5 elements"³⁴⁰. Second, groups NEED and NEED2 contain the actual needs with examples while group NEED3 contains reformulated needs which are adapted from Schönbohm and Urban.³⁴¹ Research over the recent years argues that rating (likert) questions overall have a greater validity.³⁴²

Specification: Reflective construct

Scale: Ranking (1-5)³⁴³

29	NEED	A) Please sort (drag n' drop) these items with regard to your individual priorities. The items represent needs and values people try to fulfill or follow in their jobs. Order: 1=TOP=most important / 5=BOTTOM=least important	Operationalized to (need)
30	NEED_PUR	Purpose / Goals / Responsibility (e.g. working towards a meaningful goal in a responsible position)	(→ HN01)
31	NEED_SE	Social Exchange / Social Belonging (e.g. co-workers which care about you as a person or friend)	(→ HN02)
32	NEED_IMG	Image / Recognition (e.g. being lauded or receiving positive feedback for good performance)	(→ HN03)
33	NEED_INF	Influence / Power (e.g. making your opinion count)	(→ HN04)
34	NEED_COMP	Competition / Status (e.g. comparing colleagues based on common performance measures)	(→ HN05)

51	NEED2	B) Please sort (drag n' drop) these items with regard to your individual priorities. The item represents needs and values people try to fulfill or follow in their jobs. Order: 1=TOP=most important / 5=BOTTOM=least important	Operationalized to (need)
52	NEED2_ACHI	Achievement / Reward (e.g. receive recognition and/or rewards for good performance)	(→ HN06)
53	NEED2_MAS	Mastery / Advancement (e.g. learn & grow)	(→ HN07)
54	NEED2_SEXP	Self-Expression (e.g. express your thoughts, feelings & intentions)	(→ HN08)
55	NEED2_REL	Relevance / Idealism (e.g. working on something bigger with a huge relevance or idealistic goal)	(→ HN01) (→ HN09)
56	NEED2_AUTO	Autonomy / Independence (e.g. make your own decisions / work independently)	(→ HN10)

³³⁸ Munson und McIntyre 1979. p.50

³³⁹ Verint 2011

³⁴⁰ Krosnick, Jon., Thomas, Randall. and Shaeffer, Eric 2003. p.8

³⁴¹ Schönbohm und Urban 2014. p.80

³⁴² Krosnick, Jon., Thomas, Randall. and Shaeffer, Eric 2003. p.1

74	NEED3	C) Please sort (drag n' drop) these items with regard to your individual priorities. The item represents needs and values people try to fulfill or follow in their jobs. Order: 1=TOP=most important / 5=BOTTOM=least important	Operationalized to (need)
75	NEED3_ACHI	Achievement of goals	(→ HN06)
76	NEED3_STRUC	Structure and guidance	(→ HN11)
77	NEED3_FREED	Freedom to explore	(→ HN10)
78	NEED3_CONTR	Control of others	(→ HN04)
79	NEED3_SE	Connect with others	(→HN02)

3.3.2 Preferences for gamification elements correlate with human needs and cultural background

While recognizing the importance of personality-traits, work-related needs and wants may more precisely adapt to the individual job situation and environment and thus, may act as a better preference predictor and personality trait mediator.³⁴⁴ In line with these findings, Sulea et al. found that need satisfaction matters more than personal disposition when explaining, engagement and well-being of students.³⁴⁵ *“Results indicate that certain personality factors play a role in well-being, but that the fulfillment of the needs for autonomy, competence, and relatedness is of additional importance.”*^{346 347}

Based on the discussion of motivational theories³⁴⁸ it is assumed that individuals with different work-related needs and wants based on different motivations will prefer different incentive triggers (gamification mechanics) depending on their current need situation.

SDT basic assumption is that individuals have a natural, inborn tendency to grow and elaborate a unified sense of self.³⁴⁹ Put differently, when sufficiently supported, humans will invest effort, learn and master new skills matching their talents. Lu and Wu summarize motivational theories to two main conclusions. *“[...] needs-based motivations are the primary impetus for people to engage in various behaviors, and such motivations can be broadly categorized into two major groups: extrinsic and intrinsic”*^{350, 351} SDT specifically focuses on the aspect of culture by stating that *“[...] psychological needs are also highly relevant to the processes by which cultural contents are shaped and retained. That is, psychological needs play a significant role in the creation and selection of novel cultural memes (Csikszentmihalyi and Masimini, 1985) and, in turn, the needs are themselves differentially supported or disrupted by existing memes.”*³⁵²

Current research often neglects the potential influence of cultural background on gamification preferences. But national culture is part of every individual and its influence on personality cannot be separated.³⁵³

³⁴⁴ Compare to 3.3.1 BIG5 personality traits correlate with human needs

³⁴⁵ Sulea et al. 2015

³⁴⁶ Sulea et al. 2015. p.1

³⁴⁷ Compare also to Volodina et al. 2019 “Basic psychological need satisfaction predicted outcomes above personality traits.”

³⁴⁸ Compare to 2.3 Motivation theory

³⁴⁹ Deci und Ryan 2002

³⁵⁰ Lu und Wu 2013. p.156

³⁵¹ Compare to 2.3.8 Deci, Ryan Self-determination theory (6S)

³⁵² Deci und Ryan 2000. p.256

³⁵³ Triandis und Suh 2002. p.152

Khaled in 2015 analyzed cultural aspects on a conceptual basis: “*As gamification reaches further conceptual maturity, we need to be deeply thoughtful about cultural and other value biases inherent in gamification design tropes and cognizant of the preferences of the audiences we are designing for to reduce the risk of design failure and the alienation of players.*”³⁵⁴ She proposed that game dynamics embody cultural values that tend to reinforce values suited to mastery and hierarchy-focused cultures. Other academics addressed this fact previously, stating that most of the companies which implemented gamification or offer consulting services are US-based and thus might not to the culture of other nations.³⁵⁵ Thus, better understanding culture might be important for comprehending differences in individual behavior. Based on these finding cultural background will be measured against the preferences for different gamification mechanics as second construct.

Cultural background as latent construct is modelled by two variables determining the cultural context in which the person currently lives (COUNTRY_L) and the one in which he grew up (COUNTRY_Y). This construct has been adapted from a large scale BIG5 online survey analyzing the development of personality in early and middle adulthood previously to measure cultural background by Srivastava, John, Gosling and Potter in a large.³⁵⁶ However, the construct has limitations.

3.3.2.1 *Limitations to the construct cultural background*

A core problem when defining one specific culture is that there are no definite criteria which characterize a cultural area.³⁵⁷ Thus, this fuzziness also applies to the construct of cultural background. Furthermore, the construct is based on two categorical variables:

1. COUNTRY_L: “In what country do you live?”
2. COUNTRY_Y: “In what country did you spend most of your youth?”³⁵⁸

Exogenous categorical variables must be dummy coded, before they can be used in PLS-SEM.³⁵⁹ When coding variables, the concept of equidistance must be regarded.³⁶⁰ In this research German cultural background is dummy coded as 1 and Indian cultural background is coded as 2 for both variables. Other values (for different countries) will be removed from the sample. Since culture is a fuzzy concept per se, there is no way to apply equidistance between the German and the Indian cultural background, especially in this binary case. However, if the concept is interpreted as: “the higher the value the more Indian the cultural background”, this is sufficient for interpretation.

Furthermore, the two variables will for a very large percentage of the sample contain identical values. All people who grew up in a country and currently still live there have identical values. In these cases, there is a high probability that the probands exhibit only one national cultural background.³⁶¹ Thus path loadings of 1 or close to one (if cultural hybrids India/Germany participate) are expected. However, this will lead

³⁵⁴ Walz 2015chapter.11. p.298-318 by Rilla Khaled

³⁵⁵ Schönbohm und Urban 2014. p.93

³⁵⁶ Srivastava et al. 2003compare to online survey “The Big Five Project” demographic part: <https://www.outofservice.com/bigfive/>, accessed 24.11.2018

³⁵⁷ Compare to 2.7.3 Problems in classifying culture

³⁵⁸ Srivastava et al. 2003compare to online survey “The Big Five Project” demographic part: <https://www.outofservice.com/bigfive/>, accessed 24.11.2018

³⁵⁹ Skrondal und Rabe-Hesketh p.6 “Structural Equation Modeling with categorical variables”

³⁶⁰ Hair et al. 2017. p.8

³⁶¹ Neglecting the fact, that people might have spent a certain time of their lives in other countries

to issues of collinearity in terms of reliability. This aspect will be treated in the discussion when the results are known.

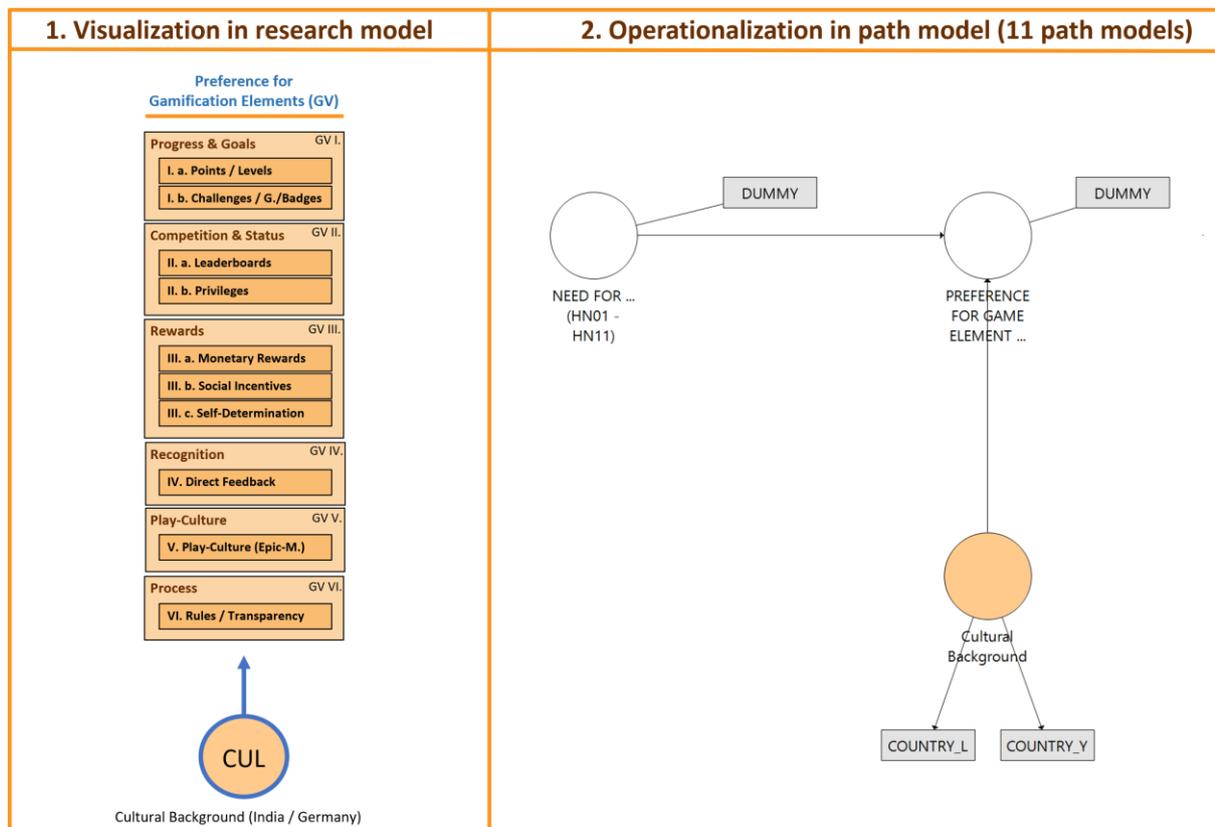


Figure 23 Operationalization of needs and cultural background on preference for gamification elements

3.3.2.2 General Hypothesis

H2A: Hypothesis Need (HN01-HN11) on Preference for Game Element(GE1-GE11)

A correlation between a NEED and a PREFERENCE FOR A GAME ELEMENT is significant. In total this forms 11 hypotheses (11 NEEDs on belonging GAME ELEMENTS).

H2B: Cultural Background on Preference for Game Element(GE1-GE11)

A correlation between the CULTURAL BACKGROUND and a PREFERENCE FOR A GAME ELEMENT is significant. In total this forms 11 hypotheses (CULTURAL BACKGROUND on 11 GAME ELEMENTS).

3.3.2.3 General Operationalization

Game Elements (GE1-GE11)

The construct “Preference for game elements” is operationalized as latent construct modelled by three to six items, depending on the grouping of gamification mechanics (coordination variables).³⁶² The belonging

Specification: Reflective construct

³⁶² Compare to 2.5.2 Gamification instruments (coordination variables) / GE11 is modelled by only one item

Scale: Likert 1-5 (Not at all suitable; Fairly suitable; Neutral; Very Suitable; Extremely suitable)

1. GE1 – Preference for Game Element Playculture

Belonging Need: Need for Purpose / Goals / Responsibility

130	GE	To which extent would you agree if the following game elements would be introduced to your workplace?	Source / Adapted from
161	GE_PC1	Work activities are organized in the context of fantasy stories that are interesting or exciting for you.	Fantasy evokes images of objects or situations that aren't actually present. This can make the experience more emotionally appealing to users. ³⁶³
162	GE_PC2	Work activities are organized in the form of topical stories that have relevance for the employee or consider the circumstances of his life.	For meaningful gamification, it is important to take into consideration the background that the user brings to the activity and the organizational context into which the specific activity is placed. ³⁶⁴
163	GE_PC3	The goals of the work activities are complemented by virtual objectives which have to be achieved by the employees to make progress in a fantasy story. The progress in the fantasy story will be visible for colleagues.	see 162 + competitive dimension

2. GE2 – Preference for Game Element Social Exchange

Belonging Need: Need for Social Belonging / Exchange

130	GE	To which extent would you agree if the following game elements would be introduced to your workplace?	Source / Adapted from
155	GE_SI1	You receive social appeals as a reward (e.g. excursions with chosen colleagues to special places)	Describes an effect where individual users achieve better results at simple tasks in the presence of other people or when working in groups. ³⁶⁵
156	GE_SI2	Some work activities are organized in a way that they can only be accomplished by cooperating with each other.	The community collaboration game dynamic rallies an entire community to work together to solve a riddle, resolve a problem, or overcome a challenge. ³⁶⁶
157	GE_SI3C	Some work activities are of competitive nature, so that employees compete with their colleagues.	Competitions enable users to challenge each other. ³⁶⁷

3. GE3 – Preference for Game Element Direct Feedback & Status / Privileges

Belonging Need: Need for Image / Recognition

130	GE	To which extent would you agree if the following game elements would be introduced to your workplace?	Source / Adapted from
158	GE_FB1	The working environment features sound effects and background music. These give the employee a feedback for his operational principles.	Implementing sound effects and / or background music. ³⁶⁸
159	GE_FB2	After certain work packages you receive direct feedback (e.g. from principles or colleagues)	Immediate feedback is used to keep the player aware of his progress or failures in realtime. ³⁶⁹

³⁶³ Li et al. p.105

³⁶⁴ Nicholson 2012

³⁶⁵ ZAJONC 1965

³⁶⁶ Vassileva 2012

³⁶⁷ Bunchball 2010

³⁶⁸ Liu, Y., Alexandrova, T., Nakajima, T. 2011

³⁶⁹ Passos, E. B., Medeiros, D. B., Neto, P. A. S., & Clua, E. W. G. 2011

		which rates your behaviour positively or negatively.	
160	GE_FB3C	Received feedback will be documented and kept visible for colleagues.	See 159 + competitive dimension
143	GE_S1	By achieving objectives, you receive status symbols such as an own office or a better parking option.	Most humans have a need for status, recognition, fame, prestige, attention and, ultimately, the esteem and respect of others [...] Status can be earned by the user in isolation, by performing certain actions ³⁷⁰
144	GE_S2	For desired activities employees are rewarded with privileges, such as the participation in exclusive events or access to exclusive areas.	See 143
145	GE_S3	For desired activities employees are assigned to managerial functions, which scale them up in the corporate hierarchy.	See 143

4. GE4 – Preference for Game Element Status / Privileges

Belonging Need: Need for Influence / Power

130	GE	To which extent would you agree if the following game elements would be introduced to your workplace?	Source / Adapted from
143	GE_S1	By achieving objectives, you receive status symbols such as an own office or a better parking option.	Most humans have a need for status, recognition, fame, prestige, attention and, ultimately, the esteem and respect of others [...] Status can be earned by the user in isolation, by performing certain actions ³⁷¹
144	GE_S2	For desired activities employees are rewarded with privileges, such as the participation in exclusive events or access to exclusive areas.	See 143
145	GE_S3	For desired activities employees are assigned to managerial functions, which scale them up in the corporate hierarchy.	See 143

5. GE5 – Preference for Game Element Competition

Belonging Need: Need for Competition

130	GE	To which extent would you agree if the following game elements would be introduced to your workplace?	Source / Adapted from
160	GE_FB3C	Received feedback will be documented and kept visible for colleagues.	Immediate feedback is used to keep the player aware of his progress or failures in realtime. ³⁷² (competitive dimension)
163	GE_PC3	The goals of the work activities are complemented by virtual objectives which have to be achieved by the employees to make progress in a fantasy story. The progress in the fantasy story will be visible for colleagues.	For meaningful gamification, it is important to take into consideration the background that the user brings to the activity and the organizational context into which the specific activity is placed ³⁷³ (competitive dimension)
146	GE_RL1	Leaderboards compare colleagues concerning their performance (e.g. "Top 5 Employee of the month").	[...] Leaderboards are used to track and display desired actions, using competition to drive valuable behaviour. ³⁷⁴
147	GE-RL2	Leaderboards show your ranking compared to other colleagues without the visibility of the names.	See 146

³⁷⁰ Bunchball 2010

³⁷¹ Bunchball 2010

³⁷² Passos, E. B., Medeiros, D. B., Neto, P. A. S., & Clua, E. W. G. 2011

³⁷³ Nicholson 2012

³⁷⁴ Bunchball 2010

148	GE-RL3C	Leaderboards show your ranking compared to other colleagues - Each name on the leaderboard will be visible.	See 146
166	GE_VC3C	Your virtual character competes with other characters. Within the roleplaying you compete with your colleagues.	A virtual character (i.e. an avatar) represents the employee. ³⁷⁵ (competitive dimension)

6. GE6 – Preference for Game Element Challenges, Points, Material Rewards

Belonging Need: Need for Achievement / Reward

130	GE	To which extent would you agree if the following game elements would be introduced to your workplace?	Source / Adapted from
140	GE_C1	Your tasks will be presented as challenges, which you have to cope with (e.g. Finish 10 tasks within the next 8 hours)	Goals of the underlying activity should be adapted as challenges for the user. ³⁷⁶
141	GE_C2	The challenges for an employee are rated by difficulty, so that the employee is always engaged to his highest abilities and therefore continuously improves.	A game helps players to continuously increase their skills by progressive disclosure of both knowledge and challenge [...]. This will help ensure that the challenges in the game match the player's skill levels [...]. ³⁷⁷
152	GE_MR1	For desired activities you are rewarded with corporate goods. For instance, you are able to get a company vehicle or a better smartphone.	The ownership dynamic represents a positive, sustained connection to an entity that leads to a feeling of shared ownership. ³⁷⁸
153	GE_MR2	For desired activities employees are rewarded with bonus payments.	Bonuses are rewarded for having completed a series of challenges or core functions. ³⁷⁹
131	GE_P1	You are able to collect points during work (e.g. constructive contributions in meetings)	Point systems reward users for completing actions, whereby a numeric value is added to their overall point total. ³⁸⁰
132	GE_P2	Points for the employees will be received by completion of single or multiple desired activities.	See 131

7. GE7 – Preference for Game Element Badges and Levels

Belonging Need: Need for Mastery / Advancement

130	GE	To which extent would you agree if the following game elements would be introduced to your workplace?	Source / Adapted from
137	GE_B1	You are able to attain achievements (badges) in terms of graphics or expressions (e.g. "5-Star Troubleshooter") for the completion of goals.	A reward for completing a clear and desirable goal. ³⁸¹
138	GE_B2	Badges are primarily being awarded for voluntary goals, which are achieved beyond the employee's main activity.	See 137
139	GE_B3C	Badges represent the performed accomplishments which are visible for colleagues.	See 137 (competitive dimension)
134	GE_L1	You are able to continuously reach higher levels. Level up's can be achieved by continuous positive outcomes which match targeted goals.	Levels indicate the proficiency of the player in the overall gaming experience over time [...] ³⁸²
135	GE_L2	Over time, the level of an employee represents his work experience and his professional success.	See 134
136	GE_L3C	Reached levels will be visible for some colleagues to allow comparisons among themselves.	See 134

³⁷⁵ Passos, E. B., Medeiros, D. B., Neto, P. A. S., & Clua, E. W. G. 2011

³⁷⁶ Liu, Y., Alexandrova, T., Nakajima, T. 2011

³⁷⁷ Liu, Y., Alexandrova, T., Nakajima, T. 2011

³⁷⁸ Bunchball 2010

³⁷⁹ Bunchball 2010

³⁸⁰ Burke, M. & Hiltbrand, T. 2011

³⁸¹ Liu, Y., Alexandrova, T., Nakajima, T. 2011

³⁸² Gnauk, B., Dannecker, L. and Hahmann, M. 2012

8. GE8 – Preference for Game Element Virtual Character

Belonging Need: Need for Self-Expression

130	GE	To which extent would you agree if the following game elements would be introduced to your workplace?	Source / Adapted from
164	GE_VC1	You take the role of a virtual character (e.g. your favorite character which you virtually and temporarily play during work).	A virtual character (i.e. an avatar) represents the employee. ³⁸³
165	GE_VC2	Cooperative work activities are carried out by multiple workers, who participate with their virtual character in a roleplaying game.	See 164
166	GE_VC3C	Your virtual character competes with other characters. Within the roleplaying you compete with your colleagues.	See 164

9. GE9 – Preference for Game Element Playculture

Belonging Need: Need for Relevance Idealism

130	GE	To which extent would you agree if the following game elements would be introduced to your workplace?	Source / Adapted from
161	GE_PC1	Work activities are organized in the context of fantasy stories that are interesting or exciting for you.	Fantasy evokes images of objects or situations that aren't actually present. This can make the experience more emotionally appealing to users. ³⁸⁴
162	GE_PC2	Work activities are organized in the form of topical stories that have relevance for the employee or consider the circumstances of his life.	For meaningful gamification, it is important to take into consideration the background that the user brings to the activity and the organizational context into which the specific activity is placed. ³⁸⁵
163	GE_PC3	The goals of the work activities are complemented by virtual objectives which have to be achieved by the employees to make progress in a fantasy story. The progress in the fantasy story will be visible for colleagues.	see 162 + competitive dimension

10. GE10 – Preference for Game Element Autonomy

Belonging Need: Need for Autonomy

130	GE	To which extent would you agree if the following game elements would be introduced to your workplace?	Source / Adapted from
149	GE_AUT1	You can spend parts of your time organizing the activities after personal preferences (for example to develop own ideas).	Self-expression results from having a desire to express autonomy, identity or originality, or to mark one's personality as unique. ³⁸⁶
150	GE_AUT2	For desired activities employees are rewarded with liberties such as freedom of choice regarding the content of work.	See 149
151	GE_AUT3	For desired tasks employees get a greater amount of self-determination (e.g. extra vacation or flexible working hours).	See 149

11. GE11 – Preference for Game Element Transparent Rules

Belonging Need: Need for Structure / Security / Stability / Order

³⁸³ Passos, E. B., Medeiros, D. B., Neto, P. A. S., & Clua, E. W. G. 2011

³⁸⁴ Li et al. p.105

³⁸⁵ Nicholson 2012

³⁸⁶ Bunchball 2010

130	GE	To which extent would you agree if the following game elements would be introduced to your workplace?	Source / Adapted from
170	GE_TR	Transparent rules for gamification system (e.g. clear transparency on which actions will lead to which consequences/outcomes, thereby reducing subjectivity in judgements)	Rules, being one component of games, have the ability to increase engagement ³⁸⁷

The sources described stem to a larger extent from the work of Thiebes, Lins and Basten in their research “Gamifying Information Systems – A Synthesis of Gamification Mechanics and Dynamics”.³⁸⁸

3.3.3 The preference for gamification elements correlates with the intention to use gamification

It is assumed the (dis-)preference for certain game elements [GE1-GE11] will influence the intention to use gamification. In previous research utilitarian and hedonic benefits retrieved from gamification acted as determinants for the acceptance and use of the technology.³⁸⁹ These attitudes are formed by the expectation that certain behaviors will lead to positive or negative outcomes.³⁹⁰ In the context of gamification, the attitudes towards gamification can be similarly interpreted as the intention to use it.³⁹¹ In this research the concept is adapted by interpreting “the attitude towards” as the “preference for” game elements [GE1-GE11].

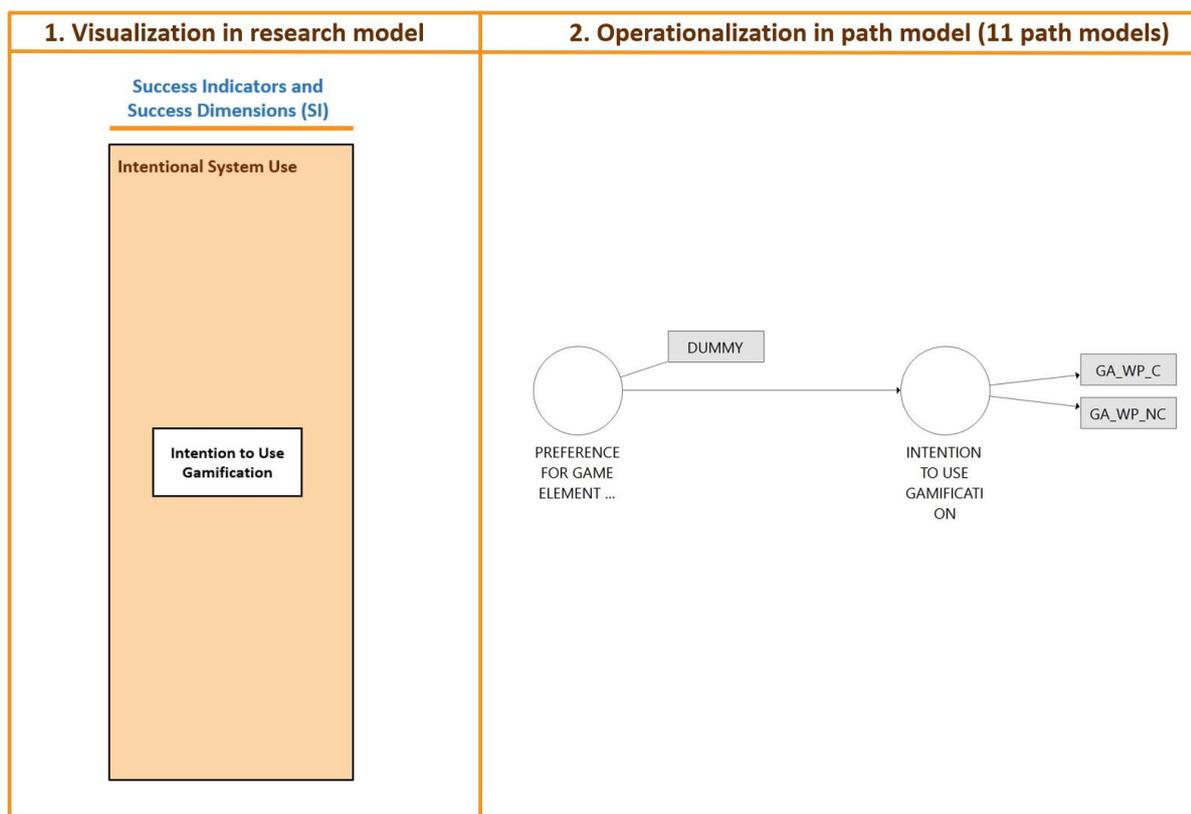


Figure 24 Operationalization of preference for gamification elements on intention to use gamification

³⁸⁷ Schönbohm und Urban 2014. p.61 (see Deterding, Dixon, Khaled & Nacke, 2011: 1-6; McGonigal, 2012: 22)

³⁸⁸ Scott Thiebes, Sebastian Lins, Dirk Basten 2014. p.12-13 Appendix A – Gamification’s Master-M&D

³⁸⁹ Lowry et al. 2013 p.8.table 1

³⁹⁰ Ajzen 1991. p.206

³⁹¹ Hamari und Koivisto 2015. p.421

3.3.3.1 General Hypothesis

H3: Hypothesis Preference for Game Element(s) (GE1-GE11) on Intention to use Gamification (SI)

A correlation between a PREFERENCE FOR (A) GAME ELEMENT(S) and the INTENTION TO USE GAMIFICATION is significant. In total this forms 11 hypotheses (11 GEs on INTENTION TO USE GAMIFICATION).

3.3.3.2 General Operationalization

Intention to use Gamification (SI)

The construct “Intention to use” is operationalized as latent construct modelled by two items based on previous research by Hamari and Koivisto and Dumpit and Fernandez.

Specification: Reflective construct

Scale: Likert 1-5 (SA = Strongly agree; A = Agree; N =Neutral; D = Disagree; SD = Strongly disagree)

SI – Intention to use gamification

171	GA_WP	Gamification - How do you judge the following statements?	Source / Adapted from
172	GA_WP_NC	I would like to work with gamification in the future.	Adapted from intention to use construct ³⁹²
173	GA_WP_C	I would recommend gamification to my friends.	See 172

3.4 Deriving the detailed research models (HN01-HN11)

3.4.1 Purpose / Goals / Responsibility [HN01]

3.4.1.1 Conceptualization

Purpose in work life connected to mid- and long-term goals are keys for 21st century intrinsic incentive systematics.³⁹³ However, working effectively on goals always requires responsibility, commitment and accountability³⁹⁴. Snook et al. point to the fact that especially executives need a strong belief in purpose to be an effective leader and accomplish their goals.³⁹⁵ This underlines the dependency of the three elements and explains why they have been clustered in one need group.

Looking at gamification elements which respond to this need, it is important to differentiate between the short run and long run perspective. “Points” as least complex gamification element can serve as a goal itself and help to make work effectivity measurable. Still, as discussed in 3.10 and pointed out by Bogost if gamification should create meaningful purpose and sustainable engagement it must go beyond points. Game developers and players have critiqued gamification on the grounds that it gets games wrong, mistaking incidental properties like points and levels for primary features like interactions with behavioral complexity.³⁹⁶ In order to support purpose, long term goals and responsibility it takes the most complex of

³⁹² Hamari und Koivisto 2013. p.12 Appendix A. Survey items / see also Dumpit und Fernandez 2017. p.10.Table 3

³⁹³ Pink 2010. p. 203

³⁹⁴ Simon Baker 2015.accessed 20.09.2017

³⁹⁵ Craig, Nick, Scott Snook 2014. p.1

³⁹⁶ Walz 2015(Bogost). p.76

gamification elements termed “Playculture” addressing elements like stories with epic meaning with which the individual can identify.³⁹⁷ It is arguable whether these playculture elements do exist in nowadays internal gamification strategies³⁹⁸. However, this does not question their importance in advanced gamification models.

Based on this discussion it is argued that the need for purpose, goals and responsibility will trigger the preference for playculture game elements.

3.4.1.2 Hypothesis

Hypothesis HN01a: The higher the need for purpose, goals and responsibility the higher the preference for game elements addressing playculture.

3.4.1.3 Operationalization

Specification: Reflective construct

Scale: Likert 1-5 (+1) (Not at all suitable; Fairly suitable; Neutral; Very Suitable; Extremely suitable; (I don't care))

130	GE	To which extent would you agree if the following game elements would be introduced to your workplace?	Operationalized to (Preference for game element)
161	GE_PC1	Work activities are organized in the context of fantasy stories that are interesting or exciting for you.	Playculture
162	GE_PC2	Work activities are organized in the form of topical stories that have relevance for the employee or consider the circumstances of his life.	Playculture
163	GE_PC3C	The goals of the work activities are complemented by virtual objectives which have to be achieved by the employees to make progress in a fantasy story. The progress in the fantasy story will be visible for colleagues.	Playculture

3.4.2 Social Exchange / Belonging [HN02]

3.4.2.1 Conceptualization

Zajonc work on social facilitation dates to the year 1965. He emphasized that in co-action effect settings (people / animals doing the same thing while being in the same place) for most tasks overall performance was better in groups than in the isolated setting, even when minimizing competition effects.³⁹⁹ Moreover, Vassileva argues that social interactions (e.g. in applications) can motivate users to change their behavior (e.g. participate more actively).

“Since different people are motivated by different things, it can be expected that personalizing the incentives and the way the rewards are presented to the individual, would be beneficial. Also, since communities have different needs in different phases of their existence, it is necessary to model the changing needs

³⁹⁷ Compare to 2.5.2.5

³⁹⁸ due to the social complexity and individual perceptions and preferences

³⁹⁹ ZAJONC 1965. p.272 (interestingly intellectual work (problem-solving) suffered in the group situation but the sheer output of words was increased)

of communities and adapt the incentive mechanisms accordingly, to attract the kind of contributions that are beneficial.”⁴⁰⁰

Thus, the modeling of user and group incentives is an important design aspect.

3.4.2.2 Hypothesis

Hypothesis HN02a: The higher the need for social exchange and belonging the higher the preference for game elements addressing social exchange.

3.4.2.3 Operationalization

Specification: Reflective construct

Scale: Likert 1-5 (+1) (Not at all suitable; Fairly suitable; Neutral; Very Suitable; Extremely suitable; (I don't care))

3.4.2.4 Operationalization

130	GE	To which extent would you agree if the following game elements would be introduced to your workplace?	Operationalized to (Preference for game element)
155	GE_SI1	You receive social appeals as a reward (e.g. excursions with chosen colleagues to special places)	Social Incentives
156	GE_SI2	Some work activities are organized in a way that they can only be accomplished by cooperating with each other.	Social Incentives
157	GE_SI3C	Some work activities are of competitive nature, so that employees compete with their colleagues.	Social Incentives

3.4.3 Image / Recognition [HN03]

3.4.3.1 Conceptualization

As argued in 2.5.2.4 Brim and Asplund found in a U.S. employee survey 2009 that “[e]mployees receiving predominantly negative feedback from their manager are over 20 times more likely to be engaged than those receiving little or no feedback.”⁴⁰¹ Continuous feedback (not only from management but from a 360° viewpoint) seems to have a huge impact on employee engagement. Herzberg et al. found in their study of 1,753 events that led to extreme job satisfaction that “receiving recognition” scored second best and was mentioned by over 40% of the interviews.

Shenkar et al. define reputation, image, prestige and goodwill in an organizational context as generic substitutes in an organizational context and use “standing” (status) as substitute.⁴⁰² In this work image is used as substitute. Recognition at work leads to an increase in the way a person perceives his or her own value. If this recognition is made public, it also increases the valuation by others leading to an increase of the person’s “image”. Therefore, image and recognition are presented in one group.

To address the subsequent concepts recognition and image each concept is represented by three items.

⁴⁰⁰ Vassileva 2012. p.1

⁴⁰¹ Brim und Asplund 2009

⁴⁰² Shenkar und Yuchtman-Yaar 1997. p.1361

Recognition is represented by the gamification element of direct feedback as argued by Deci, Ryan and Koestner.⁴⁰³ The concept of “image” is represented by items of the group status and privileges and are adapted from Ivanic⁴⁰⁴. He argues that e.g. loyalty programs reward customers with higher status and special privileges, thereby making customers willingly to incur higher cost to utilize exclusive privileges. These “status-reinforcing behaviors” reinforce customers high-status identity. This concept has been translated from an external gamification context to an internal context.

3.4.3.2 Hypothesis

Hypothesis HN03a: The higher the need for image and recognition the higher the preference for game elements addressing direct feedback, status and privileges.

3.4.3.3 Operationalization

Specification: Reflective construct

Scale: Likert 1-5 (+1) (Not at all suitable; Fairly suitable; Neutral; Very Suitable; Extremely suitable; (I don't care))

130	GE	To which extent would you agree if the following game elements would be introduced to your workplace?	Operationalized to (Preference for game element)
158	GE_FB1	The working environment features sound effects and background music. These give the employee a feedback for his operational principles.	Direct Feedback
159	GE_FB2	After certain work packages you receive direct feedback (e.g. from principles or colleagues) which rates your behavior positively or negatively.	Direct Feedback
160	GE_FB3C	Received feedback will be documented and kept visible for colleagues.	Direct Feedback
143	GE_S1	By achieving objectives, you receive status symbols such as an own office or a better parking option.	Status & Privileges
144	GE_S2	For desired activities employees are rewarded with privileges, such as the participation in exclusive events or access to exclusive areas.	Status & Privileges
145	GE_S3	For desired activities employees are assigned to managerial functions, which scale them up in the corporate hierarchy.	Status & Privileges

3.4.4 Influence / Power [HN04]

3.4.4.1 Conceptualization

Murray describes “Dominance” as the need to control other people through command or persuasion.⁴⁰⁵ This need in translated into a business context can be imagined as climbing up in the corporate hierarchy to gain influence and power. People with a dominating need for influence and power strive to influence and to increase personal status and prestige. ⁴⁰⁶ To focus only on the influence and power aspect the items

⁴⁰³ Pink 2010. p.66

⁴⁰⁴ Ivanic 2015. p.698

⁴⁰⁵ Murray 1938. p.38-ff.

⁴⁰⁶ Stead 1972. p.804

of HN03 (image and recognition) without the aspect of feedback have been reduced only to the three status and privileges items.

3.4.4.2 Hypothesis

Hypothesis HN04a: The higher the need for influence and power the higher the preference for game elements addressing status and privileges.

3.4.4.3 Operationalization

Specification: Reflective construct

Scale: Likert 1-5 (+1) (Not at all suitable; Fairly suitable; Neutral; Very Suitable; Extremely suitable; (I don't care))

130	GE	To which extent would you agree if the following game elements would be introduced to your workplace?	Operationalized to (Preference for game element)
143	GE_S1	By achieving objectives, you receive status symbols such as an own office or a better parking option.	Status & Privileges
144	GE_S2	For desired activities employees are rewarded with privileges, such as the participation in exclusive events or access to exclusive areas.	Status & Privileges
145	GE_S3	For desired activities employees are assigned to managerial functions, which scale them up in the corporate hierarchy.	Status & Privileges

3.4.5 Competition [HN05]

3.4.5.1 Conceptualization

Competition in gamification is a controversially argued concept. Murray refers to it as aggression, the need to forcefully overcome an opponent.⁴⁰⁷ Brouwer showed that intra-team competition is negatively related to psychological safety and positively relate to task complexity and team conflict.⁴⁰⁸ McGonigal also emphasizes collaboration over competition and puts the epic sense of “*Becoming a part of something bigger than ourselves*” above the mechanics of competition.⁴⁰⁹ Tomaselli terms competition as the least important factor to motivate engagement.⁴¹⁰ . However, competition also enables users to challenge each other to get the high score at a specific activity.⁴¹¹ Looking at human history most sport activities use the element of competition to create engagement and meaningfulness.

Leaderboards visualize transparently progress of a certain group to group members (compare to 2.5.2.2). Leaderboards can be used in different varieties. Only showing the “top performers” (e.g. employee of the month) does not put low performers in a target position. Showing your individual performance as relative to other without showing names is another variance keeping aggression in competition low. Thus, leaderboards are represented by three items (146,147,148) with different competition impact/aggression levels.

⁴⁰⁷ Murray 1938. p.39

⁴⁰⁸ Brouwer 2016. p.1

⁴⁰⁹ McGonigal 2011. p.95

⁴¹⁰ Fernando C. Tomaselli et al. 2015. p.1

⁴¹¹ Bunchball 2010. p.10

However, many gamification elements can be used to foster competition when being transparently communicated to other team members (and not kept secret for the individual). Items chosen in this block is transparency of received feedback (160), overall game progress (163), and competition between virtual characters (166).

3.4.5.2 Hypothesis

Hypothesis HN05a: The higher the need for competition the higher the preference for game elements addressing competitive gamification elements.

3.4.5.3 Operationalization

Specification: Reflective construct

Scale: Likert 1-5 (+1) (Not at all suitable; Fairly suitable; Neutral; Very Suitable; Extremely suitable; (I don't care))

130	GE	To which extent would you agree if the following game elements would be introduced to your workplace?	Operationalized to (Preference for game element)
160	GE_FB3C	Received feedback will be documented and kept visible for colleagues.	Feedback
163	GE_PC3C	The goals of the work activities are complemented by virtual objectives which have to be achieved by the employees to make progress in a fantasy story. The progress in the fantasy story will be visible for colleagues.	Play Culture
146	GE_RL1	Leaderboards compare colleagues concerning their performance (e.g. "Top 5 Employee of the month").	Leaderboards
147	GE_RL2	Leaderboards show your ranking compared to other colleagues without the visibility of the names.	Leaderboards
148	GE_RL3C	Leaderboards show your ranking compared to other colleagues - Each name on the leaderboard will be visible.	Leaderboards
166	GE_VC3C	Your virtual character competes with other characters. Within the roleplaying you compete with your colleagues.	Virtual Charakter

3.4.6 Achievement / Reward [HN06]

3.4.6.1 Conceptualization

In order to decide when to receive achievements or rewards a defined target outcome must be reached. Measurable objectives are essential in business performance evaluations for individuals or teams. Kaplan discussed the common Balanced Scorecard Approach in 1992 as instrument for performance measurement. *“Traditional performance measurement systems specify the particular actions they want employees to take and then measure to see whether the employees in fact taken those actions. Such measurement systems fit with the engineering mentality of the Industrial Age. The balanced scorecard, on the other hand, [...] puts strategy puts strategy and vision, not control, at the center.”*⁴¹²

⁴¹² Kaplan und Norton 1992, p.79

Individuals with a high need for achievement and reward should respond to game mechanics addressing these needs (including challenges, goals and rewards). Rewards may be “virtual” e.g. points or classic material rewards (e.g. bonus payments). The construct is thus conceptualized by six items: The first (140) representing a classical measurable goal, followed by an item addressing challenges, allowing for varying difficulty and continuous improvement (141). Two items address traditional material rewards (151) corporate goods, (152) bonus payments. The last two items address points in a general introduction (131) and as reward for the completion of goals or challenges 132) which are conceptualized as “completion of single or multiple desired activities”

3.4.6.2 Hypothesis

Hypothesis HN06a: The higher the need for achievement and reward the higher the preference for game elements addressing challenges/goals, material rewards and points.

3.4.6.3 Operationalization

Specification: Reflective construct

Scale: Likert 1-5 (+1) (Not at all suitable; Fairly suitable; Neutral; Very Suitable; Extremely suitable; (I don't care))

130	GE	To which extent would you agree if the following game elements would be introduced to your workplace?	Operationalized to (Preference for game element)
140	GE_C1	Your tasks will be presented as challenges, which you have to cope with (e.g. Finish 10 tasks within the next 8 hours)	Challenges / Goals
141	GE_C2	The challenges for an employee are rated by difficulty, so that the employee is always engaged to his highest abilities and therefore continuously improves.	Challenges / Goals
152	GE_MR1	For desired activities you are rewarded with corporate goods. For instance, you are able to get a company vehicle or a better smartphone.	Material Rewards
153	GE_MR2	For desired activities employees are rewarded with bonus payments.	Material Rewards
131	GE_P1	You are able to collect points during work (e.g. constructive contributions in meetings).	Points
132	GE_P2	Points for the employees will be received by completion of single or multiple desired activities.	Points

3.4.7 Mastery / Advancement [HN07]

3.4.7.1 Conceptualization

While goals and challenges are necessary for achievement and rewards, mastery and advancement are related concepts.⁴¹³ Pink describes mastery and purpose as even a stronger driver of motivation in the 21th century, than traditional rewards.⁴¹⁴ Mastery and advancement use levels and badges as building block of

⁴¹³ Compare to 2.5.2 Gamification instruments (coordination variables)

⁴¹⁴ Pink 2010. p.203

success indicators. Points are neglected in this construct, since levels serve as accumulated points with a defined threshold.⁴¹⁵ The construct is conceptualized by three items representing badges (137,138,139) and three items representing levels (134,135,136). In order to differentiate the construct of badges from challenges item 138 explicitly addresses the aspect of voluntariness. Items 139 and 136 address the competitive dimension of mastery and advancement, allowing for comparison (e.g. between colleagues).

Hypothesis

Hypothesis HN07a: The higher the need for mastery and advancement the higher the preference for game elements addressing badges and levels.

3.4.7.2 Operationalization

Specification: Reflective construct

Scale: Likert 1-5 (+1) (Not at all suitable; Fairly suitable; Neutral; Very Suitable; Extremely suitable; (I don't care))

Item ID	GE	To which extent would you agree if the following game elements would be introduced to your workplace?	Operationalized to (Preference for game element)
137	GE_B1	You are able to attain achievements (badges) in terms of graphics or expressions (e.g. "5-Star Troubleshooter") for the completion of goals.	Badges
138	GE_B2	Badges are primarily being awarded for voluntary goals, which are achieved beyond the employee's main activity.	Badges
139	GE_B3C	Badges represent the performed accomplishments which are visible for colleagues.	Badges
134	GE_L1	You are able to continuously reach higher levels. Level up's can be achieved by continuous positive outcomes which match targeted goals.	Levels
135	GE_L2	Over time, the level of an employee represents his work experience and his professional success.	Levels
136	GE_L3C	Reached levels will be visible for some colleagues to allow comparisons among themselves.	Levels

3.4.8 Self-Expression [HN08]

3.4.8.1 Conceptualization

The construct of self-expression is rooted in playculture (via avatars / virtual characters).⁴¹⁶ Blohm and Leimeister also situate avatars and virtual worlds as motive of self-determination.⁴¹⁷ Due to the complexity of playculture and the high specificity of each story and belonging virtual characters (including individual perceptions of users) self-expression here is reduced to the construct of avatars/virtual characters. This somewhat limits the generalizability of the construct, but on the other hand this way it remains imaginable

⁴¹⁵ Compare to previous section

⁴¹⁶ Compare to 2.5.2.5 Group V (Purpose, Relevance)

⁴¹⁷ Blohm und Leimeister 2013. p.276 table 1

for survey participants in terms of three short questionnaire items (164,165,166). Items 164 and 165 address the core concept of the virtual character and the interactions with other players (e.g. in a role-playing context). Item 166 adds the competitive dimension between virtual characters (colleagues).

3.4.8.2 Hypothesis

Hypothesis HN08a: The higher the need for self-expression the higher the preference for game elements addressing virtual characters.

3.4.8.3 Operationalization

Specification: Reflective construct

Scale: Likert 1-5 (+1) (Not at all suitable; Fairly suitable; Neutral; Very Suitable; Extremely suitable; (I don't care))

130	GE	To which extent would you agree if the following game elements would be introduced to your workplace?	Operationalized to (Preference for game element)
164	GE_VC1	You take the role of a virtual character (e.g. your favorite character which you virtually and temporarily play during work).	Virtual Character (Avatar)
165	GE_VC2	Cooperative work activities are carried out by multiple workers, who participate with their virtual character in a roleplaying game.	Virtual Character (Avatar)
166	GE_VC3C	Your virtual character competes with other characters. Within the roleplaying you compete with your colleagues.	Virtual Character (Avatar)

3.4.9 Relevance / Idealism [HN09]

3.4.9.1 Conceptualization

The construct of relevance and idealism also stems from the playculture group.⁴¹⁸ The needs for relevance and idealism (HN09) are closely related to the needs for purpose, goals and responsibility (HN01) and therefore mapped on the same preferences. Playculture focuses on integrating an interesting gameplay and story at the core of the gamification system. In contrast to self-expression it targets the concepts of epic meaning. Badgeville states that “epic meaning” in a gamification system is necessary to let the users feel they are working on something big and meaningful. That in turn will increase engagement, loyalty, influence and fun.⁴¹⁹ The first two items (161,162) introduce the concept on a generic base “that are interesting or exciting for you”/ “stories that have relevance for the employee or consider the circumstances of his life” from two viewpoints (first plus third person expression). The reason the constructs are chosen in this generic expression are due to the fact, that playculture, story (and thus epic meaning) are perceived very differentially by individuals. Item 163 adds the competitive dimension “The progress in the fantasy story will be visible for colleagues.”.

⁴¹⁸ Compare to 2.5.2.5 Group V (Purpose, Relevance)

⁴¹⁹ Badgeville Inc.accessed 27.04.2014

3.4.9.2 Hypothesis

Hypothesis HN09a: The higher the need for relevance and idealism the higher the preference for game elements addressing playculture.

3.4.9.3 Operationalization

Specification: Reflective construct

Scale: Likert 1-5 (+1) (Not at all suitable; Fairly suitable; Neutral; Very Suitable; Extremely suitable; (I don't care))

130	GE	To which extent would you agree if the following game elements would be introduced to your workplace?	Operationalized to (Preference for game element)
161	GE_PC1	Work activities are organized in the context of fantasy stories that are interesting or exciting for you.	Playculture
162	GE_PC2	Work activities are organized in the form of topical stories that have relevance for the employee or consider the circumstances of his life.	Playculture
163	GE_PC3C	The goals of the work activities are complemented by virtual objectives which have to be achieved by the employees to make progress in a fantasy story. The progress in the fantasy story will be visible for colleagues.	Playculture

3.4.10 Autonomy / Independence [HN10]

3.4.10.1 Conceptualization

Autonomy and Independence stem from the concept of self-determination. Self-determination was previously defined as an alternative individual reward, giving a person a surplus of autonomy and independence. It follows the intrinsic motivation path by giving people freedom of choice in their respective work setting. Even though grouped as a reward, it addresses other needs than social incentives, monetary rewards or privileges.⁴²⁰ White already honored this differentiation in 1959 by grouping autonomy, curiosity and play as intrinsic motivators for an individual's strife for competence.⁴²¹ This construct lacks a competitive dimension, thus all three items (149,150,151) render the concept of autonomy based on SDT. *"We found that conditions supportive of autonomy and competence reliably facilitated this vital expression of the human growth tendency, whereas conditions that controlled behavior and hindered perceived effectance undermined its expression."*⁴²² Furthermore, Pink termed autonomy one of the three basic motivational sources for knowledge workers in the 21st century.⁴²³ Items 149 and 150 differ only in expressions and first- and third-person view and are both referring to freedom of choice in terms of work content. Item 151 adds two more specific describers (extra vacation and flexible working hours).

3.4.10.2 Hypothesis

Hypothesis HN10a: The higher the need for autonomy and independence the higher the preference for game elements addressing autonomy.

⁴²⁰ Compare to 2.5.2.3 Group III (Rewards)

⁴²¹ White 1959. p.297-333

⁴²² Ryan und Deci 2000. p.76

⁴²³ Pink 2010

3.4.10.3 Operationalization

Specification: Reflective construct

Scale: Likert 1-5 (+1) (Not at all suitable; Fairly suitable; Neutral; Very Suitable; Extremely suitable; (I don't care))

130	GE	To which extent would you agree if the following game elements would be introduced to your workplace?	Operationalized to (Preference for game element)
149	GE_AUT1	You can spend parts of your time organizing the activities after personal preferences (for example to develop own ideas).	Autonomy
150	GE_AUT2	For desired activities employees are rewarded with liberties such as freedom of choice regarding the content of work.	Autonomy
151	GE_AUT3	For desired tasks employees get a greater amount of self-determination (e.g. extra vacation or flexible working hours).	Autonomy

3.4.11 Structure / Security / Stability / Order [HN11]

3.4.11.1 Conceptualization

The concepts of structure, security and stability are difficult to operationalize with the predefined gamification mechanics. They are best covered by rules and transparency of the gamification system, which is not a gamification mechanic in its original sense.⁴²⁴ When regarded as a meta-mechanic of gamification, rules and transparency address tasks, processes and time-resources thereby reflect the work-related human need for structure, stability and order in working life. Due to the limited applicability of this concept only one item has been operationalized (170) addressing clear rules and transparency on which actions will lead to which consequences/outcomes. This must be regarded as a limitation to the interpretation of the results and the generalizability of the construct.

3.4.11.2 Hypothesis

Hypothesis HN11: The higher the need for structure, security, stability and order the higher the preference for game elements addressing transparency.

3.4.11.3 Operationalization

Specification: Reflective construct

Scale: Likert 1-5 (+1) (Not at all suitable; Fairly suitable; Neutral; Very Suitable; Extremely suitable; (I don't care))

130	GE	To which extent would you agree if the following game elements would be introduced to your workplace?	Operationalized to (Preference for game element)
170	GE_TR	Transparent rules for gamification system (e.g. clear transparency on which actions will lead to which consequences/outcomes, thereby reducing subjectivity in judgements)	Transparency

⁴²⁴ Compare to 2.5.2.6 Group VI (Process, Structure, Security, Stability, Order)

3.5 Overview of generic hypothesis

- H1:** A correlation between a BIG5 dimension and a NEED is significant.
- H2A:** A correlation between a NEED and a PREFERENCE FOR GAME ELEMENTS is significant.
- H2B:** A correlation between CULTURAL BACKGROUND and a PREFERENCE FOR GAME ELEMENTS is significant.
- H3:** A correlation between a PREFERENCE FOR GAME ELEMENTS and the INTENTION TO USE GAMIFICATION is significant.

These hypotheses were conceptualized and operationalized into a total of 11 path models (for the identified 11 work-related human needs) thereby creating many individual hypothesis⁴²⁵. The detailed results for each generic hypothesis are shown and discussed in section 5.4.3.

The next section introduces variance- and covariance-based methods for data analysis using structural equation modelling.

3.6 Structural Equation Modelling

Structural equation modelling (SEM) belongs to multivariate analysis methods and is suitable for analyzing complex interdependencies of variables and constructs. It is frequently used in economic and social science to assess relationships between unobservable ‘latent’ constructs. Latent constructs exist when measurement of a certain phenomenon is abstract, complex or not direct observable (i.e, customer satisfaction or trust).⁴²⁶ Furthermore SEM differentiates between formative and reflective constructs, variance- and covariance-based approaches as well as measurement models and structural models. These differences will be explained in the following sections.

⁴²⁵ e.g. 55 hypotheses just for H1 (correlation between 5 personality traits and 11 human work-related needs)

⁴²⁶ Hair et al. 2017. p.5

3.6.1 Visual representation of structural equation models

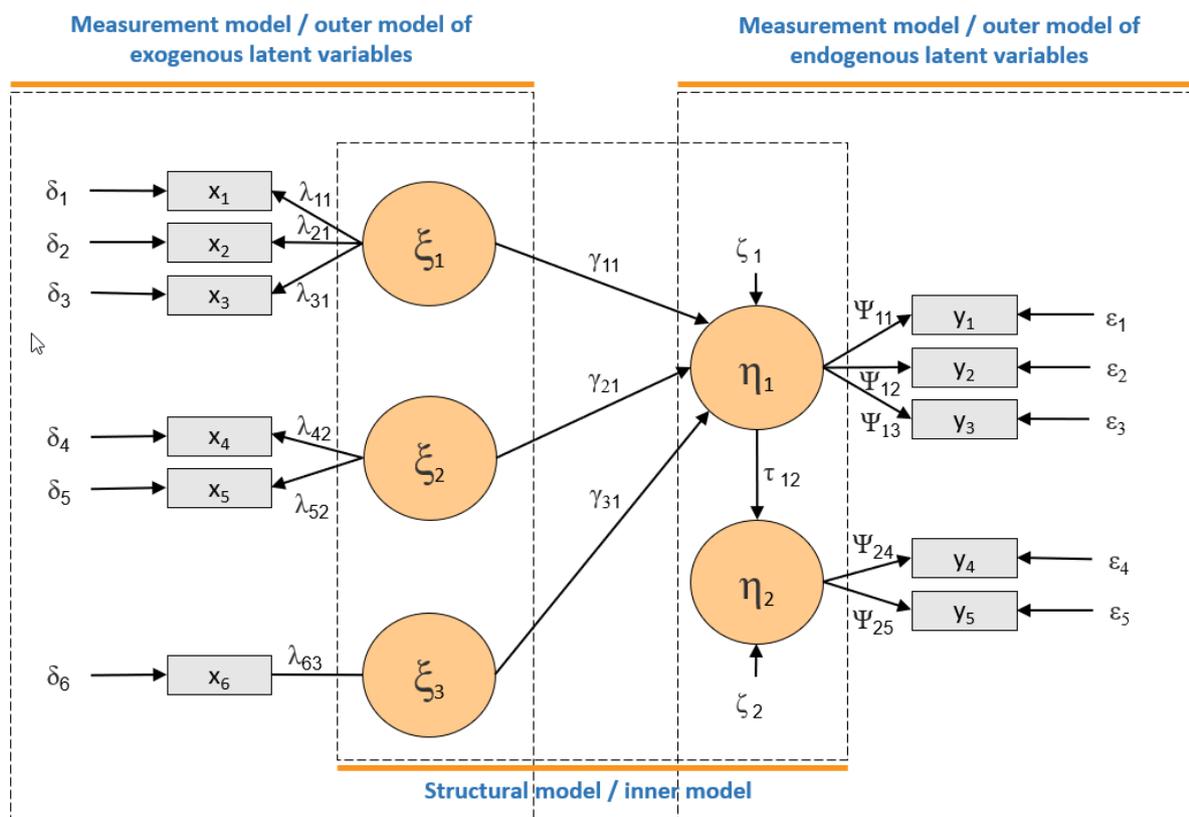


Figure 25 Structure of a path model ⁴²⁷

A structural equation model consists of measurement models (outer models) and a structural model (inner model), which interconnects the constructs of the measurement model based on theory and logical deduction. A construct consists of one to many indicators and is measured indirectly by the values of the indicator variables.⁴²⁸ Measurement models can consist of exogenous latent variables (constructs that explain other constructs) or endogenous latent variables (constructs that are explained in the model).

Latent variables (constructs that are abstract and not directly measured) are shown in path models as circles / ovals (ξ_{1-3} exogenous and η_{1-2} endogenous). The belonging grey rectangles are called items, indicators or manifest variables (x_{1-6}) and (y_{1-5}) which represents the latent constructs as proxy variables containing the raw values. The relationships between the shown constructs are modelled as single-headed arrows, which represent predictive relationships (λ_{11-63} , γ_{11-31} , τ_{12} , Ψ_{11-25}). These predictive relationships are referred to as factor loadings or path loadings. Factor loadings describe in how far the indicators correlate with the latent construct (variable). These correlations exhibit values between -1 and 1. A high positive (negative) factor loading proves a high positive (negative) correlation between the indicator and the latent variable. A factor loading of 0 describes a statistical independence of the two variables.

⁴²⁷ Adapted from Hair et al. 2017. p.10 exhibit 1.4

⁴²⁸ Chin und Newsted 1999. p.321-ff

Error terms (ε_{1-5}) belong to the endogenous reflectively measured constructs and represent the unexplained variance of the path model. Exogenous constructs and formative measures (items (δ_{1-6})) do not have error terms, but the structural model contains error terms as well (ζ_{1-2}).⁴²⁹

3.6.2 Reflective vs. formative constructs

Depending on the causal relationship between an indicator and a construct the constructs are operationalized reflectively or formatively.⁴³⁰ Reflective measures exhibit a causality which point from the construct to the indicators⁴³¹, thereby indicating that the construct forms the indicators (measures). They can be understood as a representative sample of all item within the conceptual domain.⁴³² Reflective constructs should exhibit interchangeable indicators which are highly correlated. Due to the high correlation they won't alter the meaning of the latent construct. On the other hand, formative constructs point from the indicators to the construct, thereby indicating that the causal indicators form the construct. Formative indicators are not interchangeable and taken jointly the items form and thereby determine the construct.⁴³³

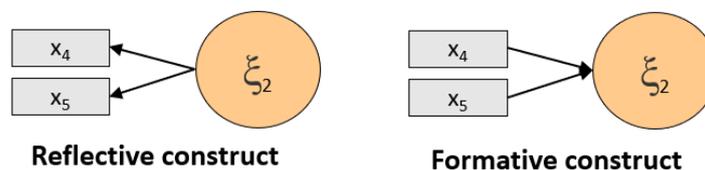


Figure 26 Reflective vs. formative constructs

3.6.3 Variance partial least squares SEM vs. covariance-based SEM

Partial least squares SEM (PLS-SEM) in contrast to covariance-based SEM (CB-SEM) is used for developing theories thereby applying exploratory research.⁴³⁴ CB-SEM is used to reject or confirm theories by estimating the covariance matrix of a given model and sample data set.⁴³⁵ According to Rigdon when theory is not yet well developed PLS-SEM should be used especially when the primary objective is explanation of modelled target constructs.⁴³⁶ While covariance-based SEM requires large sample sizes (200+), variance based SEM approaches allow for smaller sample sizes.⁴³⁷ As a rule of thumb for the minimal sample size in PLS-SEM depends on the largest regression equation (construct with the most items) in the structural equation model. This construct is multiplied by five or 10 in order to receive the minimal required sample size.⁴³⁸ Additionally, covariance-based SEM only allows for reflective constructs, while variance-based SEM offers reflective or formative constructs.⁴³⁹

The following table summarizes the main differences:

⁴²⁹ Hair et al. 2017. p.11

⁴³⁰ MacKenzie et al. 2005 p.711

⁴³¹ Compare to the direction of the arrows in the figure of the structural path model

⁴³² Eberl 2006 2006. p.651-ff

⁴³³ Jarvis et al. 2003. p.200

⁴³⁴ Chin und Newsted 1999. p.309

⁴³⁵ Hair et al. 2017. p.12

⁴³⁶ Rigdon 2012. p.355 ff

⁴³⁷ Haenlein und Kaplan 2004. p.291

⁴³⁸ Chin 1998. p.311

⁴³⁹ Chin 1998. p.299

Criteria	variance-based SEM	covariance-based SEM
Goal	Explanation of empirical data structures (prediction based) - more exploratory characteristics	Explanation of latent variables / indicator variables (parameter based) - more testing and verifying characteristics
Estimation process	Iterative and non-iterative partial least squares analysis – estimates coefficients that maximize the R ² values of the the target endogenous constructs	Minimization of differences between model theoretical and empirical covariance -
Distribution requirements	none	Multivariate normal distribution
Quality criteria	Non-parametric – No established global goodness-of-fit overall model criterion	Parametric - goodness-of-fit overall model criterion
Measurement model	Formative and/or reflective	reflective
Structural model	Only recursive models - No causal loops (no circular relationships) are allowed in the structural model	Recursive and non-recursive models
Sample size	Small 30-100 <ul style="list-style-type: none"> ▪ No identification issues with small sample sizes ▪ Generally achieves high levels of statistical power 	Large 200-800
Scales	Metric, quasi-metric (ordinal) scaled, binary coded / categorical data (with certain restrictions)	Minimum interval scaled
Theory requirements	Flexible	High
Model complexity	High (e.g. 100 latent and 1000 manifest constructs)	Low-medium (e.g. less than 100 manifest variables)
Software	SmartPLS, PLSGraph, LVPLS	LISREL, AMOS, M-PLUS, EQS

Table 6 Variance-based SEM vs. Covariance-based SEM ⁴⁴⁰

Fuchs summarizes that CB-SEM and PLS-SEM should not be considered as substitutes but rather as complementary.⁴⁴¹ However, PLS-SEM should be used when conducting exploratory research (e.g. when deducting a new theory) instead of testing or verifying existing theories, which is why PLS-SEM is chosen in this research study.

⁴⁴⁰ Adapted from Fuchs 2011. p. 38 tab.8 and Hair et al. 2017. p.17 exhibit 1.5

⁴⁴¹ Fuchs 2011. p.35

3.6.4 Multivariate analysis - Partial-Least-Squares-Structural-Equation-Modeling

The Partial-Least-Squares-Approach is used as multivariate analysis approach in this research.⁴⁴² To judge the quality of the analysis it is first important to measure the fit of the overall model. In PLS this is done in a two-step approach: First the fit of the structural model is measured and second the fit of the measurement model is assessed.⁴⁴³ Belonging quality criteria for these models will be discussed in detail within this section.

3.6.4.1 PLS Algorithm

PLS-SEM is constantly evolving as a statistical analysis method and has proven to be one of the most useful advanced methods used in social science.⁴⁴⁴ The partial-least-squares algorithm applied in this research is based on the maximization of explained variance (R^2) of the dependent variables. It consists of three subsequent steps. First based on the raw data matrix values for the latent variables are estimated. This iterative process (four sub steps) is shown in the following figure Stage 1 (#1-#4):

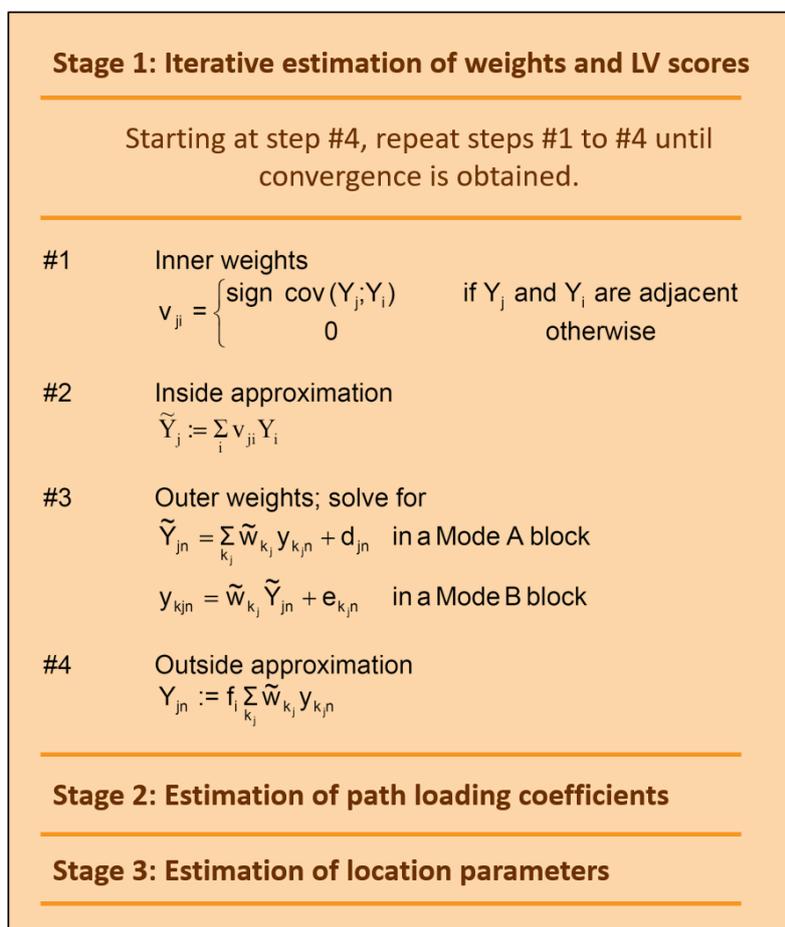


Figure 27 Stages of the PLS algorithm⁴⁴⁵

⁴⁴² Reasoning for using PLS-SEM is found in 3.26

⁴⁴³ Chin 1998. p.316 ff.

⁴⁴⁴ Hair et al. 2017. p.xiii

⁴⁴⁵ Ringle 2004. p.24 figure 2.4 cf. Lohmoller 1988. p.26

After value estimations have been derived in stage 1, stage 2 estimates the belonging path coefficients and factor loadings. This is done via partial least squares regression. Finally, in stage 3 the average values and the location parameters for the regression function are estimated.⁴⁴⁶

In order to yield representative results a PLS algorithm an enough large sample size is needed. A sample is sufficiently large when it is ten times as large as the highest number of indicators of a formative construct or ten times as large as the largest quantity of independent exogenous variables which influence an endogenous dependent variable.

3.6.5 PLS quality criteria of the measurement model for reflective constructs

To receive valuable quantitative results the right measurement approach needs to be applied. Since in social science often subjective measures (e.g. attitudes and ratings) are needed it's necessary to collect responses from people. This process can for example be executed by applying interviews or questionnaires. However, this bears a lot of disturbing aspects. Thus, the quality of PLS path models is dependent on many parameters determining objectivity, reliability and validity. PLS-SEM results are evaluated in two-steps: First the quality of the measurement model is evaluated. If the measurement model proves reliable the next step is to evaluate the relationships in the structural model (e.g. significance of path coefficients, R²).⁴⁴⁷ The most important quality measures are discussed in detail in the following sections, since this research only uses reflective constructs, formative quality criteria will not be discussed.

The following quality criteria will be applied in this research:

Quality Group
1. Objectivity
2. Reliability
3. Validity

Table 7 Quality criteria in PLS-SEM

1. Objectivity

Objectivity in execution refers to the fact, that when collecting data (in this case via a questionnaire survey) the execution parameters should remain identical. In an ideal setting all test persons are tested under identical conditions. First, this applies to the dimension of time (timespan during which the survey is executed) and the belonging instructions. The written instructions for a survey should be clear-cut and easy to understand. Items should remain in the same order and survey sessions should not be interrupted.⁴⁴⁸

The more standardized a survey process is the better the overall objectivity of the results. Social interactions between participants should not exist. The survey content should be clearly formulated and self-explaining, so that probands do not have further inquiries.⁴⁴⁹

The results of the survey must be independent from the researcher to achieve a high level of objectivity. When researches have degrees of freedom in analyzing (interpreting) survey results this is a threat to

⁴⁴⁶ Ringle 2004, p.25 cf. Chin und Newsted 1999, p.319-ff.

⁴⁴⁷ Hair et al. 2017, p.132

⁴⁴⁸ Rammstedt 2004, p.3

⁴⁴⁹ Lienert und Raatz 1998, p.8

objectivity. This often occurs if open questions need to be coded after the survey has been conducted.⁴⁵⁰ As a consequence a standardized multiple-choice test is more objective than an open interview. Even in written survey open questions sometimes cannot be avoided. However, whenever possible surveys should be designed with precoded questions (e.g. Likert items).⁴⁵¹

2. Reliability

Reliability is defined as *“the extent to which an experiment, test, or measuring procedure yields the same results on repeated trials.”*⁴⁵² It defines how accurate a scale measures a defined parameter. The criterion reliability refers to the requirement that a measurement should be free of random errors. Yet, reliability is independent of the fact that a test might measure a parameter in a wrong way. Consequently, reliability is a necessary but insufficient criterion regarding validity of a survey questionnaire.⁴⁵³ Research puts reliability above objectivity in terms of quality criteria, since reliability is precisely quantifiable.⁴⁵⁴

Reliability is measured for indicators as well as for the construct. Indicators count as reliable if the belonging construct can explain at least 50% of the variance of the indicator. This is met, if the indicator exhibits a factor (path) loading of at least 0,7. In this case the variance between the construct and the indicator is higher than the variance of the error term.⁴⁵⁵ However, factor loadings below 0,7 are accepted if they don't fall below the value of 0,4. In that case the reflective indicators should be removed from the model.

In SEM-PLS the traditional criterion for internal consistency was Cronbach's alpha (α). α is an estimate of the reliability based on the correlations of the indicator variables:

$$\text{Cronbach's } \alpha = \left(\frac{M}{M-1} \right) * \left(1 - \frac{\sum_{i=1}^M s_i^2}{s_t^2} \right)$$

M represents the count of indicator variables for the specific construct. s_i^2 is the variance of the indicator variable i of the construct which is measured with M indicators. s_t^2 represents the variance of the sum of all indicators of the construct. Cronbach's α lies between 0 and 1 and is regarded as reliable when above 0,7.⁴⁵⁶

Cronbach's alpha is sensitive to the number of items in the scale and generally underestimates the internal consistency reliability.⁴⁵⁷ Hair et al. state that it is technically more appropriate to use a different measure of internal consistency reliability which is composite reliability. Thus, this research reports Cronbach's alpha, but uses composite reliability as binding measure of reliability. Composite reliability takes the different outer loadings of the indicator variables into account and is calculated by the following formula:

$$\text{Composite reliability} = p_c = \frac{(\sum_{i=1}^M \lambda_i)^2}{(\sum_{i=1}^M \lambda_i)^2 + \sum_{i=1}^M \text{var}(\varepsilon_i)}$$

⁴⁵⁰ Bühner 2006. p.34

⁴⁵¹ Moosbrugger und Kelava 2008. p.10ff.

⁴⁵² Merriam-Webster 2018

⁴⁵³ Sushil und Verma 2010. p.174

⁴⁵⁴ Rammstedt 2004. p.5

⁴⁵⁵ Götz und Liehr-Gobbers 2004. p.727

⁴⁵⁶ Homburg und Giering 1996. p.8

⁴⁵⁷ Hair et al. 2017. p.111

t_i represents the outer loadings of the indicator variable I of a construct measured with M indicators. ε_i is again the error term of the indicator variable i . Composite reliability values also vary between 0 and 1 (the higher the value the better the reliability). It can be interpreted in the same way as Cronbach's alpha. Therefore, values for composite reliability between 0,6 and 0,7 are acceptable in exploratory research. If the composite reliability reaches values above 0,9 this is not desirable, since then all indicator variables are measuring the exact same phenomenon (e.g. when asking the exact same question in a survey).⁴⁵⁸

Another quality criterion for convergent validity of the measurement model is the concept of Fornell and Larcker "Average Variance Extraced (AVE)".⁴⁵⁹ AVE is calculated as follows:

$$AVE = \frac{\sum_{i=1}^M t_i^2}{\sum_{i=1}^M t_i^2 + \sum_{i=1}^M \text{var}(\varepsilon_i)}$$

AVE measures the variance of the indicators vs. the error term caused by the latent variable. An AVE value above 0,5 is enough, because more than 50% of the variance can be explained. AVE should be checked for every variable in the measurement model.⁴⁶⁰

3. Validity

Validity is judged by different categories: Content validity, criterion validity and construct validity. Content validity (logical validity) describes whether a construct reflects all necessary facets. There is no quantitative test or KPI for content validity but rather it is derived by logical reasoning and deduction.⁴⁶¹ Due to its subjectivity it is not a strong measure of validity. The same holds for criterion validity. Criterion validity (concrete validity) measures the extent to which a measure is correlated to an outcome. Construct validity measures the degree to which a constructs measures what it claims. It can be empirically verified and hence, construct validity is the strongest but also most complex form of test validity.⁴⁶²

Construct validity can be split in two sections: Discriminant and convergent validity.

1. Convergent validity

Convergent validity describes in how far measures or constructs that in theory measure the same phenomenon are in fact correlated. Still, in most research studies constructs are designed as unique which is measured by discriminant validity.

2. Discriminant validity

Discriminant validity describes the extent to which latent constructs and measures differ from other constructs and measures in the model. In general measures of different constructs should only exhibit a small common variance if constructs are designed as unique (thus measure different phenomenon's). Otherwise the uniqueness of the construct is questionable.⁴⁶³ There are two common measures of discriminant validity:

1. Cross-loadings for indicators

⁴⁵⁸ Hair et al. 2017. p.312

⁴⁵⁹ Fornell und Larcker 1981. p.46

⁴⁶⁰ Hair et al. 2017. p.314

⁴⁶¹ Michel und Conrad 1982. p.57

⁴⁶² Messick 1995. p.742

⁴⁶³ Bagozzi und Phillips 1982. p.469

Indicator’s outer loadings on the belonging construct must be larger than any correlation to other constructs (termed cross-loading). Cross-loadings are typically reported in a table.

Cross-Loadings Analysis			
	Y ₁	Y ₂	Y ₃
x ₁₁	0.75	0.49	0.41
x ₁₂	0.83	0.27	0.35
x ₂₁	0.55	0.82	0.60
x ₂₂	0.45	0.82	0.42
x ₃₁	0.43	0.53	0.87
x ₃₂	0.42	0.55	0.84

Table 8 Cross-Loadings Analysis ⁴⁶⁴

Y₁₋₃ represent the latent variables measured by two indicators each. In this case the loadings do exceed the cross-loadings. For example, x₂₂ exhibits the highest loading on its belonging construct Y₂ as do the other indicators. Thus, in the table above discriminant validity is satisfied.

2. Fornell-Larcker criterion for constructs

The Fornell-Larcker criterion can also be used to judge discriminant validity for constructs. It is calculated by taking the square root of the AVE (average variance extracted) and compare the results to the correlations of all other latent variables. The results should always be higher.⁴⁶⁵

Fornell-Larcker Criterion				
	Y ₁	Y ₂	Y ₃	Y ₄
Y ₁	$\sqrt{AVE_{Y_1}}$			
Y ₂	$CORR_{Y_1Y_2}$	$\sqrt{AVE_{Y_2}}$		
Y ₃	$CORR_{Y_1Y_3}$	$CORR_{Y_2Y_3}$	<i>Formative measurement model</i>	
Y ₄	$CORR_{Y_1Y_4}$	$CORR_{Y_2Y_4}$	$CORR_{Y_3Y_4}$	<i>Single-item construct</i>

Table 9 Fornell-Larcker Criterion ⁴⁶⁶

The table describes a PLS path model consisting of two reflective constructs (Y₁₋₂) one formative constructs (Y₃) and a single-item construct (Y₄). The Fornell-Larcker criterion is only used for reflective multi-item constructs since this holds for average extracted variance (AVE) as well. The square root of each construct (AVE Y₁ Y₂) needs to be larger than its correlation with the other construct (CORR Y₁Y₂).⁴⁶⁷

⁴⁶⁴ Hair et al. 2017. p.114 exhibit 4.5

⁴⁶⁵ Fornell und Larcker 1981. p.46

⁴⁶⁶ Hair et al. 2017. p.116 exhibit 4.7

⁴⁶⁷ Hair et al. 2017. p.116-ff.

Henseler et al. criticizes the approaches of cross-loadings and the Fornell-Larcker criterion as not reliable for detecting discriminant validity in certain cases (cross-loadings when two constructs are perfectly correlated, Fornell-Larcker when indicator path loadings differ only slightly). He proposes a new concept assessing the heterotrait-monotrait ratio (HTMT) of the correlations. However, since research in this area is still young, the statistics in this research apply the traditional cross-loadings & Fornell-Larcker criterion approach.

3.6.5.1 Overview of relevant quality criteria of the measurement model for reflective constructs

Quality Group	Quality Criterion	Criteria / Value
1. Objectivity	Standardization of survey process	Identical survey conditions / clear instructions / precoded items
2. Reliability	Path (Factor) Loading	>=0,7 (>=0,4)
	Cronbach's Alpha	will be reported but composite reliability is binding
	Composite Reliability	>=0,7 (>=0,6)
	Average extracted variance (AVE)	>=0,5
3. Validity	Cross-loadings for indicators	Each indicator exhibits the largest correlation with its own construct
	Fornell-Larcker criterion for constructs	The square root of the AVE should be higher than the correlations of all other latent variables

Table 10 Overview of relevant quality criteria of the measurement model for reflective constructs

Still, to assess the final applicability of a construct in a model it is not coercively necessary to fulfill all quality criteria of the table at once.⁴⁶⁸ More generally, significance tests (t-tests / p values) are used for the final evaluation of reflective measurement models. This process in PLS-SEM is called bootstrapping.

3.6.5.2 Resampling via Bootstrapping

PLS-SEM doesn't require that the sample data is normally distributed. Thus, parametric significance test cannot be used. The results of a partial-least-squares regression (e.g. path loadings, coefficients, weights) are evaluated by using the nonparametric bootstrapping method.⁴⁶⁹ Bootstrapping in statistics is used as testing method relying on random sampling with replacement. It allows assigning measures of fit (e.g. variance, bias, confidence intervals) to sample distributions. The idea of bootstrapping is that interpretations about a population from a certain sample (Sample to Population) can be modelled via resampling the data basis (use different sub samples from the population) to make interpretations about the original sample (Resampled to Sample). Since the population is not known, the actual error in a sample against the population is also unknown. By using bootstrapping the population is treated as the sample (which is known). Accordingly, the quality of the interpretation of the original sample (using resampled data) becomes quantifiable.⁴⁷⁰

⁴⁶⁸ Homburg und Baumgartner 1995. p.172

⁴⁶⁹ Götz und Liehr-Gobbers 2004. p.722 cf. Chin 1998. p.316

⁴⁷⁰ Efron und Tibshirani 1998. p.4ff.

In PLS-SEM bootstrapping is used to create many random sub samples (bootstrap samples) of the original sample with replacement. Replacement in this context means the population of which the observations are drawn stays identical, it always contains the same elements. Thus, any observation of the bootstrap sample can be included more than once or not at all. The following figure shows an example bootstrapping process:

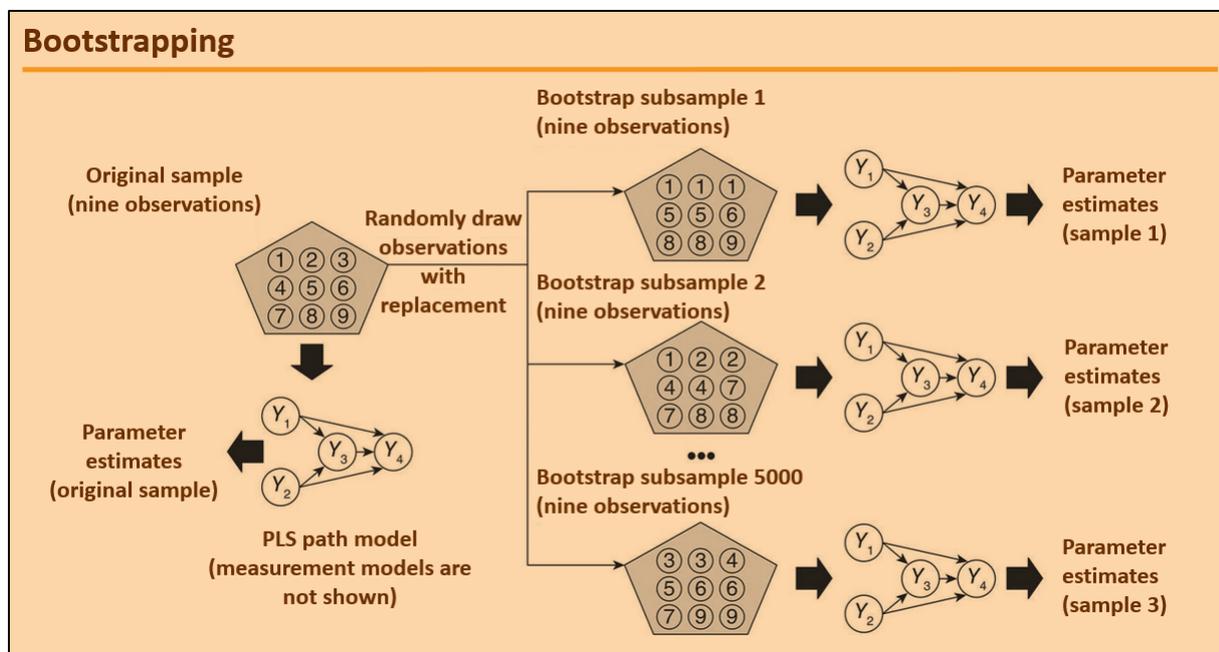


Figure 28 PLS Bootstrapping Algorithm⁴⁷¹

The number of bootstrap samples needs to be at least as large as the number of valid observations, but it is recommended to use at least 5000 bootstrap samples.⁴⁷² For every of these bootstrapping samples the path model will be evaluated, standard error and standard deviation will be calculated. Based on these calculations of the model parameters a t-test is conducted to determine the significance and the error probability of the estimated path loadings, and weight coefficients.⁴⁷³ As quality criteria of the path model the t-test for significance testing must be above 1,965 (significance level of 5% - $\alpha = 0,05$)⁴⁷⁴. PLS-SEM applications can also report p values that are equal to the probability of receiving a t-value at least as large as the one that is drawn. The p value is the probability of a false rejection of a true null hypothesis (assuming a significance when there is not).

Besides quality indicators of the measurement model (outer model) the structural model (inner model) needs to be evaluated as well.

⁴⁷¹ Hair et al. 2017. p.151 exhibit 5.8

⁴⁷² Hair et al. 2017. p.150

⁴⁷³ Weiber und Mühlhaus 2010. p.256

⁴⁷⁴ Schloderer et al. 2011. p.583

3.6.6 Evaluation of the structural model

The structural model represents the underlying concepts of the path model. To determine the model's capability to measure target constructs it is necessary to assess the structural model.⁴⁷⁵

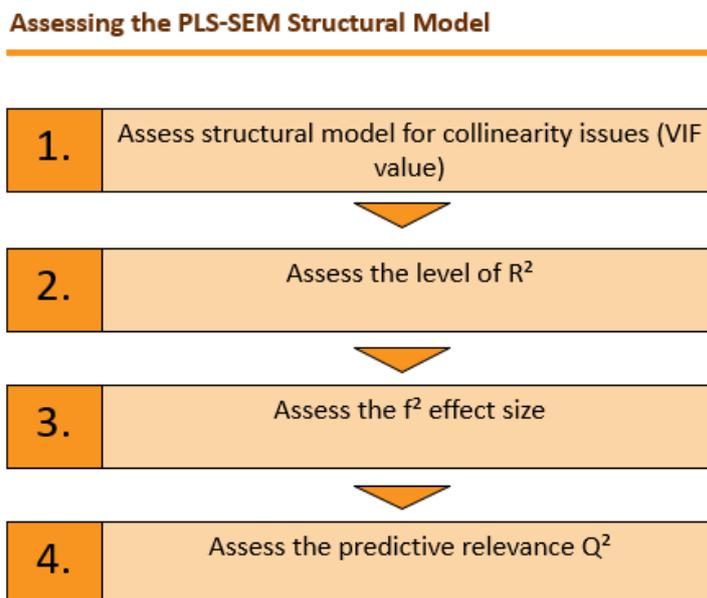


Figure 29 Assessing the PLS-SEM structural model⁴⁷⁶

Step 1. Variance Inflation Factor (VIF Value)

First, the structural model needs to be examined for collinearity issues, because the estimation of the belonging path coefficients is based on regressions of each endogenous variable on its forerunner constructs. Hereby each set of predictor constructs is measured separately for collinearity. Collinearity describes the fact when some IVs are nearly completely predicted by other IVs. Consequently, the estimation of regression coefficients might not be valid, since small fluctuations in the sample (sampling error, measurement error) can have a huge impact on the weights. The variance inflation factor (VIF) is used to determine the collinearity:

$$\text{Variance Inflation Factor: } \text{VIF}_j = \frac{1}{1 - R_j^2}$$

Variance Inflation Factor (VIF) values above 5 are considered as critical in terms of collinearity.⁴⁷⁷ In this case the constructs should be eliminated or redesigned.⁴⁷⁸

Step 2. Coefficient of determination - R²

Step two is to examine the coefficient of determination (R²) of the structural model. It is the most commonly used measure for evaluation. R² measures how much variance (in percent) is explained by the latent

⁴⁷⁵ Hair et al. 2017. p.190

⁴⁷⁶ Hair et al. 2017.adapted from p.191

⁴⁷⁷ Hair et al. 2017. p.194

⁴⁷⁸ Götz und Liehr-Gobbers 2004. p.730

construct. Thus, R^2 describes the model's predictive power. It ranges from 0 to 1, the higher the value the better the predictive power. R^2 is calculated as follows:⁴⁷⁹

$$\text{Coefficient of determination: } R^2 = 1 - \frac{\sum_{i=1}^M (y_i - \hat{y}_i)^2}{\sum_{i=1}^M (y_i - \bar{y}_i)^2}$$

Ringle and Chin suggest different target ranges for the coefficient of determination. Values above 0,67 are considered as strong, values between 0,33-0,67 as moderate and values between 0,19 – 0,33 as weak (but acceptable).^{480 481}

Step 3. Effect size - f^2

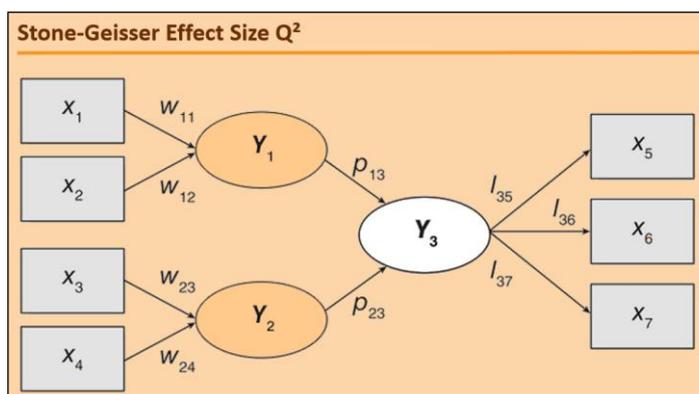
The effect size describes in how far an exogenous variable has an impact on an endogenous latent variable. In more detail it tracks the change in the R^2 value of an endogenous construct when a specified exogenous construct is removed from the model.⁴⁸² It is calculated as follows:

$$\text{Effect size: } f^2 = \frac{R_{included}^2 - R_{excluded}^2}{1 - R_{included}^2}$$

The following value ranges are used to assess f^2 : below 0,02 (no effect), 0,02-0,15 (small effect) 0,15-0,35 (medium effect), above 0,35 (large effect) of the exogenous latent variable.⁴⁸³

Step 4. Predictive relevance – Q^2

Stone and Geisser in 1974 introduced the predictive relevance measure Q^2 . It is an indicator of the model's out of sample predictive power. Q^2 describes how well the original gathered empirical sample data can be reconstructed when using the path model.⁴⁸⁴ A PLS path model has predictive relevance when it is able to predict data that was not used during the model estimation. This is achieved by using a blindfold algorithm which neglects data elements of the original sample and continuously predicts those omitted elements by using the remaining data elements. The result is the difference between the original (omitted) element of the sample data and the predicted value. Blindfolding is used for endogenous constructs that have exogenous measurement models and endogenous single-item constructs.⁴⁸⁵



⁴⁷⁹ Backhaus et al. 2015. p.75

⁴⁸⁰ Chin 1998. p.323

⁴⁸¹ Ringle 2004. p.15

⁴⁸² Hair et al. 2017. p.201

⁴⁸³ Chin 1998. p.317

⁴⁸⁴ Götz und Liehr-Gobbers 2004. p.317

⁴⁸⁵ Hair et al. 2017. p.202

Figure 30 Stone-Geisser Effect Size Q² example ⁴⁸⁶

The procedure of blindfolding is a two-step process. First the Y₃ score is predicted by the PLS-SEM algorithm. Thus, Y₃ is predicted by using Y₁, Y₂ (latent variables scores) and the belonging structural model coefficients p₁₃ and p₂₃. These estimations differ from the actual scores of Y₃ because they stem from estimates of the structural model instead of using the measurement model. Next, the predicted scores for Y₃ are used to predict the missing data points of the measurement model (x₅, x₆, x₇ in subsequent blindfolding rounds). If the predicted values are very close to the original values, then the path model has a strong predictive power. The prediction errors together with the mean of the remaining data (trivial prediction error) is used to calculate Q²:⁴⁸⁷

$$\text{Stone-Geisser Effect Size: } Q^2 = 1 - \frac{\sum_i E_{ji}}{\sum_i O_{ji}}$$

Q² values above 0 indicate that the model has predictive power for a specific endogenous construct. Negative values indicate the opposite (lack of predictive power).

3.6.6.1 Overview of relevant quality criteria of the structural model in the research context

Quality Criterion	Value
Variance Inflation Factor (VIF collinearity check)	>=5 -> critical collinearity <5 -> acceptable collinearity
Coefficient of determination - R ² (explained variance)	>=0,19 <= 0,33 -> weak (but acceptable) >0,33 <= 0,67 -> moderate >0,67 -> strong
Effect size - f ² of an exogenous latent variable	<0,02 -> no effect >= 0,02 <= 0,15 -> small effect >0,15 <= 0,35 -> medium effect >0,35 -> large effect
Predictive relevance – Q ²	>0 -> predictive power is present <0 -> lack of predictive power

Table 11 Overview of relevant quality criteria of the structural model in the research context

3.6.7 Settings and Tool (SmartPLS)

Calculations for this research have been conducted with SmartPLS v.3.2.7⁴⁸⁸ using the following settings:

PLS Algorithm:

- Weighting Scheme: Path
- Maximum Iterations: 300
- Stop Criterion (10^{-X}): 7
- No Lohmoeller Settings
- Missing Values: Mean Replacement
- No Weighting Vector

⁴⁸⁶ Hair et al. 2017. p.202 exhibit 6.6

⁴⁸⁷ Hair et al. 2017. p.206

⁴⁸⁸ SmartPLS GmbH.accessed 17.11.2018

Bootstrapping:

- Subsamples: 5000 (with parallel processing)
- No Sign Changes
- Amount of Results: Complete Bootstrapping
- Confidence Interval Method: Bias-Corrected and Accelerated (BCa) Bootstrap
- Test Type: Two Tailed
- Significance Level: 0,05

Blindfolding (Q²):

- Omission Distance: 7

Partial Least Squares Algorithm Read more!

The PLS path modeling method was developed by Wold (1982). In essence, the PLS algorithm is a sequence of regressions in terms of weight vectors. The weight vectors obtained at convergence satisfy fixed point equations (see Dijkstra, 2010, for a general analysis of these equations).

Setup Missing Values Weighting

Basic Settings

Weighting Scheme Centroid Factor Path

Maximum Iterations: 300

Stop Criterion (10^{-X}): 7

Advanced Settings

Initial Weights Use Lohmoeller Settings
or configure [individual initial weights](#)

Basic Settings

Weighting Scheme

PLS-SEM allows the user to apply three structural model weighting schemes:

- (1) centroid weighting scheme,
- (2) factor weighting scheme, and
- (3) path weighting scheme (default).

While the results differ little for the alternative weighting schemes, path weighting is the recommended approach. This weighting scheme provides the highest R² value for endogenous latent variables and is generally applicable for all kinds of PLS path model specifications and estimations. Moreover, when the path model includes higher-order constructs (often called second-order models), researchers should usually not use the centroid weighting scheme.

Maximum Iterations

This parameter represents the maximum number of iterations that will be used for calculating the PLS results. This number should be sufficiently large (e.g., 300 iterations). When checking the PLS-SEM result, one must make sure that the algorithm did not stop because the maximum number of iterations was reached but due to the stop criterion. Note: The selection of 0 for the maximum number of iterations allows you to obtain results of the sum scores approach.

Stop Criterion

The PLS algorithm stops when the change in the outer weights between two consecutive iterations is smaller than this stop criterion value (or the maximum number of iterations is reached). This value should be sufficiently small (e.g., 10⁻⁵ or 10⁻⁷).

Advanced Settings

After Calculation: Open Full Report Close Start Calculation

Figure 31 SmartPLS - Settings for Partial Least Squares Algorithm

3.6.8 Deriving Path Models

Based on the research model as shown in section 3.1 the following master path model can be derived in SmartPLS:

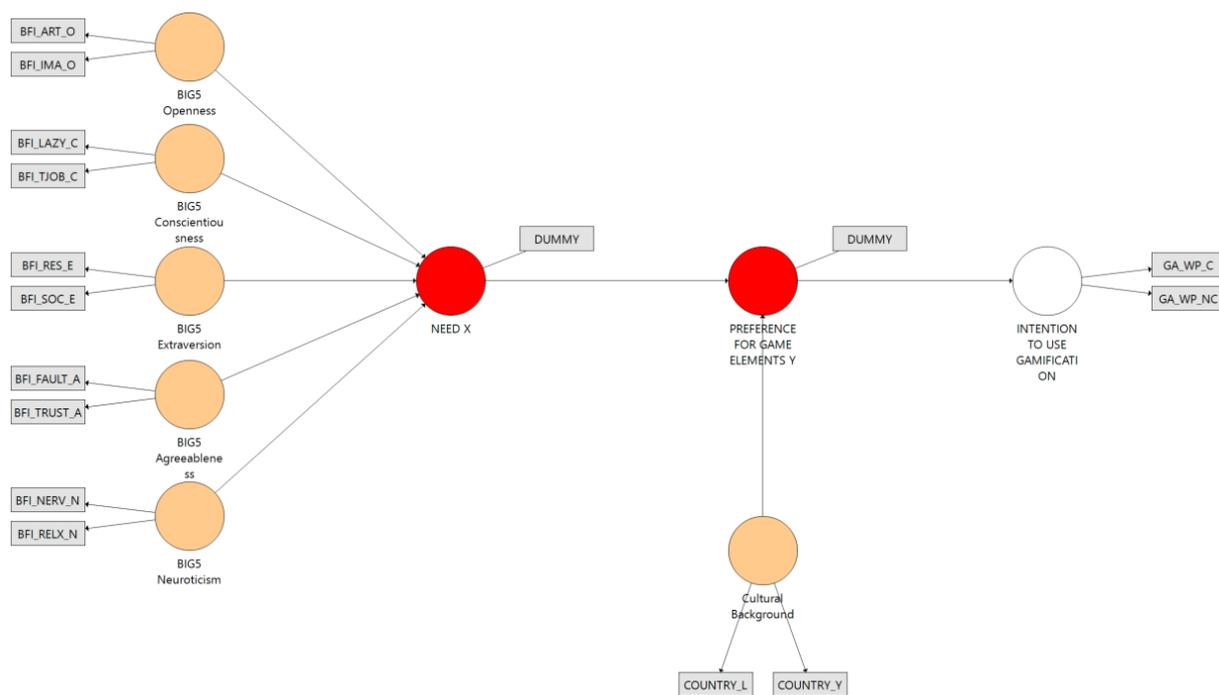


Figure 32 Path model visualization

While the orange and white constructs (personality traits, cultural background, intention to use gamification) remain unchanged over all identified needs (HN01-HN11), the red constructs (human work-related needs and belonging gamification preferences) are modeled separately for each derived need, creating a total of 11 path models.⁴⁸⁹

3.7 Interim Summary

This chapter introduced the research design of univariate and multivariate statistical analysis based on survey data (online questionnaire) and the previously derived research model. First, the research questions were translated into general hypotheses. These are:

- H1:** A correlation between a BIG5 dimension and a NEED is significant.
- H2A:** A correlation between a NEED and a PREFERENCE FOR GAME ELEMENTS is significant.
- H2B:** A correlation between CULTURAL BACKGROUND and a PREFERENCE FOR GAME ELEMENTS is significant.
- H3:** A correlation between a PREFERENCE FOR GAME ELEMENTS and the INTENTION TO USE GAMIFICATION is significant.

These hypotheses were conceptualized and operationalized into a total of 11 path models (for the identified 11 work-related human needs) in section 3.4.

Univariate and multivariate analysis represents statistical methods to investigate relationships in data samples. Univariate analysis is used to research a distribution of one variable from distributions of other

⁴⁸⁹ Compare to 3.4 Deriving the detailed research models (HN01-HN11)

(several) variables. Thus, univariate analysis represents a one-dimensional measurement category. In contrast multivariate analysis can use more variables to discover relationships. The goal in multivariate analysis is to determine a variable's specific impact on certain outcomes. Both types of analysis will be applied in this research.

Structural equation modelling (SEM) belongs to multivariate analysis methods and is suitable for analyzing complex interdependencies of variables and constructs. It is frequently used in economic and social science to assess relationships between unobservable 'latent' constructs. Latent constructs exist when measurement of a certain phenomenon is abstract, complex or not direct observable (i.e, customer satisfaction or trust).⁴⁹⁰ Due to the sample size and quality requirements for parameter estimation this research uses variance-based path modelling where smaller sample sizes can produce valid results. The results are verified by using the quality criteria discussed with discriminant validity being the predominant quality criteria. Furthermore, significance tests (t-test) will be applied via the bootstrapping approach. Content validity is ensured by the operationalization of constructs. An online survey will serve as data basis for the univariate and multivariate analysis.

Chapter 4 will next list the plain results of the univariate and multivariate analysis, before those are discussed and interpreted in chapter 5.

⁴⁹⁰ Hair et al. 2017. p.5

4 Results

The result chapter only lists plain empirical results, before those are explained, analyzed and discussed in chapter 5 Discussion.

4.1 Univariate analysis

4.1.1 Demographics

These demographic results are explained and interpreted in section 5.2.1.

Demographic attribute	Categories	Variable	Sample results (360 samples)
1. Gender	1 Male 2 Female	SEX	242 Male (67%) 114 Female (32%) 4 n/a (1%)
2. Age	1 17 or younger 2 18-20 3 21-29 4 30-39 5 40-49 6 50-59 7 60 or older	AGE	0 17 or younger (0%) 3 18-20 (1%) 112 21-29 (31%) 146 30-39 (41%) 70 40-49 (19%) 26 50-59 (7%) 2 60 or older (1%) 1 n/a (0%)
3. School education	1 Less than high school degree 2 High school degree 3 Some college but no degree 4 Associate degree 5 Bachelor degree 6 Graduate degree	EDU	0 Less than high school degree (0%) 20 High school degree (6%) 18 Some college but no degree (5%) 79 Associate degree (22%) 86 Bachelor degree (24%) 156 Graduate degree (43%) 1 n/a (0%)
4. Job Level	1 Owner/Executive/C-Level 2 Senior Management 3 Middle Management 4 Intermediate 5 Entry Level	C_JOBLEVEL	44 Owner/Executive/C-Level (12%) 56 Senior Management (16%) 85 Middle Management (24%) 150 Intermediate (42%) 16 Entry Level (4%) 9 n/a (2%)
5. Video Game Players (Average hours per day)	1 None 2 1 to 3 hours 3 4 to 6 hours 4 7 to 9 hours 5 10 hours or more	VGAMES	93 None (26%) 101 1 to 3 hours (28%) 82 4 to 6 hours (23%) 46 7 to 9 hours (13%) 38 10 hours or more (11%)
6. Company age	1 0-5 years 2 6-25 years 3 26-50 years 4 >50 years 5 >100 years	C_AGE	40 0-5 years (11%) 190 6-25 years (53%) 68 26-50 years (19%) 30 >50 years (8%) 28 >100 years (8%) 4 n/a (1%)
7. Company size (Employee count)	1 1-10 2 11-100 3 101-250 4 251-2000 5 more than 2000	C_N_EMP	39 1-10 (11%) 74 11-100 (21%) 36 101-250 (10%) 100 251-2000 (28%) 98 more than 2000 (27%) 13 n/a (4%)
8. Team size (Team member count)	1 1-4 2 5-15 3 16-50 4 51-100	C_TEAMSIZ	72 1-4 (20%) 148 5-15 (41%) 80 16-50 (22%) 14 51-100 (4%) 46 n/a (13%)

Table 12 Sample Demographics ⁴⁹¹

⁴⁹¹ For further information on the sample characteristics please refer to 5.2 Evaluation of univariate results

4.1.2 Cultural Background Differentiation

Cultural background differentiation results are explained and interpreted in section 5.2.2.

Filter COUNTRY_L + COUNTRY_Y (200 Germany responses / 152 India responses)

To which extent would you agree if the following game elements would be introduced to your workplace?

Scale: 1=Not at all suitable - 5=Extremely suitable

	\bar{x} Germany (σ) ⁴⁹²	\bar{x} India (σ) ⁴⁹³	Culture Δ ⁴⁹⁴
PURPOSE GOALS RESPONSIBILITY (HN01)			
Work activities are organized in the context of fantasy stories that are interesting or exciting for you.			
GE_PC1	2,73 (0,96)	3,84 (1,05)	1,11
Work activities are organized in the form of topical stories that have relevance for the employee or consider the circumstances of his life.			
GE_PC2	2,83 (0,96)	3,87 (0,87)	1,04
The goals of the work activities are complemented by virtual objectives which have to be achieved by the employees to make progress in a fantasy story. The progress in the fantasy story will be visible for colleagues.			
GE_PC3C	2,75 (0,95)	3,86 (0,82)	1,11
SOCIAL BELONGING (HN02)			
You receive social appeals as a reward (e.g. excursions with chosen colleagues to special places)			
GE_SI1	2,92 (1,18)	4,01 (0,98)	1,09
Some work activities are organized in a way that they can only be accomplished by cooperating with each other.			
GE_SI2	3,10 (1,07)	4,18 (0,89)	1,08
Some work activities are of competitive nature, so that employees compete with their colleagues			
GE_SI3C	2,40 (1,06)	4,10 (0,93)	1,70
IMAGE / RECOGNITION (HN03)			
The working environment features sound effects and background music. These give the employee a feedback for his operational principles.			
GE_FB1	2,58 (1,03)	3,92 (0,96)	1,34
After certain work packages you receive direct feedback (e.g. from principles or colleagues) which rates your behavior positively or negatively.			
GE_FB2	3,44 (1,09)	4,18 (0,94)	0,74
Received feedback will be documented and kept visible for colleagues.			
GE_FB3C	2,65 (1,07)	4,01 (1,02)	1,36
By achieving objectives, you receive status symbols such as an own office or a better parking option.			
GE_S1	2,71 (1,22)	4,02 (1,01)	1,31
For desired activities employees are rewarded with privileges, such as the participation in exclusive events or access to exclusive areas.			

⁴⁹² Mean value of German sample (standard deviation value of the sample in the bracket) – scale 1-5

⁴⁹³ Mean value of Indian sample (standard deviation value of the sample in the bracket) – scale 1-5

⁴⁹⁴ Difference (Delta) between the mean values of the two samples – For example a cultural delta of 1 represents that the 1-5 likert scale was answered with 1 point difference on average between the two cultures. Standard deviations need to be regarded when interpreting the delta results, these are shown in brackets next to the mean values.

GE_S2	2,91 (1,26)	4,02 (1,00)	1,11
-------	-------------	-------------	------

For desired activities employees are assigned to managerial functions, which scale them up in the corporate hierarchy.

GE_S3	3,18 (1,09)	4,08 (0,95)	0,90
-------	-------------	-------------	------

INFLUENCE / POWER (HN04)

By achieving objectives, you receive status symbols such as an own office or a better parking option.

GE_S1	2,71 (1,22)	4,02 (1,01)	1,31
-------	-------------	-------------	------

For desired activities employees are rewarded with privileges, such as the participation in exclusive events or access to exclusive areas.

GE_S2	2,91 (1,26)	4,02 (1,00)	1,11
-------	-------------	-------------	------

For desired activities employees are assigned to managerial functions, which scale them up in the corporate hierarchy.

GE_S3	3,18 (1,10)	4,08 (0,95)	0,90
-------	-------------	-------------	------

COMPETITION (HN05)

Received feedback will be documented and kept visible for colleagues.

GE_FB3C	2,65 (1,07)	4,01 (1,02)	1,36
---------	-------------	-------------	------

The goals of the work activities are complemented by virtual objectives which have to be achieved by the employees to make progress in a fantasy story. The progress in the fantasy story will be visible for colleagues.

GE_PC3C	2,75 (0,95)	3,86 (0,82)	1,11
---------	-------------	-------------	------

Leaderboards compare colleagues concerning their performance (e.g. "Top 5 Employee of the month").

GE_RL1	2,29 (1,20)	4,09 (0,95)	1,80
--------	-------------	-------------	------

Leaderboards show your ranking compared to other colleagues without the visibility of the names.

GE_RL2	2,53 (1,30)	3,91 (1,08)	1,38
--------	-------------	-------------	------

Leaderboards show your ranking compared to other colleagues - Each name on the leaderboard will be visible.

GE_RL3C	2,11 (1,17)	4,03 (1,07)	1,92
---------	-------------	-------------	------

Your virtual character competes with other characters. Within the roleplaying you compete with your colleagues.

GE_VC3C	2,20 (1,19)	4,00 (1,02)	1,80
---------	-------------	-------------	------

ACHIEVEMENT / REWARD (HN06)

Your tasks will be presented as challenges, which you have to cope with (e.g. Finish 10 tasks within the next 8 hours)

GE_C1	2,94 (1,04)	4,12 (0,90)	1,18
-------	-------------	-------------	------

The challenges for an employee are rated by difficulty, so that the employee is always engaged to his highest abilities and therefore continuously improves.

GE_C2	3,23 (1,06)	3,95 (0,97)	0,72
-------	-------------	-------------	------

For desired activities you are rewarded with corporate goods. For instance, you are able to get a company vehicle or a better smartphone.

GE_MR1	3,19 (1,28)	4,06 (1,02)	0,87
--------	-------------	-------------	------

For desired activities employees are rewarded with bonus payments.

GE_MR2	3,57 (1,11)	4,26 (0,99)	0,69
--------	-------------	-------------	------

You are able to collect points during work (e.g. constructive contributions in meetings)

GE_P1	2,89 (1,14)	3,85 (0,95)	0,96
-------	-------------	-------------	------

Points for the employees will be received by completion of single or multiple desired activities.

GE_P2	3,12 (1,22)	3,97 (0,92)	0,85
-------	-------------	-------------	------

MASTERY / ADVANCEMENT (HN07)

You are able to attain achievements (badges) in terms of graphics or expressions (e.g. "5-Star Troubleshooter") for the completion of goals.

GE_B1	2,65 (1,34)	3,94 (1,03)	1,29
-------	-------------	-------------	------

Badges are primarily being awarded for voluntary goals, which are achieved beyond the employee's main activity.

GE_B2	2,70 (1,38)	3,99 (0,96)	1,29
-------	-------------	-------------	------

Badges represent the performed accomplishments which are visible for colleagues.

GE_B3C	2,62 (1,31)	3,92 (1,02)	1,30
--------	-------------	-------------	------

You are able to continuously reach higher levels. Level up's can be achieved by continuous positive outcomes which match targeted goals.

GE_L1	3,05 (1,35)	4,04 (0,99)	0,99
-------	-------------	-------------	------

Over time, the level of an employee represents his work experience and his professional success.

GE_L2	3,02 (1,33)	3,96 (0,97)	0,94
-------	-------------	-------------	------

Reached levels will be visible for some colleagues to allow comparisons among themselves.

GE_L3C	2,75 (1,22)	3,86 (0,96)	1,11
--------	-------------	-------------	------

SELF EXPRESSION (HN08)

You take the role of a virtual character (e.g. your favorite character which you virtually and temporarily play during work).

GE_VC1	2,29 (1,21)	4,20 (0,84)	1,91
--------	-------------	-------------	------

Cooperative work activities are carried out by multiple workers, who participate with their virtual character in a roleplaying game.

GE_VC2	2,43 (1,25)	4,09 (0,88)	1,66
--------	-------------	-------------	------

Your virtual character competes with other characters. Within the roleplaying you compete with your colleagues.

GE_VC3C	2,20 (1,19)	4,00 (1,02)	1,80
---------	-------------	-------------	------

RELEVANCE / IDEALISM (HN09) identical to HN01

Work activities are organized in the context of fantasy stories that are interesting or exciting for you.

GE_PC1	2,73 (0,96)	3,84 (1,05)	1,11
--------	-------------	-------------	------

Work activities are organized in the form of topical stories that have relevance for the employee or consider the circumstances of his life.

GE_PC2	2,83 (0,96)	3,87 (0,87)	1,04
--------	-------------	-------------	------

The goals of the work activities are complemented by virtual objectives which have to be achieved by the employees to make progress in a fantasy story. The progress in the fantasy story will be visible for colleagues.

GE_PC3C	2,75 (0,95)	3,86 (0,82)	1,11
---------	-------------	-------------	------

AUTONOMY (HN10)

You can spend parts of your time organizing the activities after personal preferences (for example to develop own ideas).

GE_AUT1	3,58 (0,85)	4,05 (0,73)	0,47
---------	-------------	-------------	------

For desired activities employees are rewarded with liberties such as freedom of choice regarding the content of work.

GE_AUT2	3,40 (1,01)	4,04 (0,80)	0,64
---------	-------------	-------------	------

For desired tasks employees get a greater amount of self-determination (e.g. extra vacation or flexible working hours).

GE_AUT3	3,42 (0,96)	3,99 (0,88)	0,57
---------	-------------	-------------	------

STRUCTURE SECURITY STABILITY ORDER (HN11)

Transparent rules for gamification system (e.g. clear transparency on which actions will lead to which consequences/outcomes, thereby reducing subjectivity in judgements)

GE_TR 2,93 (1,38) 4,15 (0,88) 1,22

4.2 Multivariate analysis

The visualization of the path model will show the following values: path coefficients (inner model), R² and the outer weights / loadings (outer model). An outline is given in the following figure:

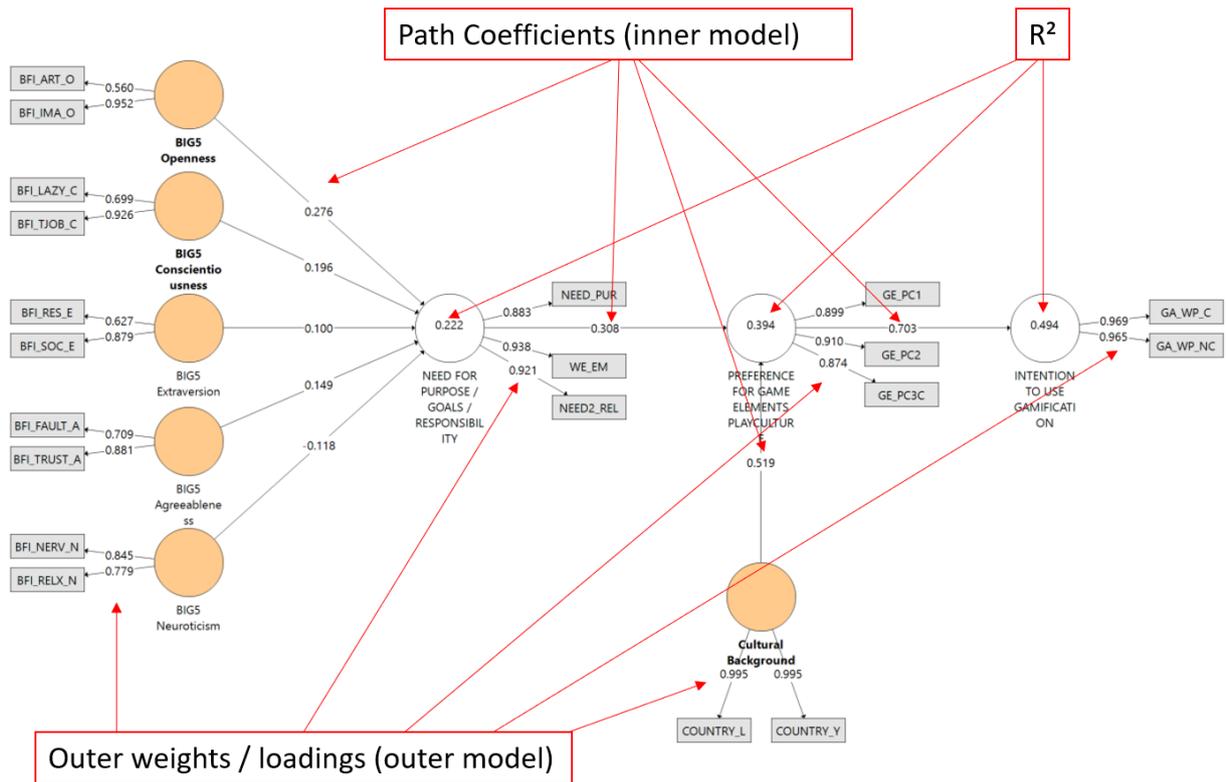


Figure 33 Visualization of results values in the path model

4.2.1 HN01 Purpose Goals Responsibility

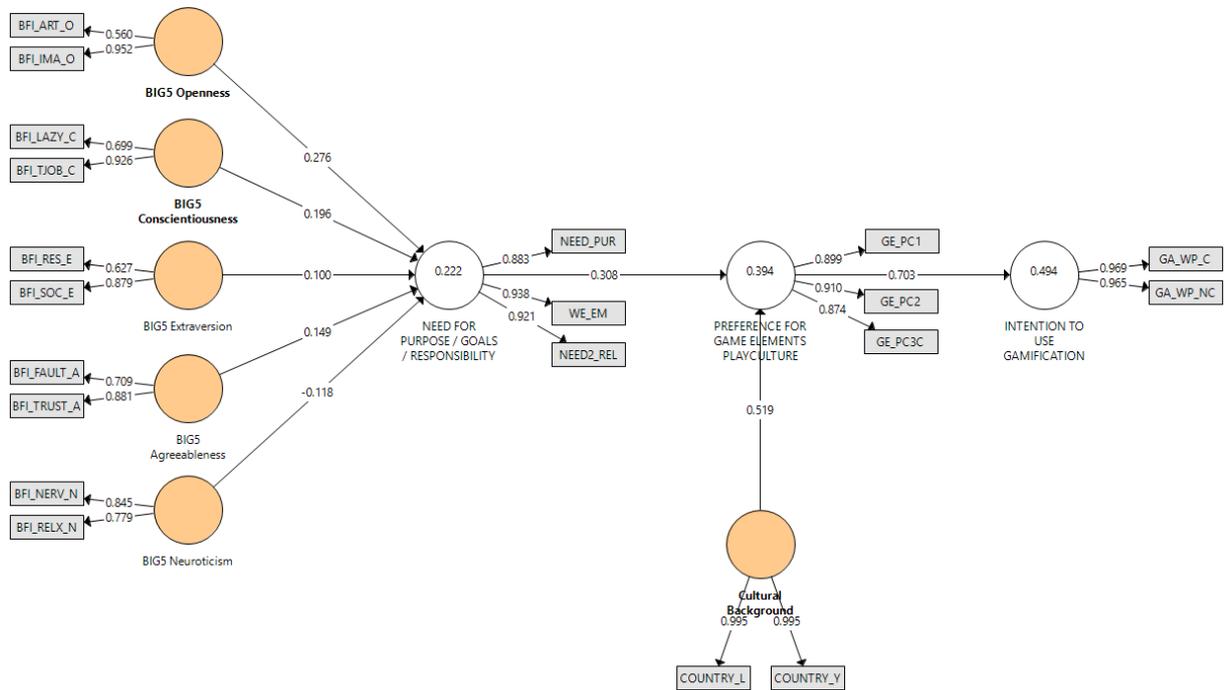


Figure 34 Path Model HN01

Bootstrapping (HN01)	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
BIG5 Agreeableness -> NEED FOR PURPOSE / GOALS / RESPONSIBILITY	0.149	0.149	0.059	2.524	0.012
BIG5 Extraversion -> NEED FOR PURPOSE / GOALS / RESPONSIBILITY	0.100	0.097	0.059	1.700	0.090
BIG5 Conscientiousness -> NEED FOR PURPOSE / GOALS / RESPONSIBILITY	0.196	0.196	0.057	3.455	0.001
BIG5 Openness -> NEED FOR PURPOSE / GOALS / RESPONSIBILITY	0.276	0.277	0.054	5.093	0.000
BIG5 Neuroticism -> NEED FOR PURPOSE / GOALS / RESPONSIBILITY	-0.118	-0.109	0.054	2.176	0.030
NEED FOR PURPOSE / GOALS / RESPONSIBILITY -> PREFERENCE FOR GAME ELEMENTS	0.308	0.310	0.040	7.652	0.000
Cultural Background -> PREFERENCE FOR GAME ELEMENTS PLAYCULTURE	0.519	0.518	0.034	15.492	0.000
PREFERENCE FOR GAME ELEMENTS PLAYCULTURE -> INTENTION TO USE	0.703	0.704	0.026	27.270	0.000

Table 13 Bootstrapping HN01⁴⁹⁵

⁴⁹⁵ For all additional quality criteria as discussed in 3.6.5 and 3.6.6 please refer to the appendix.

4.2.2 HN02 Social Belonging

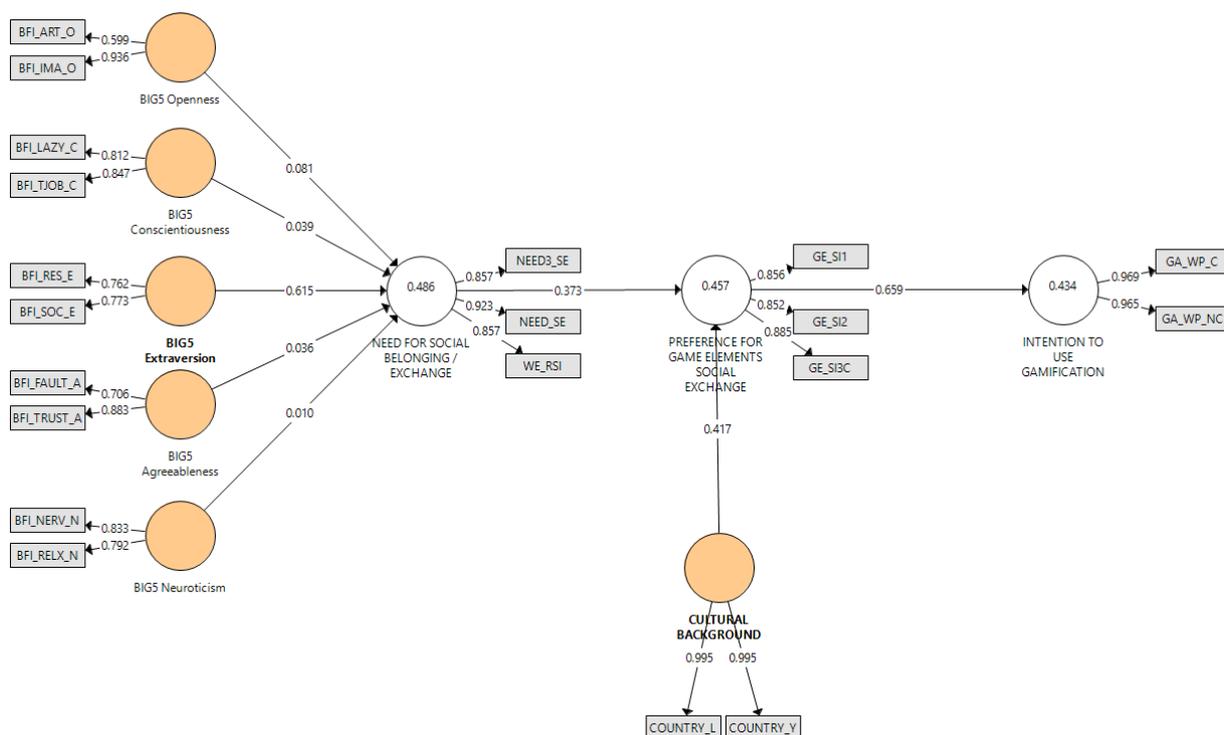


Figure 35 Path Model HN02

Bootstrapping (HN02)	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
BIG5 Agreeableness -> NEED FOR SOCIAL BELONGING / EXCHANGE	0.036	0.037	0.046	0.784	0.433
BIG5 Conscientiousness -> NEED FOR SOCIAL BELONGING / EXCHANGE	0.039	0.036	0.050	0.789	0.430
BIG5 Extraversion -> NEED FOR SOCIAL BELONGING / EXCHANGE	0.615	0.611	0.041	14.861	0.000
BIG5 Neuroticism -> NEED FOR SOCIAL BELONGING / EXCHANGE	0.010	0.018	0.050	0.201	0.841
BIG5 Openness -> NEED FOR SOCIAL BELONGING / EXCHANGE	0.081	0.082	0.047	1.725	0.085
CULTURAL BACKGROUND -> PREFERENCE FOR GAME ELEMENTS SOCIAL EXCHANGE	0.417	0.422	0.043	9.704	0.000
NEED FOR SOCIAL BELONGING / EXCHANGE -> PREFERENCE FOR GAME ELEMENTS SOCIAL EXCHANGE	0.373	0.371	0.043	8.608	0.000
PREFERENCE FOR GAME ELEMENTS SOCIAL EXCHANGE -> INTENTION TO USE	0.659	0.660	0.031	21.586	0.000

Table 14 Bootstrapping HN02⁴⁹⁶

⁴⁹⁶ For all additional quality criteria as discussed in 3.6.5 and 3.6.6 please refer to the appendix.

4.2.3 HN03 Image Recognition

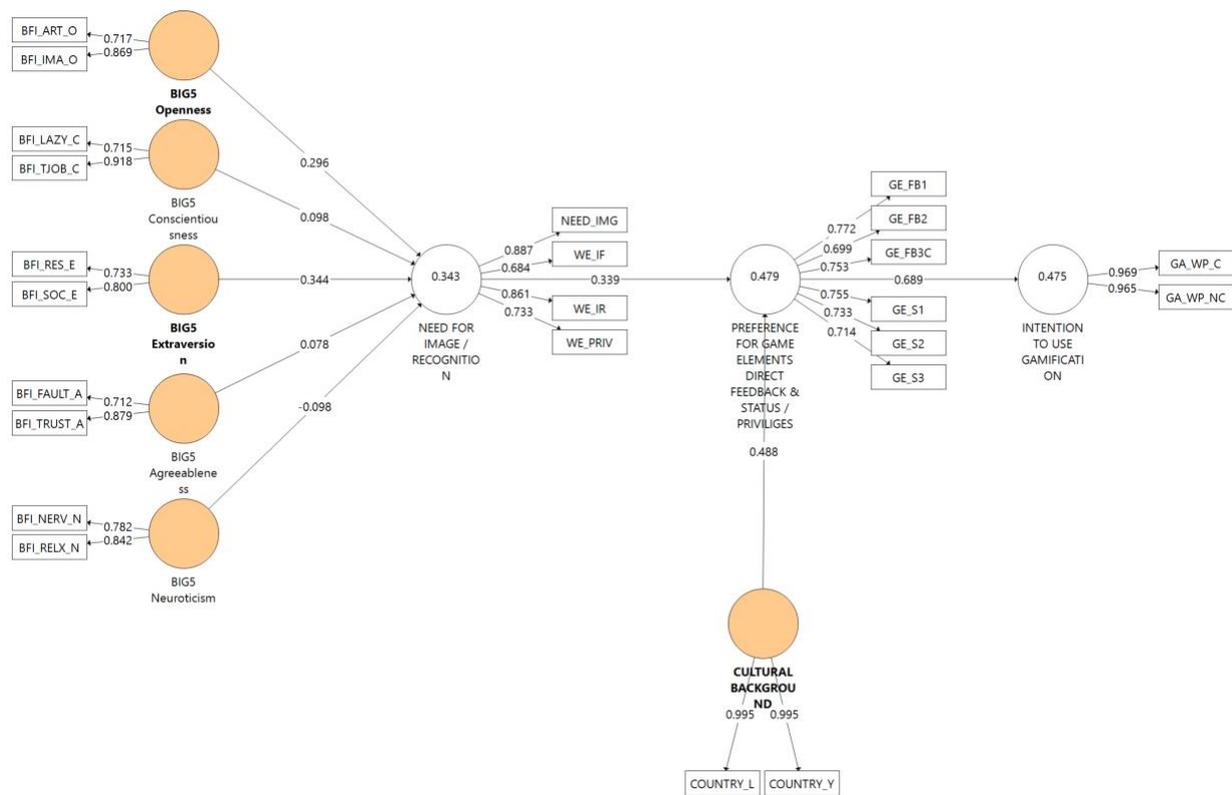


Figure 36 Path Model HN03

Bootstrapping (HN03)	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
BIG5 Agreeableness -> NEED FOR IMAGE / RECOGNITION	0.078	0.080	0.055	1.419	0.156
BIG5 Conscientiousness -> NEED FOR IMAGE / RECOGNITION	0.098	0.099	0.049	2.020	0.044
BIG5 Extraversion -> NEED FOR IMAGE / RECOGNITION	0.344	0.342	0.051	6.687	0.000
BIG5 Neuroticism -> NEED FOR IMAGE / RECOGNITION	-0.098	0.093	0.054	1.834	0.067
BIG5 Openness -> NEED FOR IMAGE / RECOGNITION	0.296	0.296	0.053	5.633	0.000
CULTURAL BACKGROUND -> PREFERENCE FOR GAME ELEMENTS IMAGE / RECOGNITION	0.488	0.492	0.036	13.732	0.000
NEED FOR IMAGE / RECOGNITION -> PREFERENCE FOR GAME ELEMENTS IMAGE / RECOGNITION	0.339	0.338	0.039	8.726	0.000
PREFERENCE FOR GAME ELEMENTS IMAGE / RECOGNITION -> INTENTION TO USE GAMIFICATION	0.689	0.693	0.025	27.631	0.000

Table 15 Bootstrapping HN03⁴⁹⁷

⁴⁹⁷ For all additional quality criteria as discussed in 3.6.5 and 3.6.6 please refer to the appendix.

4.2.4 HN04 Influence Power

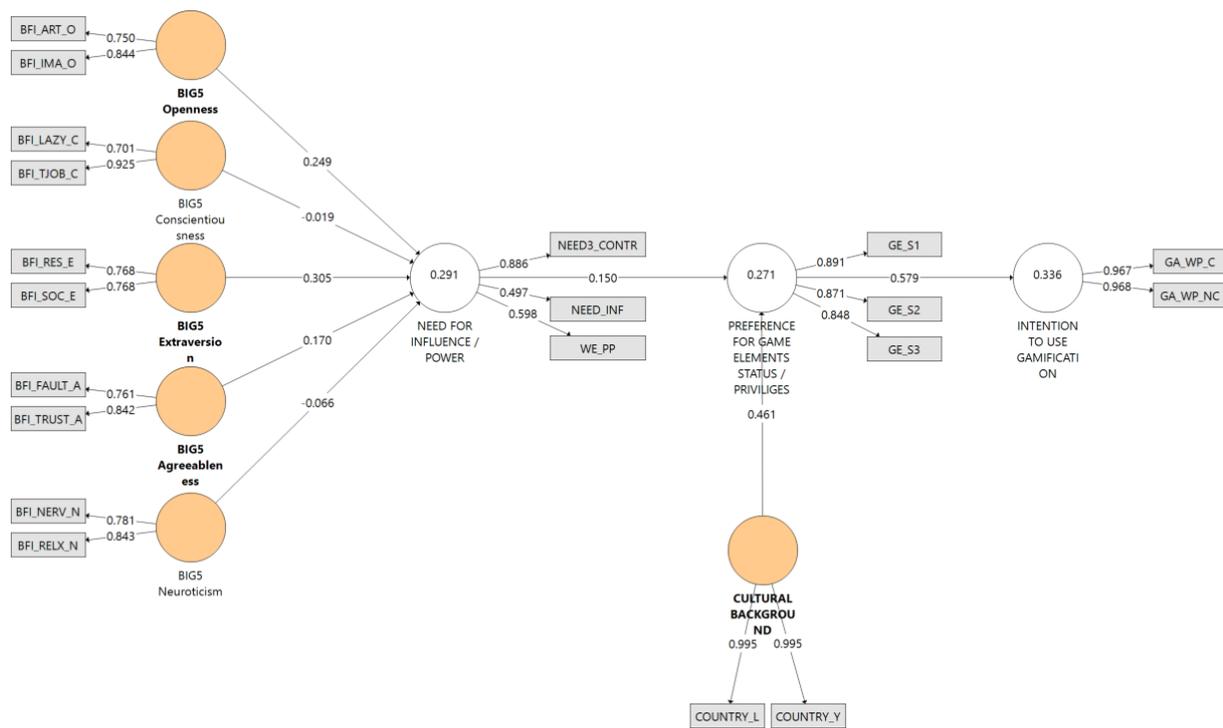


Figure 37 Path Model HN04

Bootstrapping (HN04)	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
BIG5 Agreeableness -> NEED FOR INFLUENCE / POWER	0.170	0.172	0.060	2.843	0.005
BIG5 Conscientiousness -> NEED FOR INFLUENCE / POWER	-0.093	-0.011	0.058	0.333	0.739
BIG5 Extraversion -> NEED FOR INFLUENCE / POWER	0.305	0.299	0.056	5.427	0.000
BIG5 Neuroticism -> NEED FOR INFLUENCE / POWER	-0.066	-0.062	0.061	1.070	0.285
BIG5 Openness -> NEED FOR INFLUENCE / POWER	0.249	0.250	0.047	5.333	0.000
CULTURAL BACKGROUND -> PREFERENCE FOR GAME ELEMENTS STATUS / PRIVILIGES	0.461	0.459	0.040	11.595	0.000
NEED FOR INFLUENCE / POWER -> PREFERENCE FOR GAME ELEMENTS STATUS / PRIVILIGES	0.150	0.155	0.048	3.146	0.002
PREFERENCE FOR GAME ELEMENTS STATUS / PRIVILIGES -> INTENTION TO USE GAMIFICATION	0.579	0.579	0.037	15.630	0.000

Table 16 Bootstrapping HN04⁴⁹⁸

⁴⁹⁸ For all additional quality criteria as discussed in 3.6.5 and 3.6.6 please refer to the appendix.

4.2.5 HN05 Competition

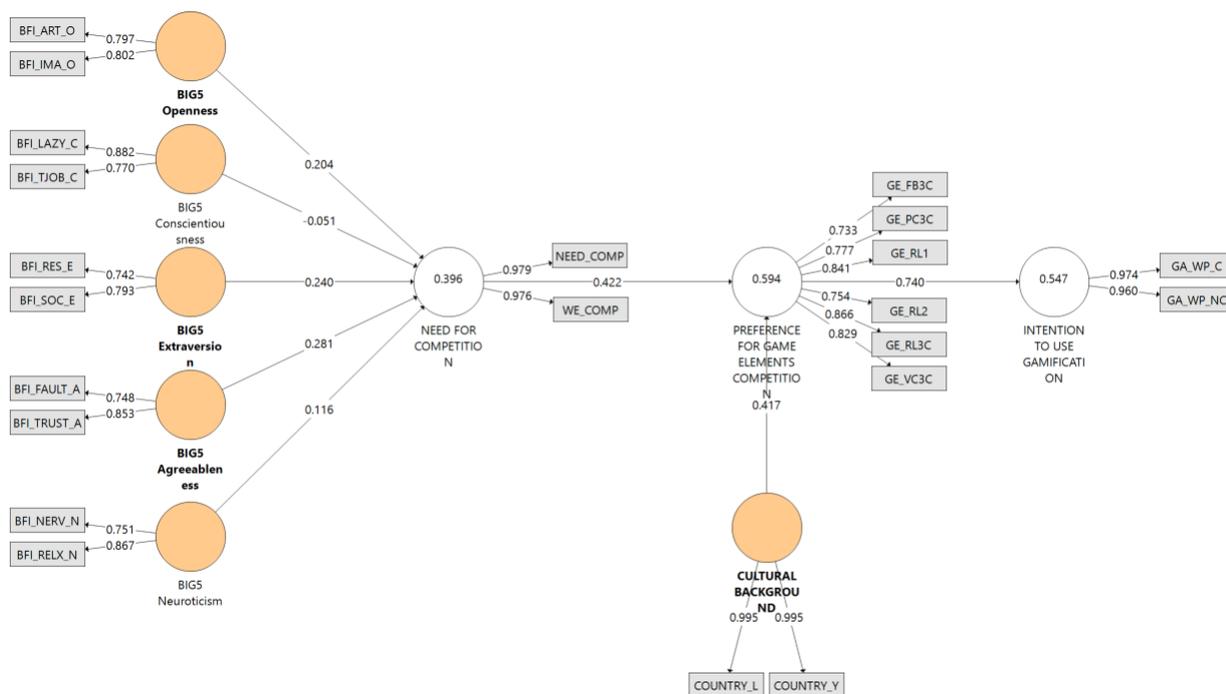


Figure 38 Path Model HN05

Bootstrapping (HN05)	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
BIG5 Agreeableness -> NEED FOR COMPETITION	0.281	0.277	0.048	5.908	0.000
BIG5 Conscientiousness -> NEED FOR COMPETITION	-0.051	-0.048	0.051	1.003	0.317
BIG5 Extraversion -> NEED FOR COMPETITION	0.240	0.243	0.051	4.677	0.000
BIG5 Neuroticism -> NEED FOR COMPETITION	0.116	0.121	0.052	2.217	0.027
BIG5 Openness -> NEED FOR COMPETITION	0.204	0.206	0.049	4.146	0.000
CULTURAL BACKGROUND -> PREFERENCE FOR GAME ELEMENTS COMPETITION	0.417	0.418	0.047	8.934	0.000
NEED FOR COMPETITION -> PREFERENCE FOR GAME ELEMENTS COMPETITION	0.422	0.421	0.048	8.760	0.000
PREFERENCE FOR GAME ELEMENTS COMPETITION -> INTENTION TO USE GAMIFICATION	0.740	0.741	0.022	34.175	0.000

Table 17 Bootstrapping HN05⁴⁹⁹

⁴⁹⁹ For all additional quality criteria as discussed in 3.6.5 and 3.6.6 please refer to the appendix.

4.2.6 HN06 Achievement Reward

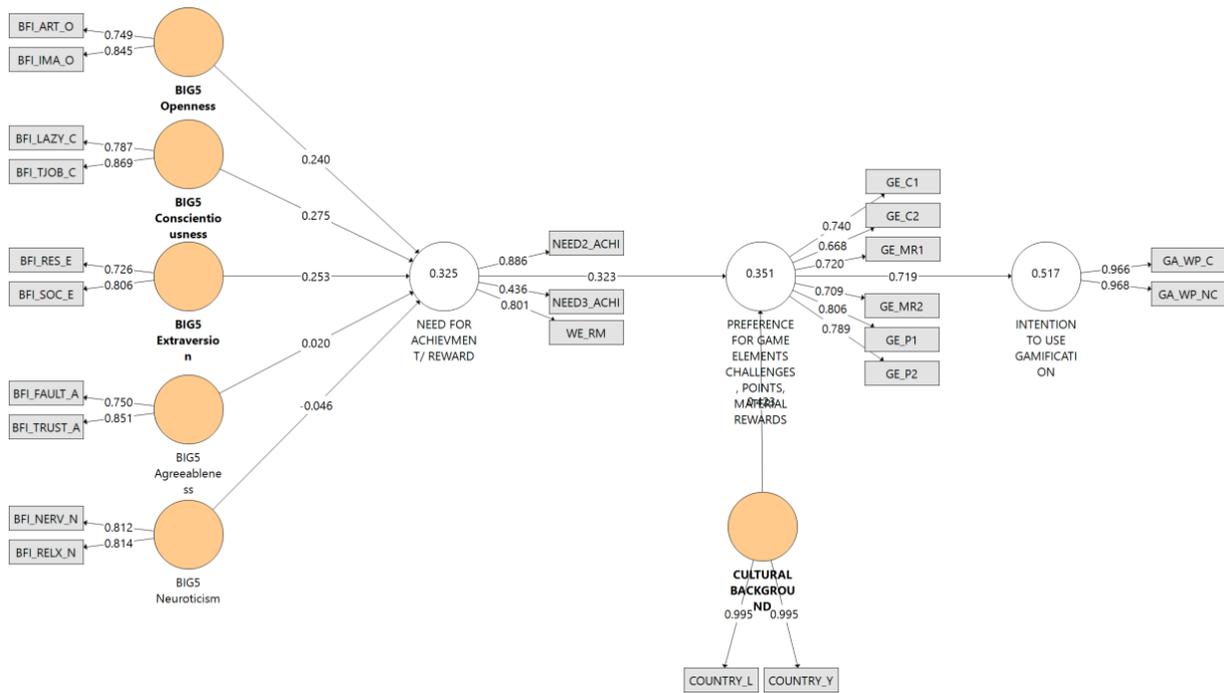


Figure 39 Path Model HN06

Bootstrapping (HN06)	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
BIG5 Agreeableness -> NEED FOR ACHIEVMENT/ REWARD	0.020	0.022	0.058	0.341	0.733
BIG5 Conscientiousness -> NEED FOR ACHIEVMENT/ REWARD	0.275	0.280	0.050	5.458	0.000
BIG5 Extraversion -> NEED FOR ACHIEVMENT/ REWARD	0.253	0.251	0.055	4.617	0.000
BIG5 Neuroticism -> NEED FOR ACHIEVMENT/ REWARD	-0.046	-0.050	0.054	0.852	0.394
BIG5 Openness -> NEED FOR ACHIEVMENT/ REWARD	0.240	0.238	0.054	4.447	0.000
CULTURAL BACKGROUND -> PREFERENCE FOR GAME ELEMENTS CHALLENGES, POINTS, MATERIAL REWARDS	0.423	0.423	0.040	10.495	0.000
NEED FOR ACHIEVMENT/ REWARD -> PREFERENCE FOR GAME ELEMENTS CHALLENGES, POINTS, MATERIAL REWARDS	0.323	0.322	0.046	6.989	0.000
PREFERENCE FOR GAME ELEMENTS CHALLENGES, POINTS, MATERIAL REWARDS -> INTENTION TO USE GAMIFICATION	0.719	0.718	0.023	31.676	0.000

Table 18 Bootstrapping HN06⁵⁰⁰

⁵⁰⁰ For all additional quality criteria as discussed in 3.6.5 and 3.6.6 please refer to the appendix.

4.2.7 HN07 Mastery Advancement

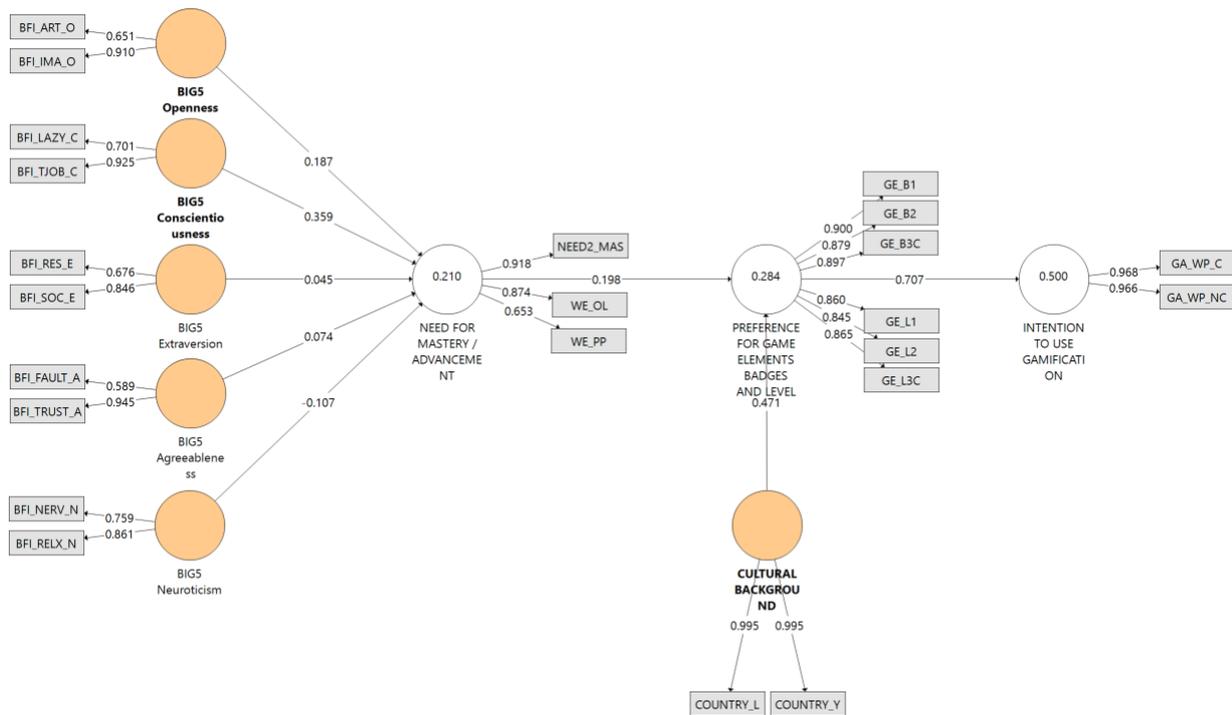


Figure 40 Path Model HN07

Bootstrapping (HN07)	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O /STDEV)	P Values
BIG5 Agreeableness -> NEED FOR MASTERY / ADVANCEMENT	0.074	0.082	0.062	1.202	0.230
BIG5 Conscientiousness -> NEED FOR MASTERY / ADVANCEMENT	0.359	0.353	0.053	6.813	0.000
BIG5 Extraversion -> NEED FOR MASTERY / ADVANCEMENT	0.045	0.047	0.064	0.700	0.485
BIG5 Neuroticism -> NEED FOR MASTERY / ADVANCEMENT	-0.107	-0.098	0.055	1.952	0.051
BIG5 Openness -> NEED FOR MASTERY / ADVANCEMENT	0.187	0.188	0.057	3.298	0.001
CULTURAL BACKGROUND -> PREFERENCE FOR GAME ELEMENTS BADGES AND LEVEL	0.471	0.472	0.036	13.180	0.000
NEED FOR MASTERY / ADVANCEMENT -> PREFERENCE FOR GAME ELEMENTS BADGES AND LEVEL	0.198	0.200	0.041	4.790	0.000
PREFERENCE FOR GAME ELEMENTS BADGES AND LEVEL -> INTENTION TO USE GAMIFICATION	0.707	0.706	0.027	25.858	0.000

Table 19 Bootstrapping HN07⁵⁰¹

⁵⁰¹ For all additional quality criteria as discussed in 3.6.5 and 3.6.6 please refer to the appendix.

4.2.8 HN08 Self Expression

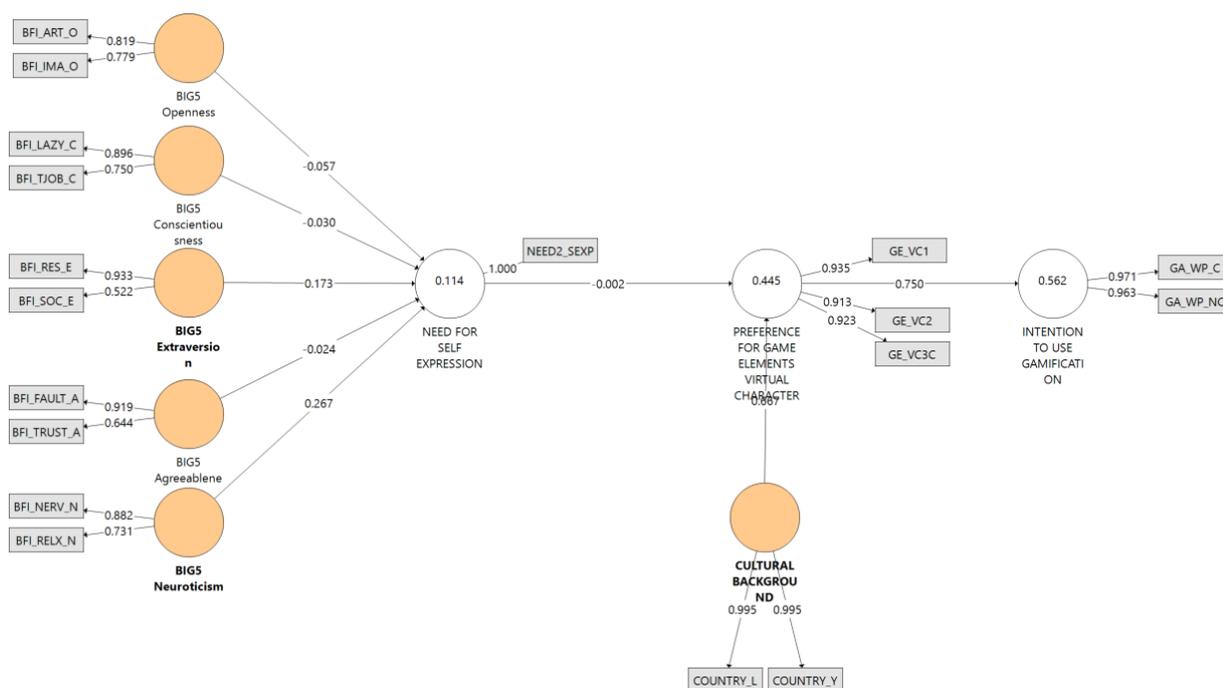


Figure 41 Path Model HN08

Bootstrapping (HN08)	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O /STDEV)	P Values
BIG5 Agreeableness -> NEED FOR SELF EXPRESSION	-0.024	-0.018	0.055	0.440	0.660
BIG5 Conscientiousness -> NEED FOR SELF EXPRESSION	-0.030	-0.022	0.057	0.533	0.594
BIG5 Extraversion -> NEED FOR SELF EXPRESSION	0.173	0.167	0.066	2.635	0.009
BIG5 Neuroticism -> NEED FOR SELF EXPRESSION	0.267	0.256	0.064	4.202	0.000
BIG5 Openness -> NEED FOR SELF EXPRESSION	-0.057	-0.040	0.052	1.088	0.277
CULTURAL BACKGROUND -> PREFERENCE FOR GAME ELEMENTS VIRTUAL CHARACTER	0.667	0.664	0.031	21.503	0.000
NEED FOR SELF EXPRESSION -> PREFERENCE FOR GAME ELEMENTS VIRTUAL CHARACTER	-0.002	-0.001	0.038	0.054	0.957
PREFERENCE FOR GAME ELEMENTS VIRTUAL CHARACTER -> INTENTION TO USE GAMIFICATION	0.750	0.750	0.023	32.506	0.000

Table 20 Bootstrapping HN08⁵⁰²

⁵⁰² For all additional quality criteria as discussed in 3.6.5 and 3.6.6 please refer to the appendix.

4.2.9 HN09 Relevance Idealism

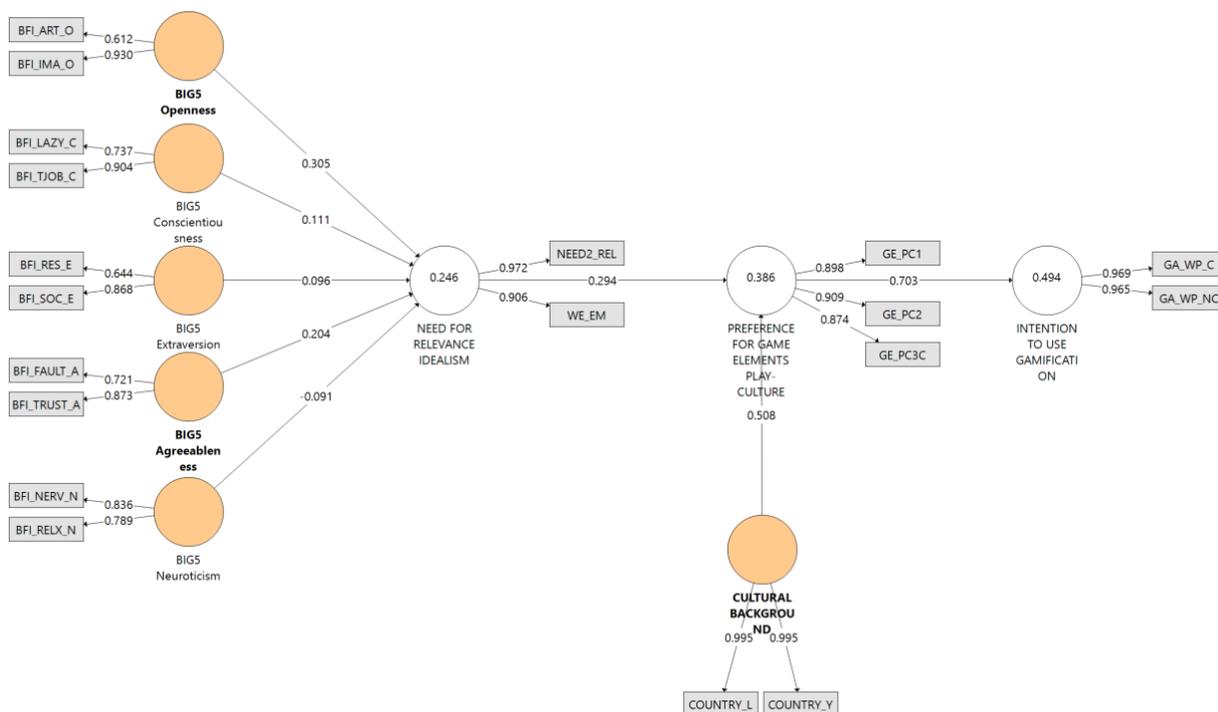


Figure 42 Path Model HN09

Bootstrapping (HN09)	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ((O/STDEV))	P Values
BIG5 Agreeableness -> NEED FOR RELEVANCE IDEALISM	0.204	0.204	0.058	3.548	0.000
BIG5 Conscientiousness -> NEED FOR RELEVANCE IDEALISM	0.111	0.113	0.060	1.849	0.065
BIG5 Extraversion -> NEED FOR RELEVANCE IDEALISM	0.096	0.098	0.055	1.745	0.082
BIG5 Neuroticism -> NEED FOR RELEVANCE IDEALISM	-0.091	-0.085	0.054	1.678	0.094
BIG5 Openness -> NEED FOR RELEVANCE IDEALISM	0.305	0.302	0.053	5.771	0.000
CULTURAL BACKGROUND -> PREFERENCE FOR GAME ELEMENTS PLAY-CULTURE	0.508	0.509	0.034	14.814	0.000
NEED FOR RELEVANCE IDEALISM -> PREFERENCE FOR GAME ELEMENTS PLAY-CULTURE	0.294	0.293	0.042	7.049	0.000
PREFERENCE FOR GAME ELEMENTS PLAY-CULTURE -> INTENTION TO USE GAMIFICATION	0.703	0.705	0.024	28.963	0.000

Table 21 Bootstrapping HN09⁵⁰³

⁵⁰³ For all additional quality criteria as discussed in 3.6.5 and 3.6.6 please refer to the appendix.

4.2.10 HN10 Autonomy

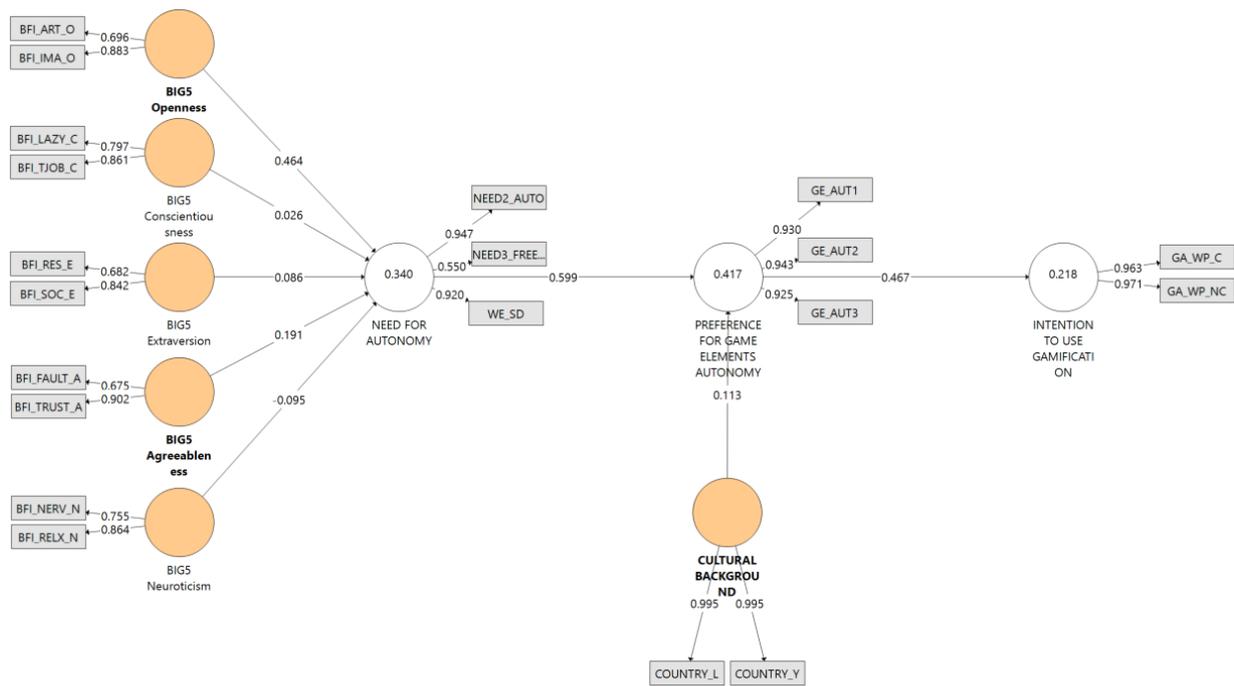


Figure 43 Path Model HN10

Bootstrapping (HN10)	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
BIG5 Agreeableness -> NEED FOR AUTONOMY	0.191	0.192	0.057	3.339	0.000
BIG5 Conscientiousness -> NEED FOR AUTONOMY	0.026	0.027	0.050	0.512	0.304
BIG5 Extraversion -> NEED FOR AUTONOMY	0.086	0.088	0.051	1.681	0.047
BIG5 Neuroticism -> NEED FOR AUTONOMY	-0.095	-0.095	0.061	1.558	0.060
BIG5 Openness -> NEED FOR AUTONOMY	0.464	0.464	0.053	8.827	0.000
CULTURAL BACKGROUND -> PREFERENCE FOR GAME ELEMENTS AUTONOMY	0.113	0.119	0.041	2.775	0.003
NEED FOR AUTONOMY -> PREFERENCE FOR GAME ELEMENTS AUTONOMY	0.599	0.597	0.042	14.381	0.000
PREFERENCE FOR GAME ELEMENTS AUTONOMY -> INTENTION TO USE GAMIFICATION	0.467	0.471	0.042	11.021	0.000

Table 22 Bootstrapping HN10⁵⁰⁴

⁵⁰⁴ For all additional quality criteria as discussed in 3.6.5 and 3.6.6 please refer to the appendix.

4.2.11 HN11 Structure Security Stability Order

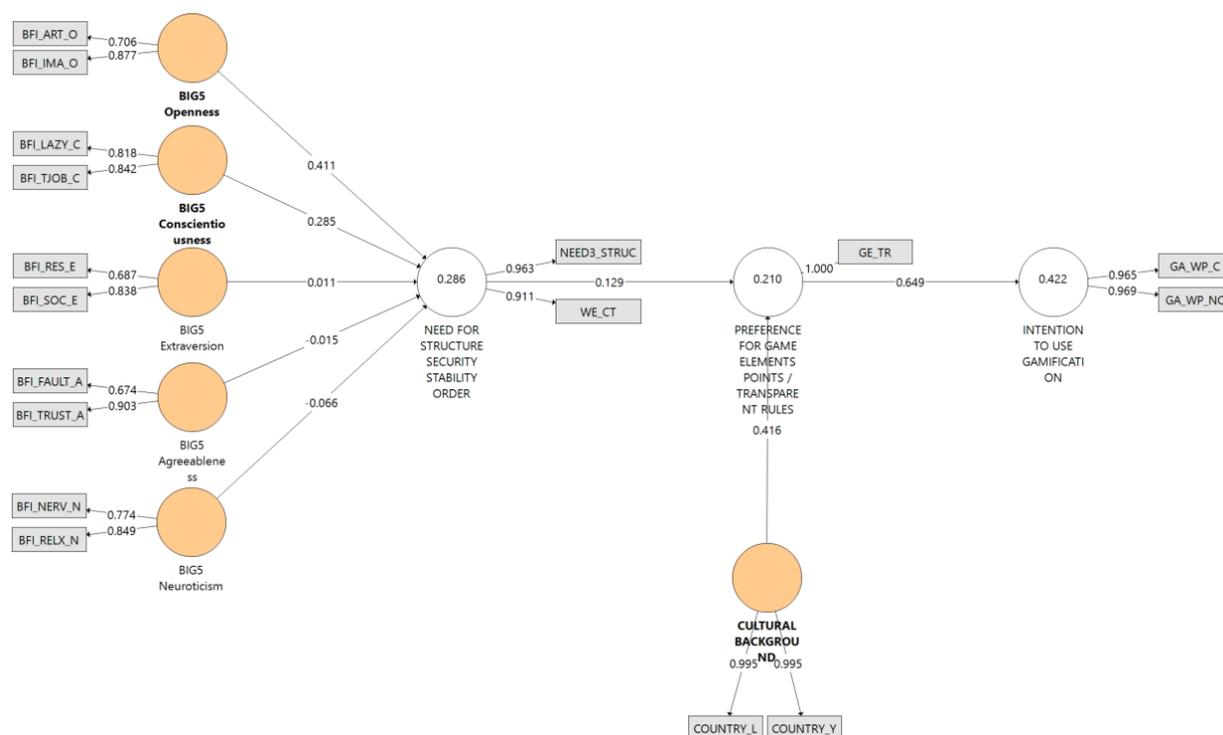


Figure 44 Path Model HN11⁵⁰⁵

Bootstrapping (HN11)	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
BIG5 Agreeableness -> NEED FOR STRUCTURE SECURITY STABILITY ORDER	-0.015	-0.008	0.051	0.297	0.766
BIG5 Conscientiousness -> NEED FOR STRUCTURE SECURITY STABILITY ORDER	0.285	0.281	0.050	5.636	0.000
BIG5 Extraversion -> NEED FOR STRUCTURE SECURITY STABILITY ORDER	0.011	0.014	0.055	0.194	0.846
BIG5 Neuroticism -> NEED FOR STRUCTURE SECURITY STABILITY ORDER	-0.066	-0.062	0.057	1.166	0.244
BIG5 Openness -> NEED FOR STRUCTURE SECURITY STABILITY ORDER	0.411	0.408	0.049	8.362	0.000
CULTURAL BACKGROUND -> PREFERENCE FOR GAME ELEMENTS POINTS / TRANSPARENT RULES	0.416	0.417	0.043	9.758	0.000
NEED FOR STRUCTURE SECURITY STABILITY ORDER -> PREFERENCE FOR GAME ELEMENTS POINTS / TRANSPARENT RULES	0.129	0.131	0.045	2.872	0.004
PREFERENCE FOR GAME ELEMENTS POINTS / TRANSPARENT RULES -> INTENTION TO USE GAMIFICATION	0.649	0.649	0.035	18.475	0.000

Table 23 Bootstrapping HN11

⁵⁰⁵ For all additional quality criteria as discussed in 3.6.5 and 3.6.6 please refer to the appendix.

5 Discussion

To derive valid conclusions from the methods and models applied it is necessary to use resilient data. Hence, in 5.1 the sample objectivity in terms of quantity and quality will be discussed first. Based on these findings the univariate results (5.2) will be analyzed focusing on the differences between the Indian and German culture in this sample. Sections 5.3 and 5.4 are dedicated to the discussion of the measurement and structural model (multivariate analysis) judging reliability, validity and determinants. After the hypotheses are analyzed in section 5.4.3 the research questions are answered and further implications of this study for science and for practice are discussed.

5.1 Evaluation of sample quantity and quality (objectivity)

To answer the research questions raised an online questionnaire was issued during summer 2016 (13.07.2016-24.07.2016) and yielded 360 valid samples (out of 418 total responses).⁵⁰⁶

In order to judge the quality of the samples it is important to determine the fit with the defined research scope.⁵⁰⁷ Structural differentiation attributes were the enterprise category, focus group, socio-technical focus individual personality traits and individual cultural background. The enterprise category differentiated between knowledge intense enterprises (white collar) and blue collar (other) enterprises. Due to this attribute 13 samples were disregarded since they did not fit into the reference frame. Four samples were disregarded since the team size was one (self-employed) which is not within the scope of this research. In terms of individual cultural background only Germany and India (and “hybrids”) were accepted, this led to 6 invalid samples with different cultural backgrounds. The other structural differentiation attributes were not relevant in terms of sampling but rather narrow the focus of the research. Thus, in total 23 responses were deleted since they did not fit into the defined reference frame leaving 360 valid samples.⁵⁰⁸

5.2 Evaluation of univariate results

To better understand the valid sample, it is necessary to describe its demographic characteristics and belonging observations.

⁵⁰⁶ For details please see section 3.2.1 Survey Participant Recruitment

⁵⁰⁷ Compare to 1.3 Scope of study

⁵⁰⁸ For further details on the invalid data please see section 3.2.2 Invalid samples

5.2.1 Demographic description

Demographic attribute	Categories	Variable	Sample results (360 samples)
1. Gender	1 Male 2 Female	SEX	242 Male (67%) 114 Female (32%) 4 n/a (1%)
2. Age	1 17 or younger 2 18-20 3 21-29 4 30-39 5 40-49 6 50-59 7 60 or older	AGE	0 17 or younger (0%) 3 18-20 (1%) 112 21-29 (31%) 146 30-39 (41%) 70 40-49 (19%) 26 50-59 (7%) 2 60 or older (1%) 1 n/a (0%)

Table 24 Sample Gender & Age

The sample is not evenly split into both genders, but rather consists of 67% male and 32% female participants. Gender differences are not the focus of this research however, they are important to keep in mind when interpreting results. Niederle and Vesterlung conducted a meta study on gender and competition, confirming that women respond less favorably to competition than their male counterparts. Resulting in fewer women entering and winning competitions.⁵⁰⁹ These findings are in line with this research. When for example averaging the preference for the competitive game element leaderboard males prefer leaderboards by 0,3 as compared to the preference of points which is only 0,1 larger for males. However, the differences are not substantial, also considering the standard deviation within each group of approx.1,4. *Calculation in sample: (GE_RL1+GE_RL2+GE_RL3: 3,10 male average (sd 1,41) vs 2,79 female average (sd 1,45) (GE_P1+GE_P2: 3,4 (sd 1,12) male average vs 3,3 (sd 1,25) female average)*. Jent and Janneck researched the effect of gender and age on gamification finding, that male users feel slightly more motivated by gamification than female users. Still, gamification is useful for each gender with differences in the specific game mechanics.⁵¹⁰

The average age of the sample is rather young, 72% of all participants are aged between 21 and 39 years. Jent et al. found that motivation through gamification can be achieved in all age groups, but the effects decrease with raising age.⁵¹¹ Hamari et al. argues that rising age might be connected to a general reduction in ease of use.⁵¹² These findings are in line with this research when comparing the results for “intention to use gamification” between participants aged 18-39 (average score 3,32) and older people (average score 2,97). *(Calculation in sample: (GE_WP_NC+GE_WP_C: 3,32 (sd 0,80) average aged 18-39 vs 2,97 (sd 0,84) average aged older than 39)*

⁵⁰⁹ Niederle und Vesterlund 2011. p.625

⁵¹⁰ Jent und Janneck 2018. p.8

⁵¹¹ Jent und Janneck 2018. p.8

⁵¹² Koivisto und Hamari 2014. p.181

Demographic attribute	Categories	Variable	Sample results (360 samples)
3. School education	1 Less than high school degree 2 High school degree 3 Some college but no degree 4 Associate degree 5 Bachelor degree 6 Graduate degree	EDU	0 Less than high school degree (0%) 20 High school degree (6%) 18 Some college but no degree (5%) 79 Associate degree (22%) 86 Bachelor degree (24%) 156 Graduate degree (43%) 1 n/a (0%)
4. Job Level	1 Owner/Executive/C-Level 2 Senior Management 3 Middle Management 4 Intermediate 5 Entry Level	C_JOBLEVEL	44 Owner/Executive/C-Level (12%) 56 Senior Management (16%) 85 Middle Management (24%) 150 Intermediate (42%) 16 Entry Level (4%) 9 n/a (2%)

Table 25 Sample Education & Job Level

89% of the sample exhibit an associate, bachelor or graduate degree. This is not surprising, since only white-collar respondents have been addressed and blue-collar participants have been disregarded. Lower education levels (2+3) show a lower intention to use gamification, however it is not reported here since the sample size (38 participants in education level 2+3) is rather small. The job level is normally distributed considering the rather young age of the sample. The intention to use gamification varies considerably between the job levels. The management levels (1+2+3) show an average value of 3,51 (sd 0,72) toward the intention to use gamification while entry and intermediate levels (4+5) score 2,89 on average (sd 0,81). This contrasts with the intuition that higher ages (for which IoU decreases) are in higher job levels. The sample shows a job level (C_JOBLEVEL) mean for ages 18-39 of 3,06 (sd 1,18) vs people older than 39 3,23 (sd 0,96)). Thus, age is only somewhat related to job level.

Demographic attribute	Categories	Variable	Sample results (360 samples)
5. Video Game Players (Average hours per day)	1 None 2 1 to 3 hours 3 4 to 6 hours 4 7 to 9 hours 5 10 hours or more	VGAMES	93 None (26%) 101 1 to 3 hours (28%) 82 4 to 6 hours (23%) 46 7 to 9 hours (13%) 38 10 hours or more (11%)

Table 26 Sample Video Game Players

Video gaming habits have been included in this study to serve as a moderating variable for the intention to use gamification. Intuition might claim that people who are regular gamers prefer gamification over those who are not. Gamers (2+3+4+5) are the predominant group in this sample (74%) scoring a mean of 3,39 (sd 0,76) regarding the intention to use gamification. Non-Gamers indeed score substantially lower with a mean value of 2,76 (sd 0,81) with must be regarded when interpreting results.

Demographic attribute	Categories	Variable	Sample results (360 samples)
6. Company age	1 0-5 years 2 6-25 years 3 26-50 years 4 >50 years 5 >100 years	C_AGE	40 0-5 years (11%) 190 6-25 years (53%) 68 26-50 years (19%) 30 >50 years (8%) 28 >100 years (8%) 4 n/a (1%)
7. Company size (Employee count)	1 1-10 2 11-100 3 101-250 4 251-2000 5 more than 2000	C_N_EMP	39 1-10 (11%) 74 11-100 (21%) 36 101-250 (10%) 100 251-2000 (28%) 98 more than 2000 (27%) 13 n/a (4%)

Table 27 Sample Company Age & Size

When looking at company size and age of the participants, company size is distributed normally (32% 1-100 employees, 38% 101-2000 employees and 27% more than 2000 employees). The company age however, is quite young. 64% off all companies are between 0 and 25 years old, while only 16% are older than 50 years. When analyzing the effects of company age on the intention to use gamification no substantial effects were found. In terms of company size, it shows that larger companies participants score higher average values for intention to use gamification (≥ 2000 employees score 3,36 (sd 0,80), <2000 and >100 : 3,3 (sd 0,81); ≤ 100 : 3,00 (sd 0,82)). It is important to note, that cultural background (COUNTRY_Y and COUNTRY_L) is distributed normally across company sizes.

Demographic attribute	Categories	Variable	Sample results (360 samples)
8. Team size (Team member count)	1 1-4 2 5-15 3 16-50 4 51-100	C_TEAMSIZE	72 1-4 (20%) 148 5-15 (41%) 80 16-50 (22%) 14 51-100 (4%) 46 n/a (13%)

Table 28 Sample Team Size

The predominant team size of five to fifteen people (41%) fits into the defined reference frame.⁵¹³ 20% work in smaller teams, 26% in larger teams. Larger teams score higher intention to use gamification values (1-15 teamsize scores 3.00 (sd 0,81) >15 teamsize scores 3,35 (sd 0,65)), however since team size is distributed quite normally across cultural background it is not focused further in this research.

5.2.2 Cultural background description

The construct of “cultural background”⁵¹⁴ scores substantially different when comparing Indian and German results separately. Across all measured 43 gamification variables, participants with an Indian cultural background on average scored 1,17 points higher on the preference for all game mechanics as compared to the German cultural background.⁵¹⁵ The average surplus for the individual gamification mechanic range from +0,47 (autonomy at work) to +1,93 (competition / leaderboards), thus Indians in general seem more positive towards gamification mechanics but do differentiate as much between the different elements.

⁵¹³ Compare to 1.3 Scope of study

⁵¹⁴ Score = (Mean COUNTRY_L + Mean COUNTRY_Y) / 2

⁵¹⁵ Scale 1-5

5.2.2.1 PURPOSE GOALS RESPONSIBILITY (HN01)

Results review

(Scale 1-5 / 1=Not at all suitable - 5=Extremely suitable)	\bar{x} Germany (σ)	\bar{x} India (σ)	Culture Δ
Work activities are organized in the context of fantasy stories that are interesting or exciting for you.			
GE_PC1	2,73 (0,96)	3,84 (1,05)	1,11
Work activities are organized in the form of topical stories that have relevance for the employee or consider the circumstances of his life.			
GE_PC2	2,83 (0,96)	3,87 (0,87)	1,04
The goals of the work activities are complemented by virtual objectives which have to be achieved by the employees to make progress in a fantasy story. The progress in the fantasy story will be visible for colleagues.			
GE_PC3C	2,75 (0,95)	3,86 (0,82)	1,11

The preference for game elements of playculture (GE_PC1, GE_PC2, GE_PC3C) shows a cultural delta between 1,04 and 1,11, thereby suggesting, that participants with an Indian cultural background prefer those elements. The standard deviation ranges around 1 (0,82-1,05) for both cultures which can be considered as average when comparing the other results. Contra intuitive is the result for the competitive variable (GE_PC3C): India as high context culture with lower values for Hofstede’s “Individualism” dimension (higher group orientation) as well as lower “masculinity” scores (femininity-based values like team building) could be expected to avoid competitive elements.⁵¹⁶

5.2.2.2 SOCIAL BELONGING (HN02)

Results review

(Scale 1-5 / 1=Not at all suitable - 5=Extremely suitable)	\bar{x} Germany (σ)	\bar{x} India (σ)	Culture Δ
You receive social appeals as a reward (e.g. excursions with chosen colleagues to special places)			
GE_SI1	2,92 (1,18)	4,01 (0,98)	1,09
Some work activities are organized in a way that they can only be accomplished by cooperating with each other.			
GE_SI2	3,10 (1,07)	4,18 (0,89)	1,08
Some work activities are of competitive nature, so that employees compete with their colleagues			
GE_SI3C	2,40 (1,06)	4,10 (0,93)	1,70

Game elements addressing social exchange (thereby serving the need for social belonging) seem to be preferred in India (mean deltas from +1,08 to +1,70 with an average standard deviation between 0,89 and 1,18). This is in line with theory, since high-context cultures like India are more group oriented than low-context cultures (Germany). Surprisingly the competitive variable (GE_SI3C) again scores even higher in the cultural background comparison (India 4,10 vs. Germany 2,4) which is a very substantial difference, which does not fit into the expected results as argued in 5.2.2.1 (since India as high context culture with lower values for Hofstede’s “Individualism” dimension (higher group orientation) as well as lower “masculinity” scores (femininity-based values like team building) could be expected to avoid competitive elements).

5.2.2.3 IMAGE / RECOGNITION (HN03)

Results review

⁵¹⁶ Compare to 2.7.4 Cultural differences: Focusing on India and Germany

(Scale 1-5 / 1=Not at all suitable - 5=Extremely suitable)	\bar{x} Germany (σ)	\bar{x} India (σ)	Culture Δ
The working environment features sound effects and background music. These give the employee a feedback for his operational principles.			
GE_FB1	2,58 (1,03)	3,92 (0,96)	1,34
After certain work packages you receive direct feedback (e.g. from principles or colleagues) which rates your behavior positively or negatively.			
GE_FB2	3,44 (1,09)	4,18 (0,94)	0,74
Received feedback will be documented and kept visible for colleagues.			
GE_FB3C	2,65 (1,07)	4,01 (1,02)	1,36
By achieving objectives, you receive status symbols such as an own office or a better parking option.			
GE_S1	2,71 (1,22)	4,02 (1,01)	1,31
For desired activities employees are rewarded with privileges, such as the participation in exclusive events or access to exclusive areas.			
GE_S2	2,91 (1,26)	4,02 (1,00)	1,11
For desired activities employees are assigned to managerial functions, which scale them up in the corporate hierarchy.			
GE_S3	3,18 (1,09)	4,08 (0,95)	0,90

Image and recognition cannot be transparently mapped to Hofstede’s six dimension or Hall’s high- vs. low-context differentiation. People with an Indian cultural background valued all elements addressing image or recognition approximately 4 (between 3,92 and 4,08 with a standard deviation around 1). This is a very high mean value. Participants with a German background only rated those elements on average between 2,58 and 3,44 (with a slightly higher sd). Feedback in the form of sound effects (GE_FB1) as well as competitive feedback (GE_FB3C) was rated poorly 2,58 and 2,65 within the German sample. Personal feedback was comparatively high valued by both cultures and seems to be the core element.

5.2.2.4 INFLUENCE / POWER (HN04)

Results review

(Scale 1-5 / 1=Not at all suitable - 5=Extremely suitable)	\bar{x} Germany (σ)	\bar{x} India (σ)	Culture Δ
By achieving objectives, you receive status symbols such as an own office or a better parking option.			
GE_S1	2,71 (1,22)	4,02 (1,01)	1,31
For desired activities employees are rewarded with privileges, such as the participation in exclusive events or access to exclusive areas.			
GE_S2	2,91 (1,26)	4,02 (1,00)	1,11
For desired activities employees are assigned to managerial functions, which scale them up in the corporate hierarchy.			
GE_S3	3,18 (1,10)	4,08 (0,95)	0,90

Influence and Power is best matched by the masculinity dimension of Hofstede’s 6D model.⁵¹⁷ Masculin cultures exhibit attributes like power, domination and achievement. India and Germany both score above the world masculinity average, with Germany being the more masculine culture. Yet, in terms of preferences for game elements addressing status, privileges and hierarchy India exhibits much higher average scores around 4,0 (sd 1,0) while Germany scores values between 2,71 and 3,18 (with slightly higher standard deviations). This is in line with the other constructs in this sample, since participants with Indian cultural background scored sufficiently higher regarding all preferences for game elements. Interestingly in this univariate description there is less variance in the average scores of the Indian sample as compared to Germany. This shall be analyzed further in the multivariate research.

⁵¹⁷ Compare to 2.7.2.1 The 6-D Model

5.2.2.5 COMPETITION (HN05)

Results review

(Scale 1-5 / 1=Not at all suitable - 5=Extremely suitable)	\bar{x} Germany (σ)	\bar{x} India (σ)	Culture Δ
Received feedback will be documented and kept visible for colleagues.			
GE_FB3C	2,65 (1,07)	4,01 (1,02)	1,36
The goals of the work activities are complemented by virtual objectives which have to be achieved by the employees to make progress in a fantasy story. The progress in the fantasy story will be visible for colleagues.			
GE_PC3C	2,75 (0,95)	3,86 (0,82)	1,11
Leaderboards compare colleagues concerning their performance (e.g. "Top 5 Employee of the month").			
GE_RL1	2,29 (1,20)	4,09 (0,95)	1,80
Leaderboards show your ranking compared to other colleagues without the visibility of the names.			
GE_RL2	2,53 (1,30)	3,91 (1,08)	1,38
Leaderboards show your ranking compared to other colleagues - Each name on the leaderboard will be visible.			
GE_RL3C	2,11 (1,17)	4,03 (1,07)	1,92
Your virtual character competes with other characters. Within the roleplaying you compete with your colleagues.			
GE_VC3C	2,20 (1,19)	4,00 (1,02)	1,80

Based on the literature review on culture it was expected that India as a high-context culture with lower scores in Hofstede's masculinity and individualism dimension⁵¹⁸ would score lower average values in the preference for game elements addressing competition. Sully de Luque and Sommer analyzed Feedback seeking behavior across cultures and differentiated (as one factor) between idealistic and collectivistic cultures and belonging direct or indirect feedback.⁵¹⁹ India as more collectivistic culture would be expected to prefer more indirect and less transparent feedback. However, the scores between 3,86 and 4,09 are not in line with this assumption. It might be that this comparatively young-aged sample⁵²⁰ of Indian participants has gone through a very competitive selection process during school and university⁵²¹ and is more used to competition than the traditional cultural background would suggest. Germany on average scores quite low on the competitive elements. Values between 2,11 and 2,75 are reported which is together with the virtual character elements) the lowest mean values reported across all preferences. Item GE_RL3C "Leaderboards show your ranking compared to other colleagues - Each name on the leaderboard will be visible." was the on average lowest valued item by the German sample scoring 2,11 (sd 1,17) leading to a cultural delta of 1,92 to the Indian average values of 4,03, which is the largest delta reported in this research.

5.2.2.6 ACHIEVMENT / REWARD (HN06)

Results review

(Scale 1-5 / 1=Not at all suitable - 5=Extremely suitable)	\bar{x} Germany (σ)	\bar{x} India (σ)	Culture Δ
Your tasks will be presented as challenges, which you have to cope with (e.g. Finish 10 tasks within the next 8 hours)			
GE_C1	2,94 (1,04)	4,12 (0,90)	1,18
The challenges for an employee are rated by difficulty, so that the employee is always engaged to his highest abilities and therefore continuously improves.			

⁵¹⁸ Compare to 2.7.4 Cultural differences: Focusing on India and Germany

⁵¹⁹ Sully De Luque und Sommer 2000. p.843 figure 1

⁵²⁰ Compare to 5.2.1 Demographic description

⁵²¹ Compare to Strohschneider 2001

GE_C2	3,23 (1,06)	3,95 (0,97)	0,72
For desired activities you are rewarded with corporate goods. For instance, you are able to get a company vehicle or a better smartphone.			
GE_MR1	3,19 (1,28)	4,06 (1,02)	0,87
For desired activities employees are rewarded with bonus payments.			
GE_MR2	3,57 (1,11)	4,26 (0,99)	0,69
You are able to collect points during work (e.g. constructive contributions in meetings)			
GE_P1	2,89 (1,14)	3,85 (0,95)	0,96
Points for the employees will be received by completion of single or multiple desired activities.			
GE_P2	3,12 (1,22)	3,97 (0,92)	0,85

The preference for game elements addressing challenges, points and material rewards is among the highest average values for the German sample⁵²², scoring an average of 3,15 (sd between 1,04 and 1,28). Hofstede’s dimensions of masculinity and individualism are in line with these findings for Germany.⁵²³ The Indian cultural background values are higher averaging at 4,04 (sd around 1,0). But for India the values do not differ substantially from the other preferences leaving little room for individual interpretations. Thus, the resulting cultural delta is lower in the achievement and reward dimension, due to the higher scores of the German sample.

5.2.2.7 MASTERY / ADVANCEMENT (HN07)

Results review

(Scale 1-5 / 1=Not at all suitable - 5=Extremely suitable)	\bar{x} Germany (σ)	\bar{x} India (σ)	Culture Δ
You are able to attain achievements (badges) in terms of graphics or expressions (e.g. "5-Star Troubleshooter") for the completion of goals.			
GE_B1	2,65 (1,34)	3,94 (1,03)	1,29
Badges are primarily being awarded for voluntary goals, which are achieved beyond the employee's main activity.			
GE_B2	2,70 (1,38)	3,99 (0,96)	1,29
Badges represent the performed accomplishments which are visible for colleagues.			
GE_B3C	2,62 (1,31)	3,92 (1,02)	1,30
You are able to continuously reach higher levels. Level up's can be achieved by continuous positive outcomes which match targeted goals.			
GE_L1	3,05 (1,35)	4,04 (0,99)	0,99
Over time, the level of an employee represents his work experience and his professional success.			
GE_L2	3,02 (1,33)	3,96 (0,97)	0,94
Reached levels will be visible for some colleagues to allow comparisons among themselves.			
GE_L3C	2,75 (1,22)	3,86 (0,96)	1,11

Master and Advancement focus more on the intrinsic motivation than the previously discussed elements focusing on achievement and rewards.⁵²⁴ The German sample scores comparatively high values for the level elements (GE_L1, GE_L2) of 3,04 (sd 1,34). The level element including competition is weaker (2,75) just like the average results for badges of 2,66 (sd 1,34) making them less attractive. The Indian sample again is evenly distributed around high scores of 4,0 and a standard deviation of 1,0. There is no

⁵²² behind HN10 autonomy

⁵²³ 2.7.4 Cultural differences: Focusing on India and Germany

⁵²⁴ Compare to 2.5.2 Gamification instruments (coordination variables)

clear preference for badges or levels, both are rated favorable. The mean cultural delta of 1,15 is average compared to the other preferences.

5.2.2.8 *SELF EXPRESSION (HN08)*

Results review

(Scale 1-5 / 1=Not at all suitable - 5=Extremely suitable)	\bar{x} Germany (σ)	\bar{x} India (σ)	Culture Δ
You take the role of a virtual character (e.g. your favorite character which you virtually and temporarily play during work).			
GE_VC1	2,29 (1,21)	4,20 (0,84)	1,91
Cooperative work activities are carried out by multiple workers, who participate with their virtual character in a roleplaying game.			
GE_VC2	2,43 (1,25)	4,09 (0,88)	1,66
Your virtual character competes with other characters. Within the roleplaying you compete with your colleagues.			
GE_VC3C	2,20 (1,19)	4,00 (1,02)	1,80

The human need for self-expression in this research is reflected by the elements of virtual game characters (e.g. avatars). It is interesting to read, that the German sample scores the lowest average scores within this dimension of 2,31 (sd 1,22) while the Indian sample scores highest in its group with an average of 4,10 (sd 0,91). Kim et al. researched the effects of culture on self-expression needs and concluded that self-expression in the western low-context cultures (U.S.A) is more privileged and valued than in high-context cultures of East Asia.⁵²⁵ This contradicts the results shown here. However, self-expression in the definition of Kim et al. referred more to the direct expression of thoughts and ideas (e.g. via social networks postings or just bumper stickers) which is not in line with the elements of virtual character used in this research. While Kim also honors "choice" as element of self-expression the virtual character elements in this research address more cooperative settings (GE_VC2) and indirect self-expression (GE_VC1 - avatars). Taking this differentiation, the results fit into the findings of the previously conducted cultural research, with the exemption of the competitive element GE_VC3C⁵²⁶.

5.2.2.9 *RELEVANCE / IDEALISM (HN09)*

Results review (*identical to HN01*)

(Scale 1-5 / 1=Not at all suitable - 5=Extremely suitable)	\bar{x} Germany (σ)	\bar{x} India (σ)	Culture Δ
Work activities are organized in the context of fantasy stories that are interesting or exciting for you.			
GE_PC1	2,73 (0,96)	3,84 (1,05)	1,11
Work activities are organized in the form of topical stories that have relevance for the employee or consider the circumstances of his life.			
GE_PC2	2,83 (0,96)	3,87 (0,87)	1,04
The goals of the work activities are complemented by virtual objectives which have to be achieved by the employees to make progress in a fantasy story. The progress in the fantasy story will be visible for colleagues.			
GE_PC3C	2,75 (0,95)	3,86 (0,82)	1,11

The univariate preferences for game elements of playculture have previously been discussed in HN01⁵²⁷ addressing purpose, goals and responsibility. The need for relevance and idealism (HN09) are closely related to these needs and therefore mapped on the same preferences. The differences of the two constructs

⁵²⁵ Kim und Sherman 2007. p.1

⁵²⁶ Compare to 5.2.2.5 COMPETITION (HN05)

⁵²⁷ Compare to 5.2.2.1 PURPOSE GOALS RESPONSIBILITY (HN01)

become relevant in the multivariate analysis, when the personality traits are measured on the individual needs.

5.2.2.10 AUTONOMY (HN10)

Results review

(Scale 1-5 / 1=Not at all suitable - 5=Extremely suitable)	\bar{x} Germany (σ)	\bar{x} India (σ)	Culture Δ
You can spend parts of your time organizing the activities after personal preferences (for example to develop own ideas).			
GE_AUT1	3,58 (0,85)	4,05 (0,73)	0,47
For desired activities employees are rewarded with liberties such as freedom of choice regarding the content of work.			
GE_AUT2	3,40 (1,01)	4,04 (0,80)	0,64
For desired tasks employees get a greater amount of self-determination (e.g. extra vacation or flexible working hours).			
GE_AUT3	3,42 (0,96)	3,99 (0,88)	0,57

The average results for game elements addressing autonomy within the German sample are the highest with a score of 3,47 and a slightly lower standard deviation of 0,94. Hofstede’s dimension of individualism addresses the extent to which people act individually or as part of a group. Germany scores 67 in this dimension while India scores 48, which is close to the world average of 44 points. Chirkov argues that individualism and autonomy are not the same constructs: “*Self-Determination Theory [...] sharply differentiates autonomy from individualism: autonomy is a fundamental psychological need of a human organism, whereas individualism/collectivism is a socially constructed doctrine about the relationships between an individual and society [...]*”⁵²⁸ While individualism and autonomy are not aligned perfectly by this definition, the two constructs are considered as closely related. Thus, the results of the German sample are in line with Hofstede’s research. The Indian sample does not fit into this line of reasoning, since the autonomy dimension exhibits the same high averages preferences scores like in the other dimensions (around 4,0). Chirkov postulates that autonomy may be valued differently across cultures (societies) but the functional role is universal, the more people receive support for this basic psychological need the better is their well-being.⁵²⁹

5.2.2.11 STRUCTURE SECURITY STABILITY ORDER (HN11)

Results review

(Scale 1-5 / 1=Not at all suitable - 5=Extremely suitable)	\bar{x} Germany (σ)	\bar{x} India (σ)	Culture Δ
Transparent rules for gamification system (e.g. clear transparency on which actions will lead to which consequences/outcomes, thereby reducing subjectivity in judgements)			
GE_TR	2,93 (1,38)	4,15 (0,88)	1,22

The need for structure, security, stability, and order has been operationalized to the game element of transparent rules (clear transparency on which actions will lead to which consequences/outcomes). This dimension is best reflected by Hofstede’s “uncertainty avoidance” index. Uncertainty avoidance refers to the regulation of all possible situations to minimize uncertainty and obtain structure and control. Germany scores noticeably higher than India (Uncertainty Avoidance 65 vs. 40). Still, the empirical results do not

⁵²⁸ Chirkov 2008. p.255

⁵²⁹ Chirkov 2008. p.256

support this view. While Germany averages medium scores for transparent rules in its sample (2,93), India scores much higher with a mean value of 4,15.

5.3 Evaluation of the multivariate measurement model

Based on the quality criteria described in section 3.6⁵³⁰ reflective constructs will be judged by their reliability and validity. The following sections analyze reliability and validity of the eleven measurement models.

5.3.1 Reliability of the measurement model

Reliability quality indicators of the measurement model for reflective constructs revisited:

Quality Group	Quality Criterion	Criteria / Value
2. Reliability	Path (Factor) Loading	$\geq 0,7$ ($\geq 0,4$)
	Cronbach's Alpha	will be reported but composite reliability is binding
	Composite Reliability	$\geq 0,7$ ($\geq 0,6$)
	Average extracted variance (AVE)	$\geq 0,5$

Table 29 Reliability quality indicators of the measurement model for reflective constructs

In section 3.6 a minimum threshold for factor loadings between 0,4 and 0,7 has been set. This research will use a value of 0,5 as fixed reliability criterion thus, indicators below 0,5 should be eliminated. Cronbach's alpha is sensitive to the number of items in the scale and generally underestimates the internal consistency reliability.⁵³¹ Therefore, Cronbach's Alpha will be reported but composite reliability and average extracted variance will be the binding quality criteria. Additionally, t-tests and belonging p values will be reported to judge significance of the indicators.

5.3.1.1 Reliability of elements of personality traits on human work-related needs

The BIG5 personality traits constructs are operationalized by two variables describing each of the five personality traits.⁵³² The path loadings for the five personality constructs range from 0,522 to 0,952 across all 11 path models, for this reason all are constructs are regarded as valid in terms of factor loading. Cronbach's Alpha due to its calculation is identical across all models and does not reach the standard quality criteria (values between 0,304 and 0,548). However, as discussed in section 3.6.5 composite reliability is used as binding criterion. Composite reliability values vary slightly across the models, ranging from 0,712-0,816, making all indicators valid. The same holds for average variance extracted with values between 0,571 and 0,689. Hence, all reliability quality criteria have been met for personality traits.

⁵³⁰ See 3.6 Structural Equation Modelling

⁵³¹ Compare to 3.6.5 PLS quality criteria of the measurement model for reflective constructs

⁵³² See BFI-10 2.69 Personality Traits – Big-Five-Inventory

5.3.1.2 Reliability of human work-related needs and cultural background on preferences for gamification elements

Human work-related needs have been operationalized using one to four variables. For all 11 models the reliance criteria (Path loadings, Cronbach's Alpha, Composite Reliability, Average Variance Extracted) are met, but composite reliability is in six models above 0,9, which is not desirable since it indicates that indicators are redundant.⁵³³ But since indicators were measured redundantly with differently asked questions all indicators remain in the model. There are two further exemptions: The variable HN04 NEED_INF shows a path loading of 0,497 which is below 0,5. Furthermore, Cronbach's Alpha (0,507) and Average Variance Extracted (0,463) are below the accepted threshold. For this reason, the construct HN04 must be regarded as not reliable and is disregarded. HN06 the need for achievement and reward exhibits a Cronbach's Alpha of 0,530 but is regarded as reliable since composite reliability is valid with a value of 0,765.

5.3.1.3 Reliability of preferences for gamification elements on success indicator intention to use

The latent construct "preference for certain game elements" has been operationalized using one to six variables. For all 11 models the reliance criteria (Path loadings, Cronbach's Alpha, Composite Reliability, Average Variance Extracted) meet the minimum threshold. Yet, in seven out of the 11 models composite reliability is above 9.0 indicating that indicators are redundant.⁵³⁴ As explained in the previous section, indicators were measured redundantly with differently asked questions and therefore remain in the model.

5.3.2 Evaluation of discriminant validity

After discussing reliability, the discriminant validity of the measurement model needs to be considered. Validity will be discussed for indicators as well as for constructs. As discussed in 3.6.5 criterion validity (indicators) measures the extent to which a measure is correlated to an outcome. Construct validity measures the degree to which a constructs measures what it claims.

To consider indicator validity the results section shows the complete cross-loadings for all 11 models. Indicator's outer loadings on the belonging construct must be larger than any correlation to other constructs (termed cross-loading). This is given for all indicators in all models.

Construct validity is also listed in the results section using the Fornell-Larcker criterion. It is calculated by taking the square root of the AVE (average variance extracted) and compare the results to the correlations of all other latent variables. The results should always be higher.⁵³⁵ This is given for all constructs in all models.

Based on these criteria discriminant validity for indicators as well as for constructs is given.

5.4 Evaluation of the multivariate structural model

Section 3.6.6 gives an overview on relevant quality criteria when examining structural (inner) models:

⁵³³ Hair et al. 2017. p.312

⁵³⁴ Hair et al. 2017. p.312

⁵³⁵ Fornell und Larcker 1981. p.46

Quality Criterion	Value
Variance Inflation Factor (VIF collinearity check)	≥ 5 -> critical collinearity < 5 -> acceptable collinearity
Coefficient of determination - R^2 (explained variance)	$\geq 0,19$ $\leq 0,33$ -> weak (but acceptable) $> 0,33$ $\leq 0,67$ -> moderate $> 0,67$ -> strong
Effect size - f^2 of an exogenous latent variable	$< 0,02$ -> no effect $\geq 0,02$ $\leq 0,15$ -> small effect $> 0,15$ $\leq 0,35$ -> medium effect $> 0,35$ -> large effect
Predictive relevance - Q^2	> 0 -> predictive power is present < 0 -> lack of predictive power

Table 30 Overview of relevant quality criteria of the structural model in the research context

These quality criteria will now be discussed for all 11 structural models. Coefficients of determination will be regarded as relevant if their value is above 0,33 (R^2). The effect sizes will be regarded as relevant if their value is above 0,15 (f^2). Path coefficients above 0,15 are regarded as significant.⁵³⁶

5.4.1 Evaluation of Variance Inflation Factors (VIF)

Collinearity describes the fact when some IVs are nearly completely predicted by other IVs. All Variance Inflation Factors for the 11 models range between 1 and 5 and thus are in valid ranges. One exemption is the construct of cultural background which due to its conceptualization exhibits an extreme VIF value of 27,181 and would need to be redesigned. However, as argued in 3.3.2.1 and the following section 5.4.2.3 the construct will remain unchanged in the models, accepting limitations in the result interpretation.

5.4.2 Evaluation of coefficients of determination and predictive relevance (R^2, Q^2)

R^2 measures how much variance (in percent) is explained by the latent construct. Accordingly, R^2 describes the model's predictive power. It ranges from 0 to 1, the higher the value the better the predictive power. Q^2 describes how well the original gathered empirical sample data can be reconstructed when using the path model.⁵³⁷ The following table gives an overview about the two measures:

⁵³⁶ Compare to Hair et al. 2017. p.97

⁵³⁷ Compare to 3.6.6.4 Evaluation of the structural model

Coefficients of determination and predictive relevance Overview (R ² & Q ²)	Work-related Human Need		Preference for Game Element		Intention to Use Gamification	
	R ²	Q ²	R ²	Q ²	R ²	Q ²
HN01 - Purpose Goals Responsibility	0,222	0,149	0,394	0,298	0,494	0,441
HN02 - Social Belonging	0,486	0,342	0,457	0,320	0,434	0,385
HN03 - Image Recognition	0,343	0,193	0,479	0,242	0,475	0,423
HN04 - Influence Power	0,291	0,103	0,271	0,192	0,336	0,299
HN05 - Competition	0,396	0,352	0,594	0,356	0,547	0,482
HN06 - Achievement Reward	0,325	0,141	0,351	0,178	0,517	0,461
HN07 - Mastery Advancement	0,210	0,202	0,284	0,103	0,500	0,446
HN08 - Self Expression	0,114	0,091	0,445	0,358	0,562	0,500
HN09 - Relevance Idealism	0,246	0,167	0,386	0,291	0,494	0,441
HN10 - Autonomy	0,340	0,214	0,417	0,339	0,218	0,192
HN11 - Strcuture Security Stability Order	0,286	0,219	0,210	0,196	0,422	0,375
Total count of relevant effects	4		8		10	

Bold values are relevant

Table 31 Coefficients of determination and predictive relevance Overview

Based on the R² thresholds of Chin only four moderate effects can be identified, which explain the variance of human work-related needs based on personality.⁵³⁸ Seven constructs are weak or not even acceptable. Thus, the overall effect of the BIG5 personality traits on human work-related needs is very limited.

The effect on preference for certain game elements based on needs and cultural background is moderate in eight cases and weak in three models. Consequently, the overall effect can be considered as moderate. A specification of the effect sizes (f²) differentiated between needs and cultural background is discussed in the following section 5.4.2.

The effect on intention to use gamification based on the preference for certain game elements is moderate in ten models and weak in one case. Overall to be considered as moderate impact, but stronger compared to the previous constructs.

The predictive power (Q²) is positive for all elements and thus sufficient. The path models can be used to reconstruct empirically gathered data.

⁵³⁸ Chin 1998. p.323

5.4.2.1 *Effects of personality traits on human work-related needs*

Personality Traits on Human Needs Relationships and Effects Overview (Path Coefficients & P Values)	BIG5 Agreeableness			BIG5 Extraversion			BIG5 Conscientiousness			BIG5 Openness			BIG5 Neuroticism			Total count of relevance per human need
	Path Coefficient	f ²	P Value	Path Coefficient	f ²	P Value	Path Coefficient	f ²	P Value	Path Coefficient	f ²	P Value	Path Coefficient	f ²	P Value	
HN01 - Purpose Goals Responsibility	0,149	0,019	0,012	0,100	0,008	0,090	0,196	0,036	0,001	0,276	0,070	0,000	-0,118	0,011	0,030	2
HN02 - Social Belonging	0,036	0,002	0,433	0,615	0,450	0,000	0,039	0,002	0,430	0,081	0,009	0,085	0,010	0,000	0,841	1
HN03 - Image Recognition	0,078	0,006	0,156	0,344	0,113	0,000	0,098	0,011	0,044	0,296	0,093	0,000	-0,098	0,009	0,067	2
HN04 - Influence Power*	0,170	0,028	0,005	0,305	0,081	0,000	-0,019	0,000	0,739	0,249	0,061	0,000	-0,066	0,004	0,285	3
HN05 - Competition	0,281	0,089	0,000	0,240	0,060	0,000	-0,051	0,003	0,317	0,204	0,048	0,000	0,116	0,013	0,027	3
HN06 - Achievement Reward	0,020	0,000	0,733	0,253	0,060	0,000	0,275	0,079	0,000	0,240	0,060	0,000	-0,046	0,002	0,394	3
HN07 - Mastery Advancement	0,074	0,005	0,230	0,045	0,002	0,485	0,359	0,122	0,000	0,187	0,031	0,001	-0,107	0,009	0,001	2
HN08 - Self Expression	-0,024	0,000	0,660	0,173	0,020	0,009	-0,030	0,001	0,594	-0,057	0,003	0,277	0,267	0,043	0,000	2
HN09 - Relevance Idealism	0,204	0,038	0,000	0,096	0,008	0,082	0,111	0,012	0,065	0,305	0,088	0,000	-0,091	0,007	0,094	2
HN10 - Autonomy	0,191	0,038	0,000	0,086	0,007	0,047	0,026	0,001	0,304	0,464	0,226	0,000	-0,095	0,008	0,060	2
HN11 - Structure Security Stability Order	-0,015	0,000	0,766	0,011	0,000	0,846	0,285	0,800	0,000	0,411	0,165	0,000	-0,066	0,004	0,244	2
Total count of relevance per personality trait	4			6			4			9			1			

*construct previously determined as not reliable

Bold values are relevant

Table 32 Personality Traits on Human Needs – Relationships and Effects Overview

Summarizing the table, it can be concluded that most human need dimensions (7) exhibit two relevant BIG5 personality traits, which differ depending on the need. Three human needs are influenced by three personality traits, while only one need (HN02 – Social Belonging) exhibits only one relevant BIG5 dimension (Extraversion). Yet, the effect sizes (f²) are even in the relevant cases small. Only two medium effects sizes (Openness on HN10 + HN11) and two strong effect sizes (Conscientiousness on HN11 and Extraversion on HN02) are shown out of 55 measurements in total.

The personality trait dimension of openness shows the most relevant path coefficients. It is followed by extraversion, which influences six human needs. Agreeableness and conscientiousness show relevant relationships and effects for four human needs, while neuroticism is only relevant for HN08 (Self-Expression). Taken together with the results of the coefficients of determination and predictive relevance the effects of the BIG5 personality traits on human work-related needs are weak. The dimensions of openness and extraversion are noteworthy. While openness serves as a relationship predictor for most needs the belonging effect-sizes are mostly small. Extraversion exhibits relevant relationships in intuitively suiting needs (Social Belonging, Image Recognition, *Influence Power*, Competition, Achievement Reward and Self-Expression). Still, except for HN02 the effect sizes must be considered weak.

In previous research Minica has researched the correlation between the human needs system, personality and human motivation. The research concludes i.a. that “[e]ach person, depending on his or her specific needs and necessities, and the national and organizational context where they carry on their activity, has aspirations and a set of motivational expectations”⁵³⁹ However, a different personality model based on 12 dimensions was used, allowing for more granularity. Stankov in 2018 found low correlations between the BIG5 personality traits and the construct of intelligence. His central conclusion was that the domains of personality need to be broadened. “My argument is that the domain of personality is broader than what has been identified through the lexical approach, with the Big Five/Six model having hijacked the term of “personality”. Based on our own findings, personality may be expanded to include some “dark” traits and self-beliefs[...]”⁵⁴⁰

⁵³⁹ Minica 2015. p.108 see also Andreş, S., (2012) Management. Sinteză, teste, îndrumări, Editura Eftimie Murgu, Reşiţa, p.111

⁵⁴⁰ Stankov 2018. p.10

McAndrew in 2018 adds two more relevant aspects to the discussion of personality traits predicting certain behavior. First, research shows that the more extreme a personality trait is pronounced, the more accurate that trait will predict behavior. However, “extreme” pronunciation is relative when the sample size grows⁵⁴¹. Second, personality research often uses personality traits to predict a person’s behavior in a single experimental session. But a personality trait can be overpowered by stronger factors in a specific situation. Thus, predictions will be better over longer periods of time and multiple precise situations, especially with extreme scores of personality measures.⁵⁴²

5.4.2.2 Effects of human work-related needs and cultural background on preferences for gamification elements

Human Needs and Cultural Background on Preferences for Game Elements Relationships and Effects Overview (Path Coefficients & P Values)	Human Need (HN01-HN11)			Cultural Background		
	Path Coefficient	f ²	P Value	Path Coefficient	f ²	P Value
Playculture (HN01)	0,308	0,155	0,000	0,519	0,441	0,000
Social Exchange (HN02)	0,373	0,201	0,000	0,417	0,252	0,000
Direct Feedback & Status / Privileges (HN03)	0,339	0,189	0,000	0,488	0,392	0,000
Status / Privileges (HN04)*	0,150	0,029	0,002	0,461	0,271	0,000
Competition (HN05)	0,422	0,230	0,000	0,417	0,225	0,000
Challenges, Points, Material Rewards (HN06)	0,323	0,151	0,000	0,423	0,259	0,000
Badges and Levels (HN07)	0,198	0,054	0,000	0,471	0,305	0,000
Virtual Character (HN08)	-0,002	0,000	0,957	0,667	0,801	0,000
Playculture (HN09)	0,294	0,139	0,000	0,508	0,413	0,000
Autonomy (HN10)	0,599	0,546	0,000	0,113	0,020	0,003
Transparent Rules (HN11)	0,129	0,020	0,004	0,416	0,211	0,000

*construct previously determined as not reliable

Bold values are relevant

Table 33 Human Needs and Cultural Background on Preferences for Game Elements – Relationships and Effects Overview

All models except HN04, HN08 and HN11 exhibit very strong path coefficients and belonging p-values for the construct human needs on preferences. The belonging effect sizes in the relevant dimensions show medium to large effects. Concluding, that there is a substantial relationship and effect on the preferences for game elements depending on needs. The construct cultural background is even stronger in relationships and effects (with only one exemption HN10). But the following limitations apply:

5.4.2.3 Discussion of the construct cultural background

The construct of cultural background has limitations by design. These have been explained in 3.3.2.1 Limitations to the construct cultural background. As expected, the path loadings for both variables are close to 1 (0,995) with very high collinearity, expressing that mostly single national cultural background probands participated.⁵⁴³ This results in too high values (close to 1)⁵⁴⁴ for the reliability and validity

⁵⁴¹ Someone considering his- or herself extremely extroverted might be “outperformed” by someone who is still much more extroverted

⁵⁴² McAndrew 2018

⁵⁴³ Compare to 3.2.1 Survey Participant Recruitment

⁵⁴⁴ Compare to 3.6.5 PLS quality criteria of the measurement model for reflective constructs

measures (Cronbach's Alpha, Composite Reliability, AVE, cross-loadings and Fornell-Larcker criterion, VIF) and should be corrected (e.g. via removing or combining predictors). However, depending on the goals of the research multicollinearity may be accepted:

“Multicollinearity:

- *can make choosing the correct predictors to include more difficult.*
- *interferes in determining the precise effect of each predictor, but...*
- *doesn't affect the overall fit of the model or produce bad predictions.* ⁵⁴⁵

Since the goal of this research is not to show a calculatable precise statistical impact of cultural background but rather to acknowledge that the construct has an important impact the limitations given will be accepted. Recalculating the models with a modified (mean) single-item construct produces only slightly different results (e.g. R^2 HN01 of 0,394 vs. 0,388). Therefore, the relationship and effect of cultural background on preferences for certain game elements must be considered substantial. The descriptive analysis in the univariate section (5.2 Evaluation of univariate results) serves as additional insight on the relationship and effects. In the multivariate case HN 10 autonomy was the only model without relevant correlations and effects for culture, however as described in the univariate part, autonomy is also the group, where results between German and Indian cultural background are closest, which could explain the non-relevance in the multivariate model.

5.4.2.4 Indirect effects on preferences for gamification elements

Besides the already discussed direct effects of human needs and cultural background on preferences for game elements the path models also report values for indirect effects.⁵⁴⁶ Though BIG5 personality traits do not exhibit noteworthy indirect path coefficients in nine out of 11 models. Only in HN04 extraversion and in HN10 openness show reliable effects on the preference for game elements. This is not in line with previous research, where Codish et al. found considerable influence of extraversion on the preference of game elements in e-learning contexts. Their results showed that there were significant differences in how these two types of personalities (extroverts and introverts) perceive the playfulness of the system and specifically the lack of playfulness of leaderboards.⁵⁴⁷ Jia et al. also found significant differences of the gamification preferences of extrovert people. Proving that those people preferred leaderboards, points and levels as well as social competition. Furthermore, openness was negatively related with the preferences of avatars (self-expression). However, Jia could not confirm the specific effects found by Codish et al.⁵⁴⁸ Buckley and Doyle also identified a general positive perception of gamification in learning contexts by extraverts and vice versa for conscientious people.⁵⁴⁹ Consequently, extraversion is the only dimension on which multiple studies identified solid effects so far. A potential explanation might be that gamification elements represent extrinsic motivators, explaining why they are especially appealing for extraverts. Yet, this only supported by one of 11 models in this study.

⁵⁴⁵ Minitab Blog 2013, see also https://www.researchgate.net/post/Multicollinearity_in_SEM_research, accessed 05.01.2019

⁵⁴⁶ Compare to 4 Results Total effects QN01-QN11

⁵⁴⁷ David Codish und Gilad Ravid 2014, p.36

⁵⁴⁸ Jia et al. 2016, p.7.table 6

⁵⁴⁹ Buckley und Doyle 2017, S. 43

5.4.2.5 Effects of preferences for gamification elements on success indicator intention to use

Preferences for Game Elements on Intention To Use Gamification Relationships and Effects Overview (Path Coefficients & P Values)	Intention To Use Gamification		
	Path Coefficient	f ²	P Value
Playculture (HN01)	0,703	0,976	0,000
Social Exchange (HN02)	0,659	0,767	0,000
Direct Feedback & Status / Privileges (HN03)	0,689	0,906	0,000
Status / Privileges (HN04)*	0,579	0,506	0,000
Competition (HN05)	0,740	1,208	0,000
Challenges, Points, Material Rewards (HN06)	0,719	1,069	0,000
Badges and Levels (HN07)	0,707	1,001	0,000
Virtual Character (HN08)	0,750	1,285	0,000
Playculture (HN09)	0,703	0,976	0,000
Autonomy (HN10)	0,467	0,280	0,000
Transparent Rules (HN11)	0,649	0,729	0,000

*construct previously determined as not reliable

Bold values are relevant

Table 34 Preferences for Game Elements on Intention To Use Gamification – Relationships and Effects Overview

All models exhibit very strong path coefficients and accordingly high p-values. However, this is not surprisingly because of two reasons. First, the preference for game elements were operationalized in a question design somewhat related to the intention to use (“To which extent would you agree if the following game elements would be introduced to your workplace?”). Second, most people within the group of gamification promoters (all participants that scored above 3 in the intention to use construct) on average scored all gamification elements (GE variables) comparatively high with low standard deviations within the group. The same aspect holds vice versa for the gamification detractors with even lower standard deviations. As a result, the survey mostly does not yield significant differences between the gamification elements in its respective groups. Reason for that might be the missing real-life experience with gamification elements, so that participants can not accurately differentiate the concepts based on the applied “intention to use” concept. They are rather generally positive (promoters) or negative (detractors) towards most gamification constructs.

5.4.2.6 Indirect effects on intention to use gamification

There is only one model (HN02) with only one dimension (extraversion) which exhibits a relationship between personality traits and the intention to use gamification.⁵⁵⁰ The indirect path coefficient is on the border of being relevant (0,151). Accordingly, there is only very little evidence in this study, that BIG5 personality traits can be used to predict the intention to use gamification.

Human work-related needs show relevant indirect path coefficients between 0,2 and 0,3 in most (8) models. Three path models (HN04, HN08 and HN11) do not exhibit relevant relationships between needs and intention to use. As expected, based on the reasoning so far, cultural background serves as a reliable

⁵⁵⁰ Compare to 5.4.2.4

predictor for intention to use in all 11 models (indirect path coefficients around 0,3). Consequently, both constructs should be regarded, when predicting the intention to use gamification.

5.4.3 Hypothesis validation

5.4.3.1 *BIG5 personality traits correlate with human needs*

H1: Hypothesis BIG5 (O,C,E,A,N) on Need (HN01-HN11)

A correlation between a BIG5 dimension and a NEED is significant. In total this forms 55 hypotheses (5 BIG5 dimensions on 11 NEEDs).

Hypothesis Validation BIG5(O,C,E,A,N) on Need(HN01-HN11)	BIG5 Agreeableness	BIG5 Extraversion	BIG5 Conscientiousness	BIG5 Openness	BIG5 Neuroticism
HN01 - Purpose Goals Responsibility	-	-	S	S	-
HN02 - Social Belonging	-	S	-	-	-
HN03 - Image Recognition	-	S	-	S	-
HN04 - Influence Power*	S	S	-	S	-
HN05 - Competition	S	S	-	S	-
HN06 - Achievement Reward	-	S	S	S	-
HN07 - Mastery Advancement	-	-	S	S	-
HN08 - Self Expression	-	S	-	-	S
HN09 - Relevance Idealism	S	-	-	S	-
HN10 - Autonomy	S	-	-	S	-
HN11 - Structure Security Stability Order	-	-	S	S	-

*construct previously determined as not reliable

S = Supported / - = Rejected

Table 35 Hypothesis validation H1 - BIG5 personality traits correlate with human needs

5.4.3.2 *Preferences for gamification elements correlate with human needs and cultural background*

H2A: Hypothesis Need (HN01-HN11) on Preference for Game Element (GE1-GE11)

A correlation between a NEED and a PREFERENCE FOR GAME ELEMENTS is significant. In total this forms 11 hypotheses (11 NEEDS on belonging GAME ELEMENTS).

H2B: Hypothesis Cultural Background (CB) on Preference for Game Element (GE1-GE11)

A correlation between CULTURAL BACKGROUND and a PREFERENCE FOR GAME ELEMENTS is significant. In total this forms 11 hypotheses (CULTURAL BACKGROUND on 11 GAME ELEMENTS).

Hypothesis Validation Need (HN01-HN11) on Preference for Game Element(GE1-GE11) Cultural Background on Preference for Game Element(GE1-GE11)	Human Need (HN01-HN11)	Cultural Background
Playculture (GE1)	S	S
Social Exchange (GE2)	S	S
Direct Feedback & Status / Privileges (GE3)	S	S
Status / Privileges (GE4)*	S	S
Competition (GE5)	S	S
Challenges, Points, Material Rewards (GE6)	S	S
Badges and Levels (GE7)	S	S
Virtual Character (GE8)	-	S
Playculture (GE9)	S	S
Autonomy (GE10)	S	-
Transparent Rules (GE11)	-	S

**construct previously determined as not reliable* S = Supported / - = Rejected

Table 36 Hypothesis validation H2 - Preferences for gamification elements correlate with human needs and cultural background

5.4.3.3 *The preference for gamification elements correlates with the intention to use gamification*

H3: Hypothesis Preference for Game Element (GE1-GE11) on Intention to use Gamification (SI)
 A correlation between a PREFERENCE FOR GAME ELEMENTS and the INTENTION TO USE GAMIFICATION is significant. In total this forms 11 hypotheses (11 GEs).

Hypothesis Validation Preference for Game Element (GE1-GE11) on Intention to Use Gamification (SI)	Intention To Use Gamification (SI)
Playculture (GE1)	S
Social Exchange (GE2)	S
Direct Feedback & Status / Privileges (GE3)	S
Status / Privileges (GE4)	S
Competition (GE5)	S
Challenges, Points, Material Rewards (GE6)	S
Badges and Levels (GE7)	S
Virtual Character (GE8)	S
Playculture (GE9)	S
Autonomy (GE10)	S
Transparent Rules (GE11)	S

S = Supported / - = Rejected

Table 37 Hypothesis validation H3 - Preference for gamification elements correlates with the intention to use gamification

5.4.4 Answering the research questions

5.4.4.1 *How do personality traits affect individual work-related needs?*

Summarizing the discussion, it can be concluded that there is a relevant relationship for about 43% of all BIG5 personality traits on human work-related needs. Openness and extraversion are the most relevant dimensions, neuroticism the least relevant one. However, the belongings effect sizes for the relevant dimensions are weak (R^2 and f^2). Only two medium effects sizes and two strong effect sizes are shown out of 55 measurements. Looking at the belonging univariate cases, it can be assumed that (from weaker effects to stronger effects):

1. People with high scores in BIG5 Conscientiousness score on average **0,34** points higher regarding the need for structure, stability and order ⁵⁵¹
2. People with high scores in BIG5 Openness score on average **0,60** points higher regarding the need for structure, stability and order ⁵⁵²
3. People with high scores in BIG5 Openness score on average **0,78** points higher regarding the need for autonomy⁵⁵³
4. People with high scores in BIG5 Extraversion score on average **1,04** points higher regarding the need for structure, stability and order ⁵⁵⁴

Overall, the relationship and effects measured in this study of BIG5 personality traits on human-work-related needs must be considered weak.

McAndrew in 2018 adds two more relevant aspects to the discussion of personality traits predicting certain behavior. First, research shows that the more extreme a personality trait is pronounced, the more accurate that trait will predict behavior. Second, a personality trait can be overpowered by stronger factors in a specific situation. Thus, predictions will be better over longer periods of time and multiple precise situations, especially with extreme scores of personality measures.⁵⁵⁵

5.4.4.2 *How do work-related needs affect the preference for specific gamification elements?*

Out of 11 models tested eight human work-related needs exhibit substantial impacts on the preference of belonging game elements.⁵⁵⁶ The effect sizes are moderate to large in six models and weak in three cases. Thus, based on this study there is a considerable relationship and effect of needs on the preference for belonging game elements. The univariate from weaker to stronger are:

1. People with high scores in need for mastery and advancement (HN07) score on average **0,52** points higher regarding the preference for game elements addressing badges and levels⁵⁵⁷ (Low effect size (f^2) of 0,054)

⁵⁵¹ Scale 1-5, High / Low scores are referred to as above / below 3 - Mean Results High 4,02 (sd 0,61) vs. Low: 3,68 (sd 0,64)

⁵⁵² Scale 1-5, High / Low scores are referred to as above / below 3 - Mean Results High 4,07 (sd 0,64) vs. Low: 3,47 (sd 0,58)

⁵⁵³ Scale 1-5, High / Low scores are referred to as above / below 3 - Mean Results High 3,62 (sd 0,63) vs. Low 2,84 (sd 0,57)

⁵⁵⁴ Scale 1-5, High / Low scores are referred to as above / below 3 - Mean Results High 3,58 (sd 0,62) vs. Low: 2,54 (sd 0,65)

⁵⁵⁵ McAndrew 2018

⁵⁵⁶ HN04 is disregarded – Compare to 5.3.1.2

⁵⁵⁷ Scale 1-5, High / Low scores are referred to as above / below 3 - Mean Results High 3,33 (sd 1,18) vs. Low: 2,81 (sd 1,04)

2. People with high scores in need for purpose, goals and responsibility (HN01) score on average **1,03** points higher regarding the preference of game elements addressing playculture⁵⁵⁸
3. People with high scores in need for achievement and reward (HN06) score on average **1,07** points higher regarding the preference for game elements addressing challenges, points and material rewards⁵⁵⁹
4. People with high scores in need for relevance and idealism (HN09) score on average **1,13** points higher regarding the preference for game elements addressing playculture⁵⁶⁰
5. People with high scores in need for image and recognition (HN03) score on average **1,19** points higher regarding the preference for game elements addressing direct feedback, status and privileges⁵⁶¹
6. People with high scores in need for social belonging (HN02) score on average **1,41** points higher regarding the preference of game elements addressing social exchange⁵⁶²
7. People with high scores in need for autonomy (HN10) score on average **1,48** points higher regarding the preference for game elements addressing autonomy⁵⁶³
8. People with high scores in need for competition (HN05) score on average **1,66** points higher regarding the preference for game elements addressing competition⁵⁶⁴

5.4.4.3 *How does cultural background affect the preference for specific gamification elements?*

In order to interpret the concept of cultural background it is important to understand its conceptualization and limitations as discussed in 3.3.2 and 5.4.2.3. Cultural background is strongly influential in this research. In nine out of 11 models it exhibits strong relationships with the preference for game elements with medium to large direct effects.⁵⁶⁵ Across all measured 43 gamification variables, participants with an Indian cultural background on average scored 1,17 points higher on the preference for all game mechanics as compared to the German cultural background.⁵⁶⁶ The average surplus for the individual gamification mechanic range from +0,47 (autonomy at work) to +1,93 (competition / leaderboards), thus Indians in general are more positive towards gamification mechanics but do differentiate between the elements. As a matter of conceptualization there is no neutral zero point for the construct of cultural background when comparing two national cultures. HN10 (autonomy) is the only model without relevant correlations and effects for culture, but as described in the univariate part, autonomy is also the group, where results between German and Indian cultural background are closest, which could explain the non-relevance in the multivariate model. The univariate effects sorted from weaker to stronger are:

1. People with Indian cultural background on average prefer game elements addressing challenges, points and material rewards (HN06) by **0,83** points as compared to German cultural background.⁵⁶⁷

⁵⁵⁸ Scale 1-5, High / Low scores are referred to as above / below 3 - Mean Results High 3,37 (sd 1,02) vs. Low: 2,34 (sd 1,02)

⁵⁵⁹ Scale 1-5, High / Low scores are referred to as above / below 3 - Mean Results High 3,66 (sd 0,81) vs. Low: 2,59 (sd 0,95)

⁵⁶⁰ Scale 1-5, High / Low scores are referred to as above / below 3 - Mean Results High 3,30 (sd 1,40) vs. Low: 2,17 (sd 1,26)

⁵⁶¹ Scale 1-5, High / Low scores are referred to as above / below 3 - Mean Results High 3,52 (sd 0,87) vs. Low: 2,33 (sd 1,16)

⁵⁶² Scale 1-5, High / Low scores are referred to as above / below 3 - Mean Results High 3,79 (sd 0,97) vs. Low: 2,38 (sd 1,11)

⁵⁶³ Scale 1-5, High / Low scores are referred to as above / below 3 - Mean Results High 4,01 (sd 0,74) vs. Low: 2,53 (sd 1,18)

⁵⁶⁴ Scale 1-5, High / Low scores are referred to as above / below 3 - Mean Results High 3,91 (sd 0,78) vs. Low: 2,25 (sd 0,9)

⁵⁶⁵ HN04 is disregarded – Compare to 5.3.1.2 / Playculture is redundant for cultural background in model HN01 and HN09, thus only reported once

⁵⁶⁶ Scale 1-5

⁵⁶⁷ Scale 1-5, German / Indian cultural background – Mean Results German: 3,12 (sd 0,85) / Indian: 3,95 (sd 0,77)

2. People with Indian cultural background on average prefer game elements addressing playculture (HN01/HN09) by **1,00** points as compared to German cultural background.⁵⁶⁸
3. People with Indian cultural background on average prefer game elements addressing feedback, status and privileges (HN03) by **1,05** points as compared to German cultural background.⁵⁶⁹
4. People with Indian cultural background on average prefer game elements addressing badges and levels (HN07) by **1,05** points as compared to German cultural background.⁵⁷⁰
5. People with Indian cultural background on average prefer game elements addressing social exchange (HN02) **1,16** points as compared to German cultural background.⁵⁷¹
6. People with Indian cultural background on average prefer game elements addressing transparent rules (HN11) by **1,19** points as compared to German cultural background.⁵⁷²
7. People with Indian cultural background on average prefer game elements addressing competition (HN05) by **1,49** points as compared to German cultural background.⁵⁷³
8. People with Indian cultural background on average prefer game elements addressing virtual characters (HN08) by **1,69** points as compared to German cultural background.⁵⁷⁴

5.4.4.4 *How does the preference for specific gamification elements affect the intention to use gamification?*

All eleven models show strong relationships and effects between the preference for certain gamification elements and the overall intention to use gamification. As explained in 5.4.2.5 this is not surprisingly because of two reasons. First, the preference for game elements were operationalized in a question design somewhat related to the intention to use (*“To which extent would you agree if the following game elements would be introduced to your workplace?”*). Second, most people within the group of gamification promoters (all participants that scored above 3 in the intention to use construct) on average scored all gamification elements (GE variables) comparatively high with low standard deviations within the group. The same aspect holds vice versa for the gamification detractors with even lower standard deviations. As a result, the survey mostly does not yield significant differences between the gamification elements in its respective groups. Reason for that might be the missing real-life experience with gamification elements, so that participants can not accurately differentiate the concepts based on the applied “intention to use” concept. They are rather generally positive (promoters) or negative (detractors) towards most gamification constructs. The detailed univariate effects from weaker to stronger are:⁵⁷⁵

1. People with high preferences for game elements addressing autonomy (HN10) on average scored **0,80** points higher on the intention to use gamification⁵⁷⁶
2. People with high preferences for game elements addressing social exchange (HN02) on average scored **1,01** points higher on the intention to use gamification⁵⁷⁷

⁵⁶⁸ Scale 1-5, German / Indian cultural background – Mean Results German: 2,70 (sd 0,96) / Indian: 3,70 (sd 1,02)

⁵⁶⁹ Scale 1-5, German / Indian cultural background – Mean Results German: 2,86 (sd 0,86) / Indian: 3,91 (sd 0,85)

⁵⁷⁰ Scale 1-5, German / Indian cultural background – Mean Results German: 2,77 (sd 1,18) / Indian: 3,91 (sd 0,80)

⁵⁷¹ Scale 1-5, German / Indian cultural background – Mean Results German: 2,75 (sd 1,02) / Indian: 3,91 (sd 1,07)

⁵⁷² Scale 1-5, German / Indian cultural background – Mean Results German: 2,80 (sd 1,02) / Indian: 3,99 (sd 1,18)

⁵⁷³ Scale 1-5, German / Indian cultural background – Mean Results German: 2,37 (sd 0,89) / Indian: 3,86 (sd 0,85)

⁵⁷⁴ Scale 1-5, German / Indian cultural background – Mean Results German: 2,24 (sd 1,16) / Indian: 3,93 (sd 1,05)

⁵⁷⁵ HN04 is disregarded – Compare to 5.3.1.2 / Playculture is redundant for intention to use in model HN01 and HN09, thus only reported once

⁵⁷⁶ Scale 1-5, High / Low scores are referred to as above / below 3 - Mean Results High 3,46 (sd 0,69) vs. Low: 2,66 (sd 0,75)

⁵⁷⁷ Scale 1-5, High / Low scores are referred to as above / below 3 - Mean Results High 3,64 (sd 0,56) vs. Low: 2,63 (sd 0,74)

3. People with high preferences for game elements addressing badges and levels (HN07) on average scored **1,05** points higher on the intention to use gamification ⁵⁷⁸
4. People with high preferences for game elements addressing feedback, status and privileges (HN03) on average scored **1,07** points higher on the intention to use gamification ⁵⁷⁹
5. People with high preferences for game elements addressing challenges, points and material rewards (HN06) on average scored **1,14** points higher on the intention to use gamification ⁵⁸⁰
6. People with high preferences for game elements addressing competition (HN05) on average scored **1,15** points higher on the intention to use gamification ⁵⁸¹
7. People with high preferences for game elements addressing virtual characters (HN08) on average scored **1,16** points higher on the intention to use gamification ⁵⁸²
8. People with high preferences for game elements addressing transparent rules (HN11) on average scored **1,18** points higher on the intention to use gamification ⁵⁸³
9. People with high preferences for game elements addressing playculture (HN01/HN09) on average scored **1,23** points higher on the intention to use gamification ⁵⁸⁴

5.4.5 Implications for science

This research suggests a collection of human work-related needs and belonging gamification elements, influenced by personality and cultural attributes. A substantial data set has been created (in total 11 SEM path models) based on a sample of 360 survey results gathered in India and Germany. Each path model analyzes multiple core constructs (personality traits, work-related needs, cultural-background, gamification element preferences) and the belonging relationships which are validated against seven quality indicators.⁵⁸⁵ Out of 11 models tested eight human work-related needs exhibit substantial impacts on the preference of belonging game elements.⁵⁸⁶ The effect sizes are moderate to large in six models and weak in three cases. Thus, based on this study there is a considerable relationship and effect of needs on the preference for belonging game elements. Regarding the underlying constructs and theories a few key points are suggested:

While the BIG5 personality traits do not exhibit a substantial relationship in most models (neither on need nor on the preference for gamification elements) the basic idea to search for other acceptance predictors in order to create user centric gamification is valuable. The personality domain should be extended to include more dimensions and factors which are not represented by the BIG5 model.⁵⁸⁷ This could be other personality models or situational related models like in this case work engagement scales like the UWES⁵⁸⁸. McAndrew adds to this by concluding, “[...] that that no matter how good a personality trait

⁵⁷⁸ Scale 1-5, High / Low scores are referred to as above / below 3 - Mean Results High 3,58 (sd 0,59) vs. Low: 2,53 (sd 0,71)

⁵⁷⁹ Scale 1-5, High / Low scores are referred to as above / below 3 - Mean Results High 3,59 (sd 0,59) vs. Low: 2,52 (sd 0,69)

⁵⁸⁰ Scale 1-5, High / Low scores are referred to as above / below 3 - Mean Results High 3,56 (sd 0,61) vs. Low: 2,42 (sd 0,59)

⁵⁸¹ Scale 1-5, High / Low scores are referred to as above / below 3 - Mean Results High 3,78 (sd 0,44) vs. Low: 2,63 (sd 0,66)

⁵⁸² Scale 1-5, High / Low scores are referred to as above / below 3 - Mean Results High 3,75 (sd 0,45) vs. Low: 2,59 (sd 0,66)

⁵⁸³ Scale 1-5, High / Low scores are referred to as above / below 3 - Mean Results High 3,64 (sd 0,54) vs. Low: 2,46 (sd 0,65)

⁵⁸⁴ Scale 1-5, High / Low scores are referred to as above / below 3 - Mean Results High 3,79 (sd 0,40) vs. Low: 2,56 (sd 0,71)

⁵⁸⁵ See 3.6.5.1 Overview of relevant quality criteria of the measurement model for reflective constructs and 8 for belonging results

⁵⁸⁶ HN04 is disregarded – Compare to 5.3.1.2

⁵⁸⁷ Compare to Stankov 2018

⁵⁸⁸ Schaufeli 2006

*may potentially be as a predictor, it can still be overpowered by strong factors in a situation.*⁵⁸⁹ Rethinking and extending the used concepts may lead to an improvement in predictive validity of the models, however may also result in more complexity and a more exploratory character.

Previous research has recognized the necessity to better adapt gamification to individual preferences.⁵⁹⁰ Often the preference for specific gamification elements are measured against personality traits, while this research included the concept of human work-related needs as mediator. While human-work-related needs also underlie situational variability valid relationships and effects have been found. Human work-related needs should be regarded in an organizational context (especially motivational research). This has also been recognized by Minica who researched the correlation between the human needs system, personality and human motivation.⁵⁹¹

The concept of cultural background offers another perspective on individual gamification preferences. The findings indicate that there is substantial difference between national cultures regarding the preferences and the acceptance of gamification elements. A core problem when trying to define one specific culture is that there are no definite criteria which characterize a cultural area.⁵⁹² These limitations have been discussed in 3.3.2.1 and 5.4.2.3. However, the univariate descriptions as well as the path model results indicate, that further research with more extensive cultural variables seems promising. Especially since the accepted results based on the traditional culture models and research, did not match with the results found in this study.⁵⁹³

The intention to use construct as applied in this research also has important limitations.⁵⁹⁴ The biggest limitation is the construct as such⁵⁹⁵. People value certain criteria based on imaginary situations and belonging examples. The difference of real-life experience vs. imaginary situations is in this complex research field of motivation, personality and work environment complex to translate (visualize) for the respondent, resulting in somewhat vague outcomes.⁵⁹⁶ Survey responses are always self-reported and limited on the first-person view. However, internal gamification as defined in this study is rare in real business environments, so that it is very difficult to find suitable survey participants when not relying on imaginary concepts like “intention to use”. Another issue in this context is the time dimension. While gamification might have large effect in the short-run (e.g. imagined as a new and fun concept) long-run motivational impacts (sustainability) has been shown to bear further pitfalls like demotivation for low performers or tricking the gamification system (metagaming).⁵⁹⁷ Yet, to make these dimensions conscious in theoretical surveys is quite impossible. Consequently, future research should try to focus on real-life conditions, applying experiment or action-research approaches.

The knowledge-based theory of the firm states that firms apply knowledge to the production of goods and services. As a result, knowledge is valued as the most strategically significant resource of a firm.⁵⁹⁸ Critics

⁵⁸⁹ McAndrew 2018

⁵⁹⁰ Compare to Jia et al. 2016 and David Codish und Gilad Ravid 2014 and Schöbel und Söllner 2016

⁵⁹¹ Minica 2015

⁵⁹² Compare to 2.7.3 Problems in classifying culture

⁵⁹³ Compare to 2.70 and 5.2.2

⁵⁹⁴ Compare to 2.8

⁵⁹⁵ Compare to 6.1 Limitations

⁵⁹⁶ Compare to David Codish und Gilad Ravid 2014 p.42 „Finally, as with every self-reported study, there are many biases in the responses and specifically with gamification where people are not always conscious about how they will behave when faced with a competitive or a collaborative environment.“

⁵⁹⁷ Seaborn und Fels 2015. p.23.see table 8 results

⁵⁹⁸ Grant 1996. p.109

of the KBTF address the fact that nature of the firm is not sufficiently characterized (e.g. firms and employees are only related via an employment contract and asset-ownership is neglected).⁵⁹⁹ The results of this research suggest that internal gamification is a promising approach when dealing with the identified issues of knowledge transformation, motivational and collaboration aspects. However, when looking at real-life implementations of internal gamification concepts so far their current primary focus is to serve “[...] *capitalism’s singular goal of accumulating wealth for capitalists by transforming (possibly unsatisfying commodities) into desirable hypercommodities and by delineating labor so that exploitation can be accomplished more efficiently.*”⁶⁰⁰ Thus, the current design-viewpoint is comparatively unidimensional as well. To overcome this shortcoming for this research context, the KBTF and gamification could be recombined into a multidimensional-theory⁶⁰¹ addressing desires (needs), meaningful goals and rewards from the different viewpoints of stakeholder-groups. One outcome could be that the construct of the firm as such (e.g. its shareholders) becomes more dynamic and flexible (driven by different game mechanics like engagement, goals or rewards). However, this could require large changes to the currently established microeconomic environment (e.g. potentially altering current profit-sharing, compensation schemes and types as well as owner-structures).

5.4.6 Implications for practice

5.4.6.1 Collaboration in knowledge intense enterprises

In order to address motivation, teamwork and knowledge flow in organisations trust has been identified as a key resource for building social capital, underlining how important the relationships between individuals are when it comes to knowledge exchange. Without trust communication between team members is restricted since the fear of potential misuse of shared knowledge prevails. Knowledge intense companies should not neglect participative management structures with an open feedback culture if focusing on knowledge creation and diffusion.⁶⁰² Adapting appropriate incentive systematics (like internal gamification) to create engagement (motivation) for KM activities seems a complex but promising approach.

5.4.6.2 Gamification as incentive systematic

Looking at the real-life adoption of internal gamification concepts which go beyond some points and badges there is not much to report, since advanced gamification concepts at the workplace are very rare. Reasons for this are manifold, good concepts need to fit into the specific context and that in turn needs know-how, creativity, money and time. In short: resources which are rare in today’s organizational life. However, if there is one important consideration at the macro level, it is that one size does not fit all.⁶⁰³ This study shall add understanding of how-to custom tailor user centric internal gamification concepts and how the different elements relate. Focusing on knowledge-intense enterprises this research declared individual motivation of employees, social interaction and collaboration and ultimately knowledge flow

⁵⁹⁹ Foss 1996. p.522-523

⁶⁰⁰ Walz 2015. chapter.10. p.275-294(Gamification and Post-Fordist Capitalism by PJ Rey)

⁶⁰¹ Multidimensional in terms of focusing on different stakeholders of the firm and their individual goals and roles in transforming knowledge

⁶⁰² Compare to Fuchs 2006. p.165 “Ich gehe davon aus, dass Vertrauen ebenso wie Sozialkapital von einer Reihe mikro-organisationaler Variablen im weiteren ausführlich bespreche - wie z. B. idiosynkratischer Arbeitsinhalt, partizipationsfördernde Managementstrukturen, feedbackorientierte Managementstrukturen, Fehlerakzeptanz in der Unternehmung, partizipative Managementstrukturen, individualisierte Entgeltsysteme und individuelle Leistungskontrolle, Stress und Kontrolle, bestimmt werden.“

⁶⁰³ Compare to Liu et al. 2017, p. 9 “When we bring tasks and gamification design elements together, it is clear that a one-size-fits-all approach is unlikely to succeed.”

within the organisation as indirect goal dimensions. As discussed, these elements can be targeted by gamification, but the recipe is complex. Consequently, it is suggested to start with small aspects of internal gamification which are well integrated into the context and have the flexibility to adopt to its users' preferences. In this context Nicholson created a user-centric theoretical framework for meaningful gamification. The core assumption is that for gamification to work employees' needs and goals need to be put over the goals of the organisation.⁶⁰⁴ *“Adopting an integrated system of human capital motivation, which takes into account the complex aspects involved in the knowledge society, represents a managerial requirement for any organisation. Managers should embrace the evaluation needs assessment of employees, who should be offered motivational packages. Stereotype solutions based on the needs of the „typical employee” will lead to the drop of effectiveness of the chosen motivational strategies.”*⁶⁰⁵

5.4.6.3 User centric gamification design recommendations

The following design recommendations were found (or validated) by the empirical part of this research:

Demographic aspects:

- **Gender:** Women respond less favorably to competition than their male counterparts. Resulting in fewer women entering and winning competitions.⁶⁰⁶
- **Age:** Motivation through gamification can be achieved in all age groups, but the effects decrease with raising age.⁶⁰⁷
- **Job level:** The intention to use gamification varies considerably between the job levels. The management levels exhibit a higher intention to use gamification as compared to entry and intermediate levels (Limitation: The average age of the sample is rather young, 72% of all participants are aged between 21 and 39 years.)

Personality, work-related needs and cultural aspects:

- **Personality-traits:** The BIG5 model did not qualify as a good (in-)direct predictor for work-related needs or gamification element preference. It can be concluded that the domains of personality at least need to be broadened: *“My argument is that the domain of personality is broader than what has been identified through the lexical approach, with the Big Five/Six model having hijacked the term of “personality”. Based on our own findings, personality may be expanded to include some “dark” traits and self-beliefs[...]*⁶⁰⁸ Furthermore, personality research often uses personality traits to predict a person's behavior in a single experimental session⁶⁰⁹. But a personality trait can be overpowered by stronger factors in a specific situation. Thus, predictions will be better over longer periods of time and multiple precise situations, especially with extreme scores of personality measures.⁶¹⁰
- **Work-related needs:** There is a substantial relationship and effect on the preferences for game elements depending on the specific work-related needs. This research offers a list of 11 work-related needs and wants derived from seven well-known psychologists. In order to design a user

⁶⁰⁴ Nicholson 2012

⁶⁰⁵ Minica 2015. p.104-109

⁶⁰⁶ Compare to Niederle und Vesterlund 2011. p.625

⁶⁰⁷ Compare to Jent und Janneck 2018. p.8

⁶⁰⁸ Stankov 2018. p.10

⁶⁰⁹ Or imaginative scenario like in this research

⁶¹⁰ McAndrew 2018

centric incentive scheme based on internal gamification it can be recommended to regularly assess an individual's needs before trying to address engagement, goals and rewards.

- **Culture:** Across all measured gamification variables, participants with an Indian cultural background on average scored sufficiently higher on the preference for all game mechanics as compared to the German cultural background. The average surplus for the individual gamification mechanic range from +0,47 (autonomy at work) to +1,93 (competition / leaderboards), thus Indians in general seem more positive towards gamification mechanics but do differentiate as much between the different elements. India as more collectivistic culture would be expected to prefer more indirect and less transparent feedback and avoid open competition. However, the results of this research are not in line with this assumption. It might be that this comparatively young-aged sample⁶¹¹ of Indian participants has gone through a very competitive selection process during school and university⁶¹² and is more used to competition than the traditional cultural background would suggest. Germany on average scores quite low on the competitive elements.

⁶¹¹ Compare to 5.2.1 Demographic description

⁶¹² Compare to Strohschneider 2001

6 Summary and conclusion

The goal of this research is to analyze possible cause and effect relationships between personality traits, human work-related needs, cultural background and the preference for specific gamification mechanics in order to address motivation and ultimately knowledge flow and collaboration in organisations. This is addressed by combining and interweaving the status quo of research in the fields of knowledge management, social capital, motivation, personality, culture, and gamification. Goal dimensions of this research model is to measure different effects on the individual's intention to use internal gamification at the workplace. Building on this research's results the insights shall help to improve work environments by fostering engagement, social interaction and hence, knowledge flow and creation.

The research questions are:

1. How do personality traits affect individual work-related needs?
- 2.A How do work-related needs affect the preference for specific gamification elements?
- 2.B How does cultural background affect the preference for specific gamification elements?
3. How does the preference for specific gamification elements affect the intention to use gamification?

The knowledge-based theory of the firm states that knowledge is the most important resource of a firm. It is held by individuals (not firms), thus socially complex. Successful knowledge exchange needs to overcome different barriers and grow "social capital" (trust, social norms and networks). This requires a holistic approach, taking into account technical-, organizational- and human-oriented factors aligned by an intelligent goal (incentive) system. Analyzing the relationship between social capital and knowledge exchange it was shown that social capital serves as an enabler for knowledge management and both have a positive reinforcing relation. Across researchers trust was identified as the key resource for building social capital, underlining how important the relationships between individuals are when it comes to knowledge exchange. Without trust communication between team members is restricted since the fear of potential misuse of shared knowledge prevails. Knowledge intense companies should not neglect participative management structures with an open feedback culture if focusing on knowledge creation and diffusion.⁶¹³

Today's monitoring and controlling practices often hinder these processes and build barriers to knowledge exchange. Knowledge exchange barriers are defined as factors which prevent the flow of knowledge throughout the organisation. Most significant barrier was the absence of incentives for team members to engage in knowledge management activities, followed by suitable IS, a lack of coordination among involved participants and cultural understanding referring to mutual trust and assistance.⁶¹⁴ In order to overcome the identified KM barriers the human-oriented dimension is most important but also most challenging (due to social complexity). Adapting appropriate incentive systematics to build engagement (motivation) for KM activities seems a complex but promising approach.

⁶¹³Compare to Fuchs 2006. p.165 "Ich gehe davon aus, dass Vertrauen ebenso wie Sozialkapital von einer Reihe mikro-organisationaler Variablen die ich im weiteren ausführlich bespreche - wie z. B. idiosynkratischer Arbeitsinhalt, partizipationsfördernde Managementstrukturen, feedbackorientierte Managementstrukturen, Fehlerakzeptanz in der Unternehmung, partizipative Managementstrukturen, individualisierte Entgeltsysteme und individuelle Leistungskontrolle, Stress und Kontrolle, bestimmt werden."

⁶¹⁴ Ajmal et al. 2010. p.166

When trying to foster engagement motivational theory needs to be considered. Combining motivational theories from the early 1940's until today it seems puzzling that many organisations follow only traditional extrinsic reward schemes (carrot & stick mechanism). Pink recently stated that extrinsic incentivized people narrow their focus hindering high performance when working in knowledge intense jobs. According to Pink autonomy, mastery and purpose are the key for 21th century intrinsic incentive systematics.⁶¹⁵ When combining motivational research in order to find the roots (human work-related needs and wants) of intrinsic human motivation 11 work-related needs have been identified of which social exchange, recognition and status and relevance/meaning are found most often. Intrinsic motivations are driven by these varying needs. If those needs can be fulfilled by "extrinsic" incentives a contradiction rises, which no longer allows to classify a single incentive as purely intrinsic or extrinsic in a universal sense. It can be argued that an incentive system as an instrument for goal-oriented behavioral change is extrinsic, since there are external influences (e.g. goals) which do not stem from the individual in an intrinsic sense. On the other hand, one could argue that varying human needs drive the roots of intrinsic motivation.⁶¹⁶ Inner motivational levels (intensity of innate desire) always interact and change with external stimuli, and do not exist per se.

In contrast to this finding Deci et al. analyzed 128 studies on the effects of extrinsic rewards on intrinsic motivation. They conclude that engagement-contingent, performance-contingent, and completion-contingent rewards undermine free-choice intrinsic motivation.⁶¹⁷ Consequently, intrinsic motivators are more effective than extrinsic ones, but extrinsic motivators can reinforce intrinsic ones if combined wisely. Zichermann recognizes the interaction by stating that "*[g]ood gamification design seeks to understand and align an organisation's objectives with a player's intrinsic motivation. Then, through the use of extrinsic rewards and intrinsically satisfying design, move the player through their journey of mastery.*"⁶¹⁸

Being a powerful driver for goal-oriented behavioral change on the one hand, and a driver of human interaction on the other, gamification as incentive system has the potential to revolutionize the way people work, collaborate, and develop. Gamification shall help to align organizational and employee objectives which according to the principal-agent theory do differ depending on the relevant objectives. While organisations strive for revenue and resource maximization, employees try to maximize their utility. However, Hamari found that gamification as instrument can help turning solely utilitarian systems (productivity-oriented) into more hedonically (pleasure-oriented) ones, thereby addressing intrinsic motivation.⁶¹⁹ Information technology can be used for both productivity and pleasure at the same time representing a form of dual-purposed motivation system combining the utilitarian and hedonistic dimension. "*Addressing both utilitarian and hedonic benefits has recently become a necessity in a large number of IS research topics*"⁶²⁰.

⁶¹⁵ Pink 2010. p.203

⁶¹⁶ As derived previously

⁶¹⁷ Deci et al. 1999 "As predicted, engagement-contingent, completion-contingent, and performance-contingent rewards significantly undermined free-choice intrinsic motivation ($d = -0.40, -0.36, \text{ and } -0.2.8$, respectively), as did all rewards, all tangible rewards, and all expected rewards. Engagement-contingent and completion-contingent rewards also significantly undermined self-reported interest ($d = -0.15, \text{ and } -0.17$), as did all tangible rewards and all expected rewards. Positive feedback enhanced both free-choice behavior ($d = 0.33$) and self-reported interest ($d = 0.31$)."

⁶¹⁸ Zichermann 2011 accessed 05.03.2015

⁶¹⁹ Hamari 2013. p.239

⁶²⁰ Santhanam und Liu 2015. p.29

Organisations should understand gamification as a strategy to design behavior, foster innovation and develop human resources, however today's gamification systems often lack a sufficient game design. According to Kuo most recent gamification system are missing this central element of meaning, story and play.⁶²¹ In this context Nicholson created a user-centric theoretical framework for meaningful gamification. The core assumption is that for gamification to work employees' needs and goals need to be put over the goals of the organisation.⁶²²

Gamification addresses the previously identified motivations via different mechanics. Ten gamification elements are derived which have the expected potential to serve as stimulators between the identified human work-related needs (fostering intrinsic motivation) and the knowledge-exchange barriers (lowering the barriers). These elements (also termed coordination variables) are clustered and sorted depending on their expected social complexity (individual vs. group) and their expected interdependency on other external variables. One of these external variables is personality.

Previous research has shown that personality traits do have an important influence on technology acceptance models⁶²³ and on human needs.⁶²⁴ Individuals differ in perception and behavior of situations, conflicts or opportunities. Research has long-windedly discussed these differences and ascribed them to the variation in personality traits.⁶²⁵ As a result the Five Factor Model was developed, classifying personality traits into five dimensions: Conscientiousness, Agreeableness, Neuroticism, Extraversion and Imagination/Openness. Recent research found some measurable influence of personality traits on the perception of gamification elements (e.g. for extroverts vs. introverts).⁶²⁶ *"Our findings indicate that personality traits do play a role in people's perceived preferences on gamification, and they highlight opportunities to engage users—or, at a minimum, limit frustration and disengagement—by (1) tailoring the design of gamified applications based on users' personality traits or (2) making informed design choices that are not perceived as being demotivating by a large portion of an app's audience"*⁶²⁷ Consequently, a measurable influence of personality traits on the perception of gamification elements exists and has been identified by research. Hallifax et al. in 2019 summarized that users can be more or less receptive to different gamification instruments, depending on their personality and player profile, however research finding are heterogenous due to different gamification contexts and typologies.⁶²⁸

This study takes a different approach addressing individual characteristics. First, it is assumed that personality traits as such do not suffice to predict internal gamification element preferences alone. Ghaban et al. agree that several studies indicate the benefit of mapping gamification elements to personality. However, they criticize that this mapping requires a strong understanding of the relationship between gamification elements and personality, which might be more complex (e.g. to situational influences) than adapted by current research.⁶²⁹ In this research human work-related needs will be matched to according gamification

⁶²¹ Kuo 2013

⁶²² Nicholson 2012

⁶²³ Rosen und Kluemper 2008. p.8 "Three of the six relationships between Big Five and TAM constructs were significant, including extroversion to perceived ease of use, extroversion to perceived usefulness, and conscientiousness to perceived ease of use."

⁶²⁴ Costa und McCrae 1988. p.263 Table 3 and Table 4

⁶²⁵ Gustavsson et al. 2003. p.69-89

⁶²⁶ Compare to Jia et al. 2016 and Tondello et al. 2017. p.8 Table 4. Bivariate correlations between the groups of gameful design elements and the Big 5 personality traits. and Buckley und Doyle 2017. p.53

⁶²⁷ Jia et al. 2016. p.10

⁶²⁸ Hallifax Stuart, Audrey Serna, Jean-Charles Marty, Guillaume Lavoué, Elise Lavoué 2019. p.1

⁶²⁹ Ghaban und Hendley 2019. p.1-2

elements to serve as more situational dependent moderators between personality traits and specific preferences. Hence, it is analyzed whether personality traits influence human work-related needs and in turn together with national cultural background influence the preference for different gamification mechanics.

Khaled in 2015 analyzed cultural aspects on a conceptual basis: *“As gamification reaches further conceptual maturity, we need to be deeply thoughtful about cultural and other value biases inherent in gamification design tropes and cognizant of the preferences of the audiences we are designing for to reduce the risk of design failure and the alienation of players.”*⁶³⁰ She proposed that game dynamics embody cultural values that tend to reinforce values suited to mastery and hierarchy-focused cultures. Other academics addressed this fact previously, stating that most of the companies which implemented gamification or offer consulting services are US-based and thus might not to the culture of other nations.⁶³¹ Thus, better understanding culture might be important for comprehending differences in individual behavior. But culture can be shared and learned on different levels (e.g. national vs. organizational).⁶³² Geert Hofstede’s work on cultural differences is defines cultural background as the *“collective programming of the mind distinguishing the members of one group or category of people from others”*. In order to operationalize the construct “cultural background” and narrow the reference frame, this research focuses on the Indian (high-context culture) and German (low-context culture) culture which exhibit a lot of fundamental differences (e.g. group vs. individual) as well as some important basic similarities (e.g. achievement drive). To measure these different effects on a theoretical basis the technology acceptance model (TAM)⁶³³ is applied and the construct of “intention to use” is introduced. The interrelationships are summarized in the following research model:

⁶³⁰ Walz 2015chapter.11. p.298-318 by Rilla Khaled

⁶³¹ Schönbohm und Urban 2014. p.93

⁶³² Hofstede 1984. p.72

⁶³³ Compare to 2.8 Technology acceptance models

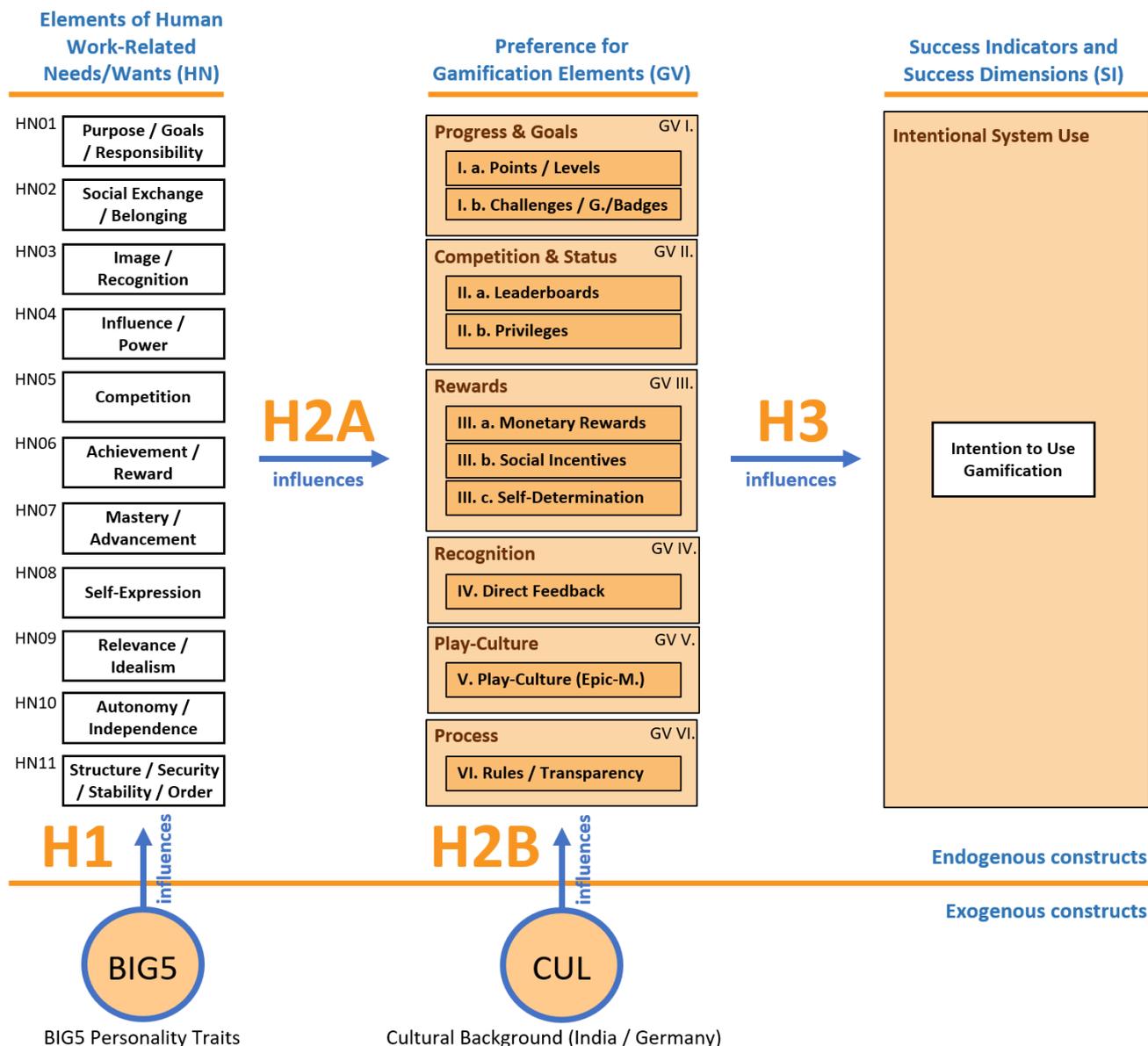


Figure 45 Overview of the research model

Based on this research model the following generic hypotheses can be deduced:

- H1:** A correlation between a BIG5 dimension and a NEED is significant.
- H2A:** A correlation between a NEED and a PREFERENCE FOR GAME ELEMENTS is significant.
- H2B:** A correlation between CULTURAL BACKGROUND and a PREFERENCE FOR GAME ELEMENTS is significant.
- H3:** A correlation between a PREFERENCE FOR GAME ELEMENTS and the INTENTION TO USE GAMIFICATION is significant.

These hypotheses were conceptualized and operationalized into a total of 11 path models (for the identified 11 work-related human needs) thereby creating individual hypothesis⁶³⁴. The detailed results for each generic hypothesis are shown and discussed in section 5.4.3. It is important to keep in mind that the effects were measured in an imaginary “intention to use” setting, so real-world transferability might be limited.⁶³⁵

Summarizing the discussion, the following conclusions can be drawn:

H1: Effects of elements of personality traits on human work-related needs

The results of this research suggest that the effects of the BIG5 personality traits on human work-related needs are generally weak. Yet, the personality dimensions of openness and extraversion are noteworthy.

Openness serves as a relationship predictor for most human work-related needs, but the belonging effect-sizes are small and unidirectional (the higher the degree of openness the higher participants classified their needs in general). Personalities exhibiting a high score on openness are considered to be imaginative, intellectual, and artistically interested, while people with lower levels tend to have narrow minded views are conservative and only show little interest in change.⁶³⁶ People with high scores for extraversion are considered to be social, active, optimistic and communicative, while lower values represent silent and reluctant behavior. In this study extraversion exhibits relevant relationships in intuitively suiting needs (Social Belonging, Image Recognition, Influence Power, Competition, Achievement Reward and Self-Expression). Still, except for social belonging other the effect sizes must be considered weak.

While the BIG5 personality traits do not exhibit a substantial relationship in most models (neither on need nor on the preference for gamification elements) the basic idea to search for other acceptance predictors in order to create user centric gamification is valuable. The personality domain should be extended to include more dimensions and factors which are not represented by the BIG5 model.⁶³⁷ This could be other personality models or situational related models like in this case work engagement scales like the UWES⁶³⁸. McAndrew adds to this by concluding, “[...] that that no matter how good a personality trait may potentially be as a predictor, it can still be overpowered by strong factors in a situation.”⁶³⁹ Rethinking and extending the used concepts may lead to an improvement in predictive validity of the models, however may also result in more complexity and a more exploratory character.

Previous research has also recognized the necessity to better adapt gamification to individual preferences.⁶⁴⁰ Often the preference for specific gamification elements are measured against personality traits, while this research included the concept of human work-related needs as mediator. While human-work-related needs also underlie situational variability valid relationships and effects have been found. Human work-related needs should be regarded in an organizational context (especially motivational research). This has also been recognized by Minica who researched the correlation between the human needs system, personality and human motivation.⁶⁴¹ The research concludes i.a. that “[e]ach person, depending on his or her specific needs and necessities, and the national and organizational context where they carry on their

⁶³⁴ e.g. 55 hypotheses just for H1 (correlation between 5 personality traits and 11 human work-related needs)

⁶³⁵ Compare to 2.8.1 TAM and 3.2 Method and survey design

⁶³⁶ Rammstedt et al. 2013. p.233-234

⁶³⁷ Compare to Stankov 2018

⁶³⁸ Schaufeli 2006

⁶³⁹ McAndrew 2018

⁶⁴⁰ Compare to Jia et al. 2016 and David Codish und Gilad Ravid 2014 and Schöbel und Söllner 2016

⁶⁴¹ Minica 2015

*activity, has aspirations and a set of motivational expectations*⁶⁴² However, a different personality model based on 12 dimensions was used, allowing for more granularity. Stankov in 2018 found low correlations between the BIG5 personality traits and the construct of intelligence. His central conclusion was that the domains of personality need to be broadened. *“My argument is that the domain of personality is broader than what has been identified through the lexical approach, with the Big Five/Six model having hijacked the term of “personality”. Based on our own findings, personality may be expanded to include some “dark” traits and self-beliefs[...]*⁶⁴³

McAndrew in 2018 adds two more relevant aspects to the discussion of personality traits predicting certain behavior. First, research shows that the more extreme a personality trait is pronounced, the more accurate that trait will predict behavior. However, “extreme” pronunciation is relative when the sample size grows⁶⁴⁴. Second, personality research often uses personality traits to predict a person’s behavior in a single experimental session. But a personality trait can be overpowered by stronger factors in a specific situation. Thus, predictions will be better over longer periods of time and multiple precise situations, especially with extreme scores of personality measures.⁶⁴⁵

H2A+H2B: Effects of human work-related needs and cultural background on preferences for gamification elements

73% of all hypotheses exhibit strong relationships between human work-related needs and belonging gamification element preferences. The effect sizes in the relevant dimensions show medium to large effects. Concluding, that there is a substantial relationship and effect on the preferences for game elements depending on needs. In other words, individuals which shows different work-related needs will also prefer different gamification elements. This is in line with previous research. Lu and Wu summarize motivational theories to two main conclusions. *“[...] needs-based motivations are the primary impetus for people to engage in various behaviors, and such motivations can be broadly categorized into two major groups: extrinsic and intrinsic*^{646, 647} Self-Determination Theory specifically focuses on the aspect of culture by stating that *“[...] psychological needs are also highly relevant to the processes by which cultural contents are shaped and retained. That is, psychological needs play a significant role in the creation and selection of novel cultural memes (Csikszentmihalyi and Massimini, 1985) and, in turn, the needs are themselves differentially supported or disrupted by existing memes.*⁶⁴⁸

In line with this reasoning, the construct cultural background is even stronger in relationships and effects. Consequently, the influence of cultural background on preferences for certain game elements must be considered substantial. The findings indicate that there is substantial difference between national cultures regarding the preferences and the acceptance of gamification elements. A core problem when trying to define one specific culture is that there are no definite criteria which characterize a cultural area.⁶⁴⁹ These limitations have been discussed in 3.3.2.1 and 5.4.2.3. However, the univariate descriptions as well as the

⁶⁴² Minica 2015. p.108 see also Andreş, S., (2012) Management. Sinteză, teste, îndrumări, Editura Eftimie Murgu, Reşiţa, p.111

⁶⁴³ Stankov 2018. p.10

⁶⁴⁴ Someone considering his- or herself extremely extroverted might be “outperformed” by someone who is still much more extroverted

⁶⁴⁵ McAndrew 2018

⁶⁴⁶ Lu und Wu 2013. p.156 see also p.170 “[...] we find that, in the context of utilitarian IT, extrinsic motivators are more important than intrinsic motivators, whereas, in the context of hedonic IT, intrinsic motivators play a more critical role than extrinsic motivators.”

⁶⁴⁷ Compare to 2.3.8 Deci, Ryan Self-determination theory (6S)

⁶⁴⁸ Deci und Ryan 2000. p.256

⁶⁴⁹ Compare to 2.7.3 Problems in classifying culture

path model results indicate, that further research with more extensive cultural variables seems promising. Especially since the accepted results based on the traditional culture models and research, did not match with the results found in this study.⁶⁵⁰

It was expected that India as a high-context culture with lower scores in Hofstede's masculinity and individualism dimension⁶⁵¹ would score lower average values in the preference for game elements addressing competition. Univariate results in this research suggest, that people with an Indian culture background show stronger preference for work-related competition than their German counterparts. Sully de Luque and Sommer analyzed Feedback seeking behavior across cultures and differentiated (as one factor) between idealistic and collectivistic cultures and belonging direct or indirect feedback.⁶⁵² India as more collectivistic culture would be expected to prefer more indirect and less transparent feedback. However, the scores revealed by univariate analysis are again not in line with this assumption. It might be that this comparatively young-aged sample⁶⁵³ of Indian participants has gone through a very competitive selection process during school and university⁶⁵⁴ and is more used to competition than the traditional cultural background would suggest.

H3: Effects of preferences for gamification elements on success indicator intention to use

All models showed strong correlation between the preference for certain game elements and the overall theoretical intention to use gamification at the workplace. However, this is not surprisingly because of two reasons. First, the preference for game elements were operationalized in a question design somewhat related to the intention to use (*"To which extent would you agree if the following game elements would be introduced to your workplace?"*). Second, most people within the group of gamification promoters (all participants that scored above 3 in the intention to use construct) on average scored all gamification elements (GE variables) comparatively high with low standard deviations within the group. The same aspect holds vice versa for the gamification detractors with even lower standard deviations. As a result, the survey mostly does not yield significant differences between the gamification elements in its respective groups. Reason for that might be the missing real-life experience with gamification elements, so that participants can not accurately differentiate the concepts based on the applied "intention to use" concept. People value certain criteria based on imaginary situations and belonging examples. The difference of real-life experience vs. imaginary situations is in this complex research field of motivation, personality and work environment complex to translate for the respondent, resulting in somewhat vague outcomes.⁶⁵⁵ Survey responses are always self-reported and limited on the first-person view. However, internal gamification as defined in this study is rare in real business environments, so that it is very difficult to find suitable survey participants when not relying on imaginary concepts like "intention to use". Another issue in this context is the time dimension. While gamification might have large effect in the short-run (e.g. imagined as a new and fun concept) long-run motivational impacts (sustainability) has been shown to

⁶⁵⁰ Compare to 2.7 and 5.2.2

⁶⁵¹ Compare to 2.7.4 Cultural differences: Focusing on India and Germany

⁶⁵² Sully De Luque und Sommer 2000. p.843 figure 1

⁶⁵³ Compare to 5.2.1 Demographic description

⁶⁵⁴ Compare to Strohschneider 2001

⁶⁵⁵ Compare to David Codish und Gilad Ravid 2014. p.42 „Finally, as with every self-reported study, there are many biases in the responses and specifically with gamification where people are not always conscious about how they will behave when faced with a competitive or a collaborative environment.“

bear further pitfalls like demotivation for low performers or tricking the gamification system (metagamming).⁶⁵⁶ Yet, to make these dimensions conscious in theoretical surveys is quite impossible. Consequently, future research should try to focus on real-life conditions, applying experiment or action-research approaches.

Looking at the real-life adoption of internal gamification concepts which go beyond some points and badges there is not much to report, since clever gamification at the workplace are still rare. Reasons for this are manifold, good concepts need to fit into the specific context and that in turn needs know-how, creativity, money and time. In short: resources which are rare in today's organizational life. However, if there is one important consideration at the macro level, it is that one size does not fit all.⁶⁵⁷ This study shall add understanding of how-to custom tailor user centric internal gamification concepts and how the different elements relate. Focusing on knowledge-intense enterprises this research declared individual motivation of employees, social interaction and collaboration and ultimately knowledge flow within the organization as indirect goal dimensions. As discussed, these elements can be targeted by gamification, but the recipe is complex. Consequently, it is suggested to start with small aspects of internal gamification which are well integrated into the context and have the flexibility to adopt to its users' preferences. *"Adopting an integrated system of human capital motivation, which takes into account the complex aspects involved in the knowledge society, represents a managerial requirement for any organisation. Managers should embrace the evaluation needs assessment of employees, who should be offered motivational packages. Stereotype solutions based on the needs of the „typical employee“ will lead to the drop of effectiveness of the chosen motivational strategies."*⁶⁵⁸ This includes that potential gamification mechanics remain on a pure volunteer basis.⁶⁵⁹

6.1 Limitations

Due to its exploratory nature this research bears some important limitations which have already been discussed thoroughly. Next, follows a summary of the key aspects:

Design limitations:

- This research followed a defined research scope focusing i.a. on two cultures, knowledge-intense work surroundings and white-collar workers.⁶⁶⁰ This limits generalizability on the one hand, on the other hand it shows how many potential influencing variables (next to the common demographics) may be considered.
- Boyle criticizes the BIG5 framework since the replicability of results across different samples is not consistent.⁶⁶¹ This limitation needs to be regarded when discussing and comparing the results to comparable research projects also applying the BIG5 methodology.

Construct limitations:

⁶⁵⁶ Seaborn und Fels 2015. p.23.see table 8 results

⁶⁵⁷ Compare to Liu et al. 2017, p. 9 "When we bring tasks and gamification design elements together, it is clear that a one-size-fits-all approach is unlikely to succeed."

⁶⁵⁸ Minica 2015. p.104-109

⁶⁵⁹ Compare to: Caillois 1982 Interestingly he defined as basis requirement for playing that playing always must be unproductive and on a volunteer basis.

⁶⁶⁰ See 1.3 Scope of study

⁶⁶¹ Boyle 2010. p.20

- Some survey items and resulting latent constructs have been developed from scratch and need further validation, since no appropriate sources could be identified.⁶⁶²
- Cultural background: A core problem when trying to define one specific culture is that there are no definite criteria which characterize a cultural area.⁶⁶³ These limitations have been discussed in 3.3.2.1 and 5.4.2.3. Cultural background is an important construct, however by definition diffuse and complex.
- The “intention to use construct” as applied in this research also has important limitations.⁶⁶⁴ The biggest limitation is the construct as such. People value certain criteria based on imaginary situations and belonging examples. The difference of real-life experience vs. imaginary situations is in this complex research field of motivation, personality and work environment complex to translate for the respondent, resulting in somewhat vague outcomes.⁶⁶⁵ Survey responses are always self-reported and limited on the first-person view. However, internal gamification as defined in this study is rare in real business environments, so that it is very difficult to find suitable survey participants when not relying on imaginary concepts like “intention to use”.
- Time dimension: While gamification might have large effect in the short-run (e.g. imagined as a new and fun concept) long-run motivational impacts (sustainability) has been shown to bear further pitfalls like demotivation for low performers or tricking the gamification system (metagamming).⁶⁶⁶ Yet, to make these dimensions conscious in theoretical “intention to use” surveys is quite impossible.

Sample limitations:

- The sample is not evenly split into both genders, but rather consists of 67% male and 32% female participants. Furthermore, the average age of the sample is rather young, 72% of all participants are aged between 21 and 39 years. This limits generalizability.

6.2 Future Research

The results of this research identify some interesting opportunities for further research which are presented below:

The personality domain should be extended to include more dimensions and factors which are not represented by the BIG5 model.⁶⁶⁷ This could be other personality models or situational related models like in this case work engagement scales like the UWES⁶⁶⁸. McAndrew adds to this by concluding, “[...] *that no matter how good a personality trait may potentially be as a predictor, it can still be overpowered by strong factors in a situation.*”⁶⁶⁹ Rethinking and extending the used concepts may lead to an improvement in predictive validity of the models, however may also result in more complexity and a more exploratory character.

⁶⁶² See 8.2 Appendix B - Questionnaire Quantitative Study for details

⁶⁶³ Compare to 2.7.3 Problems in classifying culture

⁶⁶⁴ Compare to 2.8

⁶⁶⁵ Compare to David Codish und Gilad Ravid 2014 p.42 „Finally, as with every self-reported study, there are many biases in the responses and specifically with gamification where people are not always conscious about how they will behave when faced with a competitive or a collaborative environment.“

⁶⁶⁶ Seaborn und Fels 2015. p.23.see table 8 results

⁶⁶⁷ Compare to Stankov 2018

⁶⁶⁸ Schaufeli 2006

⁶⁶⁹ McAndrew 2018

Previous research measured the preference for specific gamification elements against personality traits, while this research included the concept of human work-related needs as mediator. While human-work-related needs also underlie situational variability substantial relationships and effects have been identified. Future research should regard human work-related needs in a real-life organizational context (especially motivational research) and take other dimensions into account (e.g. the time- or situational-dimension). This has also been recognized by Minica who researched the correlation between the human needs system, personality and human motivation.⁶⁷⁰

The concept of cultural background offers another perspective on individual gamification preferences. The findings indicate that there is substantial difference between national cultures regarding the preferences and the acceptance of gamification elements. As mentioned in the limitations, a core problem when trying to define one specific culture is that there are no definite criteria which characterize a cultural area.⁶⁷¹ However, the univariate descriptions as well as the path model results indicate, that further research with more extensive cultural variables seems promising. Especially since the accepted results based on the traditional culture models and research, did not match with the results found in this study.⁶⁷²

⁶⁷⁰ Minica 2015

⁶⁷¹ Compare to 2.7.3 Problems in classifying culture

⁶⁷² Compare to 2.70 and 5.2.2

7 References

- Ajmal, Mian; Helo, Petri; Kekäle, Tauno (2010): Critical factors for knowledge management in project business. In: *Journal of Knowledge Management* 14 (1), S. 156–168. DOI: 10.1108/13673271011015633.
- Ajzen (1991): The Theory of Planned Behavior. In: *ORGANIZATIONAL BEHAVIOR AND HUMAN DECISION PROCESSES* (50), S. 179–211.
- Ajzen; Fishbein (1980): Understanding Attitudes and Predicting Social Behavior. In: *Engelwood Cliffs, N.J.: Prentice-Hal.*
- Andreş (2012): Management. Sinteze, teste, îndrumări, Editura Eftimie Murgu, Reşiţa.
- Aulinger, Andreas; Pfriem, Reinhard; Fischer, Dirk (2001): Wissen managen - ein weiterer Beitrag zum Mythos des Wissens? Oder: emotionale Intelligenz und Institution im Wissensmanagement. In: *Wissen in Unternehmen : Konzepte, Maßnahmen, Methoden*, S. 69–87.
- Backhaus, Klaus; Erichson, Bernd; Weiber, Rolf (Hg.) (2015): Fortgeschrittene Multivariate Analysemethoden. Eine anwendungsorientierte Einführung. 3., überarbeitete und aktualisierte Auflage. Berlin, Heidelberg: Springer Gabler. Online verfügbar unter <http://dx.doi.org/10.1007/978-3-662-46087-0>.
- Badgeville Inc.: Game Mechanics - Epic Meaning. Gamifiction Wiki Definitions. Online verfügbar unter http://badgeville.com/wiki/Game_Mechanics/Epic_Meaning, zuletzt geprüft am 27.04.2014.
- Bagozzi, Richard (2007): The Legacy of the Technology Acceptance Model and a Proposal for a Paradigm Shift. In: *Journal of the Association for Information Systems* 8 (4), S. 244–254. DOI: 10.17705/1jais.00122.
- Bagozzi, Richard P.; Phillips, Lynn W. (1982): Representing and Testing Organizational Theories: A Holistic Construal. In: *Administrative Science Quarterly* 27 (3), S. 459. DOI: 10.2307/2392322.
- Bammer G. (2003): Embedding Critical Systems Thinking in the Academy. In: *Stream: OR/Systems Thinking for Social Improvement*. Online verfügbar unter <http://www.mngt.waikato.ac.nz/ejrot/cmsconference/2003/abstracts/orsystems/Bammer.pdf>, zuletzt geprüft am 23.02.2014.
- Baxter, Gordon; Sommerville, Ian (2011): Socio-technical systems: From design methods to systems engineering. In: *Interacting with Computers* 23 (1), S. 4–17. DOI: 10.1016/j.intcom.2010.07.003.
- Blohm, Ivo; Leimeister, Jan Marco (2013): Gamification. In: *Bus Inf Syst Eng* 5 (4), S. 275–278. DOI: 10.1007/s12599-013-0273-5.
- Bogost, Ian (2011): Gamification is Bullshit. My position statement at the Wharton Gamification Symposium. BLOG. Online verfügbar unter http://www.bogost.com/blog/gamification_is_bullshit.shtml, zuletzt geprüft am 04.01.2014.
- Boyle, Gregory J. (2010): Critique of the Five-Factor Model of Personality. In: Gregory John Boyle (Hg.): *Personality theories and models*. Reprinted. Los Angeles, Calif.: Sage (The SAGE handbook of personality theory and assessment, / ed. by Gregory J. Boyle ... ; Vol. 1), S. 295–312.
- Brandstätter, Veronika; Schüler, Julia; Puca, Rosa Maria; Lozo, Ljubica (2013): *Motivation und Emotion*. Berlin, Heidelberg: Springer Berlin Heidelberg.
- Brandt; Hartmann (1999): Editorial: Research Topics and Strategies in Sociotechnical Systems. In: *Human Factors and Ergonomics in Manufacturing* 9 (3), S. 241.
- Brim, Brian; Asplund, Jim (2009): Driving Engagement by Focusing on Strengths. Gallup Business Journal. Gallup Business Journal. Online verfügbar unter <http://businessjournal.gallup.com/content/124214/driving-engagement-focusing-strengths.aspx>, zuletzt geprüft am 27.04.2014.
- Brouwer, Robin (2016): When Competition is the Loser: The Indirect Effect of Intra-team Competition on Team Performance through Task Complexity, Team Conflict and Psychological Safety. In: Tung X. Bui und Ralph H. Sprague (Hg.): *Proceedings of the 49th Annual Hawaii International Conference on System Sciences*. 5-8 January 2016, Kauai, Hawaii. 2016 49th Hawaii International Conference on Sys-

tem Sciences (HICSS). Koloa, HI, USA, 5/1/2016 - 8/1/2016. Hawaii International Conference on System Sciences; Annual Hawaii International Conference on System Sciences; HICSS. Piscataway, NJ, Piscataway, NJ: IEEE, S. 1348–1357.

Buckley, Patrick; Doyle, Elaine (2017): Individualising gamification. An investigation of the impact of learning styles and personality traits on the efficacy of gamification using a prediction market. In: *Computers & Education* 106, S. 43–55. DOI: 10.1016/j.compedu.2016.11.009.

Bühner, MarkusMarkusBühner (2006): Einführung in die Test- und Fragebogenkonstruktion: Technische Universität Dortmund.

Bunchball, Inc (2010): Gamification 101: An Introduction to the Use of Game Dynamics to Influence Behavior. In: *White Paper*.

Burke, M. & Hiltbrand, T. (2011): How Gamification Will Change Business Intelligence. In: *Business Intelligence Journal* 16 (2), S. 8–16.

Caillois, Roger (1982): Die Spiele und die Menschen. Maske und Rausch. Frankfurt/Main [u.a.]: Ullstein.

Cambridge (2020): Cambridge Dictionary. Definition of "culture". Hg. v. Cambridge University Press 2020. Online verfügbar unter <https://dictionary.cambridge.org/de/worterbuch/englisch/culture>, zuletzt geprüft am 10.04.2020.

Carmel, Erran; Tjia, Paul (2005): Offshoring information technology. Sourcing and outsourcing to a global workforce. Cambridge: Cambridge University Press.

Centers, Richard; Bugental, Daphne E. (1966): Intrinsic and extrinsic job motivations among different segments of the working population. In: *Journal of Applied Psychology* 50 (3), S. 193–197. DOI: 10.1037/h0023420.

Chesney, T. (2006): AN ACCEPTANCE MODEL FOR USEFUL AND FUN INFORMATION SYSTEMS. In: *Human Technology* 2 (2), S. 225–235.

Chin, W. W. (1998): The partial least squares approach for structural equation modeling. In G. A. Marcoulides (Ed.), *Modern methods for business research*. In: *Methodology for business and management*, S. 295–336.

Chin, W. W.; Newsted, P. R. (1999): p. in *Statistical Strategies for Small Sample Research*, Rick Hoyle (ed.): Thousand Oaks, CA: Sage Publications, pp. 307-341.

Chirkov, Valery (2008): Culture, personal autonomy and individualism: Their relationships and implications for personal growth and well-being. In: In G. Zheng, K. Leung, & J. G. Adair (Eds.), *Perspectives and progress in contemporary cross-cultural psychology: Proceedings from the 17th International Congress of the International Association for Cross-Cultural Psychology*. Online verfügbar unter http://i-accp.org/ebook/xian/PDFs/5_1Chirkov.pdf, zuletzt geprüft am 28.12.2018.

Choo, Chun Wei; Bontis, Nick (2002): The strategic management of intellectual capital and organizational knowledge. Oxford, New York: Oxford University Press. Online verfügbar unter <http://search.ebscohost.com/login.aspx?direct=true&scope=site&db=nlebk&db=nlabk&AN=150077>.

Chua, Alton; Lam, Wing (2005): Why KM projects fail: a multi-case analysis. In: *Journal of Knowledge Management* 9 (3), S. 6–17. DOI: 10.1108/13673270510602737.

Costa, Paul T.; McCrae, Robert R. (1988): From catalog to classification. Murray's needs and the five-factor model. In: *Journal of Personality and Social Psychology* 55 (2), S. 258–265. DOI: 10.1037/0022-3514.55.2.258.

Craig, Nick, Scott Snook (2014): From Purpose to Impact: Figure Out Your Passion and Put It to Work. In: *Harvard Business Review* 92 (no. 5), S. 105–111.

Csikszentmihalyi, Mihaly (1997): Finding flow. The psychology of engagement with everyday life. 1st ed. New York: BasicBooks (MasterMinds).

- David Codish; Gilad Ravid (2014): Personality Based Gamification–Educational Gamification for Extroverts and Introverts. In: *Conference: 9th Chais Conference for the Study of Innovation and Learning Technologies: Learning in the Technological Era At: Ra'anana, Israel*. Online verfügbar unter https://www.researchgate.net/profile/David_Codish/publication/260305044_Personality_Based_Gamification-Educational_Gamification_for_Extroverts_and_Introverts/links/00b49532ad291ee822000000/Personality-Based-Gamification-Educational-Gamification-for-Extroverts-and-Introverts.pdf, zuletzt geprüft am 27.10.2018.
- Davis; Bagozzi; Warshaw (1989): User acceptance of computer technology - a comparison of two theoretical models. In: *Management Science* 35 (8), S. 982–1003, zuletzt geprüft am 27.04.2014.
- Deci, E. L.; Ryan, R. M. (2002): *Handbook of Self-determination Research*: University of Rochester Press. Online verfügbar unter <https://books.google.de/books?id=DcAe2b7L-RgC>.
- Deci, Edward L.; Ryan, Richard M. (2000): The 'what' and 'why' of goal pursuits: Human needs and the self-determination of behavior. In: *Psychological Inquiry* 11, S. 227–268, zuletzt geprüft am 06.04.2014.
- Deci, Edward L.; Ryan, Richard M.; Koestner, Richard (1999): A meta-Analytic Review of Experiments Examining the Effects of Extrinsic Rewards in Intrinsic Motivation. In: *Psychological Bulletin* 125 (6), S. 627–668, zuletzt geprüft am 26.04.2014.
- Deterding, Sebastian; Björk, Staffan L.; Nacke, Lennart E.; Dixon, Dan; Lawley, Elizabeth: Designing gamification. In: Wendy E. Mackay, Stephen Brewster und Susanne Bødker (Hg.): *CHI '13 Extended Abstracts on Human Factors in Computing Systems*. Paris, France, S. 3263.
- Deterding, Sebastian; Dixon, Dan; Khaled, Rilla; Nacke, Lennart (Hg.) (2011): From game design elements to gamefulness. *MindTrek'11*. Tampere, Finland, September 28-30, 2011.
- Duggan, Kris; Shoup, Kate (2013): *Business gamification for dummies*. Hoboken, N.J, Chichester: Wiley; John Wiley [distributor] (For dummies).
- Dumpit, Duvince Zhalimar; Fernandez, Cheryl Joy (2017): Analysis of the use of social media in Higher Education Institutions (HEIs) using the Technology Acceptance Model. In: *Int J Educ Technol High Educ* 14 (1), S. 8609. DOI: 10.1186/s41239-017-0045-2.
- Eberl, M.: Formative und reflektive Konstrukte und die Wahl des Strukturgleichungsverfahrens. Eine statistische Entscheidungshilfe. In: *Die Betriebswirtschaft* 2006 (Vol. 66, Iss. 6), S. 651–668.
- Efron, Bradley; Tibshirani, Robert (1998): *An introduction to the bootstrap*. [Nachdr.]. Boca Raton, Fla.: Chapman & Hall (Monographs on statistics and applied probability, 57).
- Fernando C. Tomaselli; Otavio P. Sanchez; Susan A. Brown (2015): How to Engage Users through Gamification: The Prevalent Effects of Playing and Mastering over Competing. Texas. In: *ICIS 2014 Proceedings Template* Thirty Sixth International Conference on Information Systems.
- Flett, Gordon L. (2007): *Personality theory and research. An international perspective*. Mississauga, Ont.: Wiley.
- Fornell, Claes; Larcker, David F. (1981): Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. In: *Journal of Marketing Research* 18 (1), S. 39. DOI: 10.2307/3151312.
- Foss, Nicolai J. (1996): More Critical Comments on Knowledge-Based Theories of the Firm. In: *Organization Science* 7 (5), S. 519–523. DOI: 10.1287/orsc.7.5.519.
- Frey, Bruno S.; Jegen, Reto (2001): Motivation Crowding Theory. In: *J Economic Surveys* 15 (5), S. 589–611. DOI: 10.1111/1467-6419.00150.
- Friedman, Howard S.; Schustack, Miriam W. (2012): *Personality. Classic theories and modern research*. 5th ed. Boston, Mass.: Allyn & Bacon.
- Fuchs, Andreas (2011): *Methodische Aspekte linearer Strukturgleichungsmodelle. Ein Vergleich von kovarianz- und varianzbasierten Kausalanalyseverfahren*. Würzburg: Betriebswirtschaftliches Inst., Lehrstuhl für BWL und Marketing (Research papers on marketing strategy, 2).

- Fuchs, Manfred (2006): *Sozialkapital, Vertrauen und Wissenstransfer in Unternehmen*. 1. Aufl. Wiesbaden: Dt. Univ.-Verl. (Wirtschaftswissenschaft).
- Gabe Zichermann (2011): *Intrinsic and Extrinsic Motivation in Gamification* - Gamification Co. Online verfügbar unter <http://www.gamification.co/2011/10/27/intrinsic-and-extrinsic-motivation-in-gamification/>, zuletzt geprüft am 23.02.2014.
- Gartner (2012): *Gamification 2020: What Is the Future of Gamification ?* Centre Convencions Internacional Barcelona. Barcelona, 5.11.2012.
- Gartzen, Ute (2013): *Voraussetzungen für Wissenstransaktionen in hochschulnahen Forschungsclustern*. Zugl.: Aachen, Techn. Hochsch., Diss., 2013. Aachen: Apprimus-Verl. (Produktionssystematik, 2013,23).
- Gears, Deborah (2013): *Gamification in Business: Designing Motivating Solutions to Problem Situations*. In: *CHI'13 France*, zuletzt geprüft am 27.04.2014.
- Geert Hofstede (2020): *Geert Hofstede - Germany (compared to India)*. Hofstede Insights, Mikonkatu 17 A, 00100 Helsinki, FINLAND. Online verfügbar unter <https://www.hofstede-insights.com/product/compare-countries/>, zuletzt geprüft am 11.04.2020.
- Geert Hofstede, Michael H. Bond (1984): *Hofstede's Culture Dimensions An Independent Validation Using Rokeach's Value Survey*. In: *Journal of Cross-cultural Psychology - J CROSS-CULT PSYCHOL* 15 (4), S. 417–433. DOI: 10.1177/0022002184015004003.
- Ghaban, Wad; Hendley, Robert (2018): *Investigating the Interaction Between Personalities and the Benefit of Gamification*. DOI: 10.14236/ewic/HCI2018.41.
- Ghaban, Wad; Hendley, Robert (2019): *How Different Personalities Benefit From Gamification*. In: *Interacting with Computers* 31 (2), S. 138–153. DOI: 10.1093/iwc/iwz009.
- Gnauk, B., Dannecker, L. and Hahmann, M. (2012): *Leveraging Gamification in Demand Dispatch Systems*. In: *In Proceedings of the 2012 Joint EDBT/ICDT Workshops, ACM, New York, USA.*, p. 103.
- Götz, O.; Liehr-Gobbers, K. (2004): *Analyse von Strukturgleichungsmodellen mit Hilfe der Partial-Least-Squares(PLS)-Methode (Die Betriebswirtschaft : DBW. - Stuttgart : Schäffer-Poeschel, ISSN 0342-7064, ZDB-ID 213053-1. - Vol. 64.2004, 6), p. 714-738*.
- Grant, Robert M. (1996): *Toward a knowledge-based theory of the firm*. In: *Strategic management journal* 17, S. 109–122.
- Günter W. Maier, Manfred Kirchgeorg (2018): *GABLER Wirtschaftslexikon Online. Definition: Was ist "Motivation"?* Revision von Motivation vom 19.02.2018 - 16:08 (Universität Bielefeld). Online verfügbar unter <https://wirtschaftslexikon.gabler.de/definition/motivation-38456/version-261879>.
- Gustavsson, J.Petter; Jönsson, Erik G.; Linder, Jürgen; Weinryb, Robert M. (2003): *The HP5 inventory: definition and assessment of five health-relevant personality traits from a five-factor model perspective*. In: *Personality and Individual Differences* 35 (1), S. 69–89. DOI: 10.1016/S0191-8869(02)00142-3.
- Haenlein, Michael; Kaplan, Andreas M. (2004): *A Beginner's Guide to Partial Least Squares Analysis*. In: *Understanding Statistics* 3 (4), S. 283–297. DOI: 10.1207/s15328031us0304_4.
- Hair, Joseph F.; Hult, G. Tomas M.; Ringle, Christian Marc (2017): *A primer on partial least squares structural equation modeling (PLS-SEM)*. Second edition.
- Hall, Edward T. (1976): *Beyond culture*. Anchor Books ed. New York: Anchor Books.
- Hallifax Stuart, Audrey Serna, Jean-Charles Marty, Guillaume Lavoué, Elise Lavoué (2019): *Factors to Consider for Tailored Gamification*. In: *HAL archives-ouvertes.fr (CHI Play, Oct 2019, Barcelona, Spain. hal-02185647f)*. Online verfügbar unter <https://hal.archives-ouvertes.fr/hal-02185647>.
- Hamari, Jonna; Koivisto, Jonna; Sarsa, Harri (2014): *Does Gamification Work? A Literature Review of Empirical Studies on Gamification*. In: *In proceedings of the 47th Hawaii International Conference Hawaii, USA, January 6-9, 2014.*, zuletzt geprüft am 18.01.2014.

- Hamari, Juho (2013): Transforming homo economicus into homo ludens: A field experiment on gamification in a utilitarian peer-to-peer trading service. In: *Electronic Commerce Research and Applications* 12 (4), S. 236–245. DOI: 10.1016/j.elerap.2013.01.004.
- Hamari, Juho; Koivisto, Jonna (2013): Social motivations to use gamification: An empirical study of gamifying exercise. In: *ECIS 2013 - Proceedings of the 21st European Conference on Information Systems*.
- Hamari, Juho; Koivisto, Jonna (2015): “Working out for likes”: An empirical study on social influence in exercise gamification. In: *Computers in Human Behavior* 50, S. 333–347. DOI: 10.1016/j.chb.2015.04.018.
- Heckhausen: Motivation und Handeln. In: *Berl* 1989 (2. Auflage).
- Heider (1958): The Psychology of Interpersonal Relations. In: *New York*.
- Henderson, S.; Duncan-Jones, P.; Byrne, D. G.; Scott, R. (2009): Measuring social relationships. The Interview Schedule for Social Interaction. In: *Psychological medicine* 10 (4), S. 723–734. DOI: 10.1017/s003329170005501x.
- Herzberg, Frederick (2008): One more time: How do you motivate employees? Boston, Mass: Harvard Business Press (The Harvard business review classics series).
- Herzberg, Frederick; Mausner, Bernard; Snyderman, Barbara Bloch (2017): The motivation to work. London, New York: Routledge Taylor & Francis Group.
- Hirschman, Albert O. (1984): Against Parsimony: Three Easy Ways of Complicating Some Categories of Economic Discourse. In: *AEA PAPERS AND PROCEEDINGS* 74 (2). Online verfügbar unter http://stevereads.com/papers_to_read/against_parsimony_three_easy_ways_of_complicating_some_categories_of_economic_discourse.pdf, zuletzt geprüft am 23.03.2014.
- Hofstede, G. (2018): Country Comparison - Hofstede Insights. Hg. v. india country-comparison: germany. Hofstede Insights. Online verfügbar unter <https://www.hofstede-insights.com/country-comparison/germany,india/>, zuletzt aktualisiert am 01.11.2018, zuletzt geprüft am 01.11.2018.
- Hofstede, Geert H. (1984): Culture's consequences. International differences in work-related values. Abridged ed. Beverly Hills: Sage Publications (Cross-cultural research and methodology series).
- Hofstede, Geert H.; Hofstede, Gert Jan; Minkov, Michael (2010): Cultures and organizations. Software of the mind : intercultural cooperation and its importance for survival. Rev. and expanded 3rd ed. New York: McGraw-Hill.
- Homburg; Giering (1996): Konzeptualisierung und Operationalisierung komplexer Konstrukte - Ein Leitfaden für die Marketingforschung. In: *Zeitschrift für Forschung und Praxis*, 18., S. 5–24.
- Homburg, Christian; Baumgartner, Hans (1995): Beurteilung von Kausalmodellen. Bestandsaufnahme und Anwendungsempfehlungen. In: *Marketing : ZFP ; journal of research and management* 0344136971734891719953162176 (3).
- Homburg, Christian; Pflesser, Christian (Hg.) (1999): Strukturgleichungsmodelle mit latenten Variablen : Kausalanalyse. Marktforschung, p. 633-659. Wiesbaden: Gabler-Verlag.
- Hsu, C. L.; Lu, H. P. (2004): Why do people play on-line games? An extended TAM with social influences and flow experience. In: *Information & Management* 41 (7), 853-868.
- Ian Thorpe (2010): Explicit vs Tacit Knowledge for Impact | Tactical Philanthropy. Online verfügbar unter <http://www.tacticalphilanthropy.com/2010/12/explicit-vs-tacit-knowledge-for-impact/>, zuletzt geprüft am 15.11.2014.
- Ivanic, Aarti S. (2015): Status Has Its Privileges: The Psychological Benefit of Status-Reinforcing Behaviors. In: *Psychol. Mark.* 32 (7), S. 697–708. DOI: 10.1002/mar.20811.
- Janine Nahapiet; Sumantra Ghoshal (1998): Social Capital, Intellectual Capital, and the Organizational Advantage. In: *The Academy of Management Review* 23 (2), S. 242–266, zuletzt geprüft am 23.03.2014.

- Jarvis, Cheryl Burke; MacKenzie, Scott B.; Podsakoff, Philip M. (2003): A Critical Review of Construct Indicators and Measurement Model Misspecification in Marketing and Consumer Research. In: *J CONSUM RES* 30 (2), S. 199–218. DOI: 10.1086/376806.
- Jaview Carrillo, Francisco; McElroy, Mark W.; Jorna, René J.; van Engelen, Jo (2006): Rethinking social capital theory. A knowledge management perspective. In: *Journal of Knowledge Management* 10 (5), S. 124–136. DOI: 10.1108/13673270610691233.
- Jent, Sophie; Janneck, Monique (2018): Using Gamification to Enhance User Motivation: The Influence of Gender and Age. In: Louis E. Freund und Wojciech Cellary (Hg.): *Advances in The Human Side of Service Engineering. Proceedings of the AHFE 2017 International Conference on The Human Side of Service Engineering*, July 17–21, 2017, The Westin Bonaventure Hotel, Los Angeles, California, USA, Bd. 601. Cham, s.l.: Springer International Publishing (Advances in Intelligent Systems and Computing, 601), S. 3–10.
- Jia, Yuan; Xu, Bin; Karanam, Yamini; Volda, Stephen (2016): Personality-targeted Gamification. In: Jofish Kaye, Allison Druin, Cliff Lampe, Dan Morris und Juan Pablo Hourcade (Hg.): #chi4good. CHI 2016 : San Jose, CA, USA, May 7-12. Unter Mitarbeit von Allison Druin und Jofish Kaye. the 2016 CHI Conference. Santa Clara, California, USA, 07.05.2016 - 12.05.2016. CHI; Association for Computing Machinery; CHI Conference on Human Factors in Computing Systems; Annual CHI Conference on Human Factors in Computing Systems. New York, NY: Association for Computing Machinery Inc. (ACM), S. 2001–2013. Online verfügbar unter <http://binxu.org/doc/CHI2016.pdf>, zuletzt geprüft am 21.04.2018.
- Jung, J. H.; Schneider, Christoph; Valacich, Joseph (2010): (32) Enhancing the Motivational Affordance of Information Systems: The Effects of Real-Time Performance Feedback and Goal Setting in Group Collaboration Environments. In: *Management Science* 56 (4), S. 724–742. DOI: 10.1287/mnsc.1090.1129.
- Kaplan; Norton (1992): The balanced scorecard: measures that drive performance. In: *Harvard Business Review*,, pp. 71-79. Online verfügbar unter https://steinbeis-bi.de/images/artikel/hbr_1992.pdf, zuletzt geprüft am 10.11.2018.
- Kelly Skinner (2007): Developing a tool to measure knowledge exchange outcomes: The Canadian Journal of Program Evaluation Vol. 22 No. 1 Pages 49–73. Online verfügbar unter <http://www.knowledgemobilization.net/wp-content/uploads/2014/01/skinner-article-pdf.pdf>.
- Kim, Heejung S.; Sherman, David K. (2007): "Express yourself": culture and the effect of self-expression on choice. In: *Journal of Personality and Social Psychology* 92 (1), S. 1–11. DOI: 10.1037/0022-3514.92.1.1.
- Koivisto, Jonna; Hamari, Juho (2014): Demographic differences in perceived benefits from gamification. In: *Computers in Human Behavior* 35, S. 179–188. DOI: 10.1016/j.chb.2014.03.007.
- Krosnick, Jon., Thomas, Randall. and Shaeffer, Eric (2003): How Does Ranking Rate?: A Comparison of Ranking and Rating Tasks. Paper presented at the annual meeting of the American Association for Public Opinion Research, Sheraton Music City, Nashville, TN,. Online verfügbar unter http://www.allacademic.com/meta/p116273_index.html.
- Kulikowski (2017): Do we all agree on how to measure work engagement? Factorial validity of Utrecht Work Engagement Scale as a standard measurement tool - A literature review. In: *International journal of occupational medicine and environmental health* 30 (2), S. 161–175. DOI: 10.13075/ijomeh.1896.00947.
- Kuo, Ivan (2013): Moving Beyond Points and Badges: Gamification 2.0 - Gamification Co. Online verfügbar unter <http://www.gamification.co/2013/04/03/moving-beyond-points-and-badges-gamification-2-0/>, zuletzt geprüft am 23.02.2014.
- Li, Wei; Grossman, Tovi; Fitzmaurice, George: (33) GamiCAD: A Gamified Tutorial System For First Time AutoCAD Users. In: Rob Miller, Hrvoje Benko und Celine Latulipe (Hg.): the 25th annual ACM symposium. Cambridge, Massachusetts, USA, S. 103.

- Lienert, Gustav A.; Raatz, Ulrich (1998): Testaufbau und Testanalyse. 6. Auflage. Weinheim: Beltz (Grundlagen Psychologie). Online verfügbar unter http://www.content-select.com/index.php?id=bib_view&ean=9783621278454.
- Liu, Y., Alexandrova, T., Nakajima, T. (2011): Gamifying intelligent. In: *Proceedings of the 2011 International ACM Workshop on Ubiquitous Meta User Interfaces* environments Presented at Ubi-MUI'11. ACM, pp. 7–12.
- Locke, Edwin A. (1973): Satisfiers and dissatisfiers among white-collar and blue-collar employees. In: *Journal of Applied Psychology* 58 (1), S. 67–76. DOI: 10.1037/h0035418.
- Lohmoller, J. B. (1988): The PLS Program System: Latent Variables Path Analysis with Partial Least Squares Estimation. In: *Multivariate behavioral research* 23 (1), S. 125–127. DOI: 10.1207/s15327906mbr2301_7.
- Lowry; Gaskin; Twyman; Hammer; Roberts (2013): Proposing the hedonic-motivation system adoption model (HMSAM) to increase understanding of adoption of hedonically motivated systems. In: *Journal of the Association for Information Systems* 14 (11), S. 617–671.
- Lu, Xinjian; Wu, Jiming (2013): Effects of Extrinsic and Intrinsic Motivators on Using Utilitarian, Hedonic, and Dual-Purposed Information Systems: A Meta-Analysis. In: *Journal of the Association for Information Systems* 14 (3). Online verfügbar unter <http://aisel.aisnet.org/jais/vol14/iss3/1>.
- Lundvall, Bengt-Åke (2016): *The learning economy and the economics of hope*. London: Anthem Press (Anthem studies in innovation and development). Online verfügbar unter <http://www.jstor.org/stable/10.2307/j.ctt1hj9zjd>.
- MacKenzie, Scott B.; Podsakoff, Philip M.; Jarvis, Cheryl Burke (2005): The problem of measurement model misspecification in behavioral and organizational research and some recommended solutions. In: *Journal of Applied Psychology* 90 (4), S. 710–730. DOI: 10.1037/0021-9010.90.4.710.
- Maryam Alavi; Dorothy E. Leidner (2001): Review: Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues. In: *MIS Quarterly* 25 (1), S. 107, zuletzt geprüft am 23.03.2014.
- Maslow, A. H. (1943): A theory of human motivation. In: *Psychological Review* 50 (4), S. 370–396. DOI: 10.1037/h0054346.
- Maslow, Abraham H.; Frager, Robert (1987): *Motivation and personality*. 3rd ed. New York: Harper and Row.
- McAndrew, Frank (2018): When Do Personality Traits Predict Behavior? In: *Psychology Today* Posted Oct 02, 2018. Online verfügbar unter <https://www.psychologytoday.com/us/blog/out-the-ooze/201810/when-do-personality-traits-predict-behavior>, zuletzt geprüft am 04.01.2019.
- McClelland, David C. (1958): *Talent and society : New perspectives in the identification of talent*: Princeton, N.J.
- McClelland, David C. (1978): Managing motivation to expand human freedom. In: *American Psychologist* 33 (3), S. 201–210. DOI: 10.1037/0003-066x.33.3.201.
- McGonigal, Jane (2011): *Reality is broken. Why games make us better and how they can change the world*. New York: Penguin Press. Online verfügbar unter <http://www.loc.gov/catdir/enhancements/fy1107/2010029619-d.html>.
- McSweeney, B. (2002): Hofstede's Model of National Cultural Differences and their Consequences: A Triumph of Faith - a Failure of Analysis. In: *Human Relations* 55 (1), S. 89–118. DOI: 10.1177/0018726702551004.
- Merriam-Webster (2003): Definition of HEDONISM. Online verfügbar unter <https://www.merriam-webster.com/dictionary/hedonism>, zuletzt geprüft am 11.11.2017.
- Merriam-Webster (2018): Definition of RELIABILITY. Online verfügbar unter <https://www.merriam-webster.com/dictionary/reliability>, zuletzt geprüft am 14.03.2018.

- Messick, Samuel (1995): Validity of psychological assessment: Validation of inferences from persons' responses and performances as scientific inquiry into score meaning. In: *American Psychologist* 50 (9), S. 741–749. DOI: 10.1037/0003-066X.50.9.741.
- Michaels, Ed; Handfield-Jones, Helen; Axelrod, Beth (2009): *The war for talent*. [Nachdr.]. Boston, Mass.: Harvard Business School Press.
- Michel, Lothar; Conrad, Wolfgang (1982): Theoretische Grundlagen psychometrischer Tests. In: *In Karl-Josef Groffmann & Lothar Michel, Psychologische Diagnostik. Grundlagen psychologischer Diagnostik (1-129)*. Göttingen: Hogrefe. Mehr lesen auf <http://www.stangl-taller.at/TESTEXPERIMENT/literatur.html#0dJ73ZookDXvBALA.99>.
- Minica, Mirela (2015): CORRELATION BETWEEN HUMAN NEEDS SYSTEM - PERSONALITY - HUMAN MOTIVATION. In: *ECOFORUM* [Volume 4, Issue 2 (7), 2015].
- Minitab Blog (2013): What Are the Effects of Multicollinearity and When Can I Ignore Them? Hg. v. Minitab. Online verfügbar unter <http://blog.minitab.com/blog/adventures-in-statistics-2/what-are-the-effects-of-multicollinearity-and-when-can-i-ignore-them>, zuletzt geprüft am 05.01.2019.
- Minkov, Michael (2007): *What makes us different and similar. A new interpretation of the World Values Survey and other cross-cultural data*. Sofia: Klasika i Stil Publishing House.
- Mittendorff, Kariene; Geijsel, Femke; Hoeve, Aimee; Laat, Maarten de; Nieuwenhuis, Loek (2006): Communities of practice as stimulating forces for collective learning. In: *Journal of Workplace Learning* 18 (5), S. 298–312. DOI: 10.1108/13665620610674971.
- Monavvarian, Abbas; Asgari, Nasser; Akhavan, Peyman; Ashena, Mostafa (2013): Developing social capital for facilitating knowledge management practices. In: *International Journal of Social Economics* 40 (9), S. 826–844. DOI: 10.1108/IJSE-07-2012-0121.
- Moosbrugger, Helfried; Kelava, Augustin (2008): Qualitätsanforderungen an einen psychologischen Test (Testgütekriterien). In: Helfried Moosbrugger und Augustin Kelava (Hg.): *Testtheorie und Fragebogenkonstruktion*. Mit 43 Tabellen. Berlin: Springer (Springer-Lehrbuch), S. 7–26.
- Morgan C.T. (1959): Psychological theory of drive. In Koch, Sigmund (ed) *Psychology: a study of a science*, vol 1.
- Munson, J. Michael; McIntyre, Shelby H. (1979): Developing Practical Procedures for the Measurement of Personal Values in Cross-Cultural Marketing. In: *Journal of Marketing Research* 16 (1), S. 48–51. DOI: 10.2307/3150873.
- Murray, H. A. (1938): *Explorations in personality*. Oxford, England:: Oxford Univ. Press.
- Nicholson, S. (Hg.) (2013): *Exploring Gamification Techniques for Classroom Management*. Games+Learning+Society 9.0. Madison, WI.
- Nicholson, Scott (2012): A User-Centered Theoretical Framework for Meaningful Gamification. In: *Paper Presented at Games+Learning+Society 8.0, Madison, WI*. Online verfügbar unter <http://scottnicholson.com/pubs/meaningfulframework.pdf>, zuletzt geprüft am 01.12.2013.
- Niederle, Muriel; Vesterlund, Lise (2011): Gender and Competition. In: *Annu. Rev. Econ.* 3 (1), S. 601–630. DOI: 10.1146/annurev-economics-111809-125122.
- Nonaka, Ikujiro (1994a): A Dynamic Theory of Organizational Knowledge Creation. In: *Organization Science* 5 (1), S. 14–37. DOI: 10.1287/orsc.5.1.14.
- Nonaka, Ikujiro (1994b): A dynamic theory of organizational knowledge creation – How Japanese companies create the dynamics of innovation. 5. Jahrgang, Nr. 1, p.14–37.
- Nonaka, Ikujiro; Takeuchi, Hirotaka; Mader, Friedrich (1997): *Die Organisation des Wissens. Wie japanische Unternehmen eine brachliegende Ressource nutzbar machen*. Frankfurt/Main [u.a.]: Campus-Verl.
- Oliver P. John, Laura P. Naumann, Christopher J. Soto (2008): Paradigm Shift to the Integrative Big Five Trait Taxonomy. *Handbook of Personality Theory and Research*. 3. Auflage. S. 114–117.

- Omerzel, Doris & Gulev, Rune (2011): Knowledge Resources and Competitive Advantage. *Managing Global Transitions*. 9. 335-354.
- Ong, Michael (2013): Gamification and its effect on employee engagement and performance in a perceptual diagnosis task. Master of Science. University of Canterbury. Psychology. Online verfügbar unter <http://hdl.handle.net/10092/7640>.
- Passos, E. B., Medeiros, D. B., Neto, P. A. S., & Clua, E. W. G. (2011): Turning Real-World Software Development into a Game. In: *Paper presented at the SBGAMES (Games and Digital Entertainment), Salvador*.
- Pelz, W. (2017): Reiss Profile. Kritik der „Theorie“ der 16 Lebensmotive. In: *THM Business School*, zuletzt geprüft am 02.12.2017.
- Phelan, Steven E.; Lewin, Peter (2000): Arriving at a strategic theory of the firm. In: *International Journal of Management Reviews* 2 (4), S. 305–323. DOI: 10.1111/1468-2370.00044.
- Picot, Arnold; Reichwald, Ralf; Wigand, Rolf T. (2003): Die grenzenlose Unternehmung. Information, Organisation und Management ; Lehrbuch zur Unternehmensführung im Informationszeitalter. 5., aktualisierte Aufl. Wiesbaden: Gabler (Gabler-Lehrbuch).
- Pink, Daniel H. (2010): Drive. The surprising truth about what motivates us. Edinburgh: Canongate.
- Polanyi, Michael (1962): Personal knowledge. Towards a post-critical philosophy. Chicago, Ill.: University of Chicago Press.
- Polanyi, Michael; Sen, Amartya (2009): The tacit dimension. Chicago, London: University of Chicago Press.
- Pritchard, D.; Millar, A.; Haddock, A. (2010): The nature and value of knowledge. Three investigations. Oxford, New York: Oxford University Press.
- Putnam, R. D. (1995): Bowling alone: America's declining social capital. In: *Journal of Democracy* 6 (1), S. 65–78. DOI: 10.1353/jod.1995.0002.
- Raffael Herrmann (2012): Wissenspyramide. Der WINF. Online verfügbar unter <http://derwirtschaftsinformatiker.de/2012/09/12/it-management/wissenspyramide-wiki/>, zuletzt geprüft am 08.11.2014.
- Rammstedt, Beatrice (2004): Zur Bestimmung der Güte von Multi-Item-Skalen : eine Einführung. In: *Zentrum für Umfragen, Methoden und Analysen -ZUMA- (Ed.)*, zuletzt geprüft am 13.03.2018.
- Rammstedt, Beatrice; Kemper, Christoph J.; Klein, Mira Céline; Beierlein, Constanze; Kovaleva, Anastassiya (2013): A Short Scale for Assessing the Big Five Dimensions of Personality. 2013, Jg. 7(2), S. 233-249. Hg. v. GESIS - Leibniz Institute for the Social Sciences.
- Rammstedt Beatrice; Kemper Christoph J.; Klein Mira Céline; Beierlein Constanze; Kovaleva Anastassiya (2012): Eine kurze Skala zur Messung der fünf Dimensionen der Persönlichkeit: Big-Five-Inventary-10 (BFI-10). In: *GESIS-Working Papers 22*, zuletzt geprüft am 25.04.2015.
- Reiss, Steven (2000): Who am I? The 16 basic desires that motivate our behavior and define our personality. New York: Jeremy P. Tarcher/Putnam.
- Reiss, Steven (2004): Multifaceted Nature of Intrinsic Motivation: The Theory of 16 Basic Desires. In: *Review of General Psychology* 8 (3), S. 179–193. DOI: 10.1037/1089-2680.8.3.179.
- Riege, Andreas (2005): Three-dozen knowledge-sharing barriers managers must consider. In: *Journal of Knowledge Management* 9 (3), S. 18–35. DOI: 10.1108/13673270510602746.
- Rigdon, Edward E. (2012): Rethinking Partial Least Squares Path Modeling. In Praise of Simple Methods. In: *Long Range Planning* 45 (5-6), S. 341–358. DOI: 10.1016/j.lrp.2012.09.010.
- Ringle, Christian (2004): Messung von Kausalmodellen : ein Methodenvergleich (ISSN 1618-2952).
- Rockett, Katharine (2012): Perspectives on the Knowledge-Based Society. An Introduction to the Special Issue. In: *Economics E-Journal*. DOI: 10.5018/economics-ejournal.ja.2012-35.

- Rosen, A.; Kluemper, D. (2008): The Impact of the Big Five Personality Traits on the Acceptance of Social Networking Website. In: *Americas Conference on Information Systems (AMCIS) AMCIS 2008 Proceedings*. Online verfügbar unter <https://www.researchgate.net/publication/39728522>, zuletzt geprüft am 04.01.2018.
- Rosenstiel, L. (Hg.) (1999): Motivationale Grundlagen von Anreizsystemen, in: (Bühler, 1999, Unternehmenssteuerung und Anreizsysteme), Stuttgart, S. 47-77. Kongress-Dokumentation 52. Deutscher Betriebswirtschafter-Tag. Deutscher Betriebswirtschafter-Tag. Stuttgart: Schäffer-Poeschel (Schriftenreihe der Schmalenbach-Gesellschaft).
- Ryan, Richard M.; Deci, Edward L. (2000): Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. In: *American Psychologist* 55 (1), S. 68–78. DOI: 10.1037/0003-066X.55.1.68.
- Sailer, Michael; Homner, Lisa (2020): The Gamification of Learning: a Meta-analysis. In: *Educ Psychol Rev* 32 (1), S. 77–112. DOI: 10.1007/s10648-019-09498-w.
- Santhanam, Radhika; Liu, De (2015): Towards Meaningful Engagement. Gamification Designs for Gameful Interaction with Information Systems. In: *SSRN Journal*. DOI: 10.2139/ssrn.2521283.
- Schacter DL; Gilbert DT; Wegner DM (2011): Psychology (2nd Edition). In: *New York: Worth*.
- Schaufeli, W. B. (2006): The Measurement of Work Engagement With a Short Questionnaire. A Cross-National Study. In: *Educational and Psychological Measurement* 66 (4), S. 701–716. DOI: 10.1177/0013164405282471.
- Schloderer, Matthias P.; Ringle, Christian M.; Sarstedt, Marko (2011): Einführung in die varianzbasierte Strukturgleichungsmodellierung. Grundlagen, Modellevaluation und Interaktionseffekte am Beispiel von SmartPLS. In: Manfred Schwaiger und Anton Meyer (Hg.): Theorien und Methoden der Betriebswirtschaft. Handbuch für Wissenschaftler und Studierende. München: Franz Vahlen, S. 564–592, zuletzt geprüft am 13.03.2018.
- Schneider, K.; Schmalt, H. D. (2000): Motivation, 3. überarbeitete und erweiterte Aufl., Stuttgart.
- Schöbel, S.; Söllner, M. (2016): How to Gamify Information Systems - Adapting Gamification to Individual User Preferences. In: *Twenty-Fourth European Conference on Information Systems*. Online verfügbar unter https://www.researchgate.net/profile/Matthias_Soellner/publication/301820359_How_to_Gamify_, zuletzt geprüft am 27.10.2018.
- Schönbohm, Avo; Urban, Katharina (2014): Can Gamification Close the Engagement Gap of Generation Y? A Pilot Study on the Digital Startup Sector in Berlin: Logos Verlag Berlin.
- Schreyögg, Georg; Geiger, Daniel (2003): Kann die Wissensspirale Grundlage des Wissensmanagements sein? Berlin: Inst. für Management (Diskussionsbeiträge des Instituts für Management / Freie Universität Berlin, Fachbereich Wirtschaftswissenschaften, N.F., 2003, 20).
- Scott Thiebes, Sebastian Lins, Dirk Basten (2014): Gamifying Information Systems – A Synthesis of Gamification Mechanics and Dynamics. In: *Twenty Second European Conference on Information Systems, At Tel Aviv*.
- Seaborn, Katie; Fels, Deborah I. (2015): Gamification in theory and action. A survey. In: *International Journal of Human-Computer Studies* 74, S. 14–31. DOI: 10.1016/j.ijhcs.2014.09.006.
- Shenkar, Oded; Yuchtman-Yaar, Ephraim (1997): Reputation, Image, Prestige, and Goodwill: An Interdisciplinary Approach to Organizational Standing. In: *Human Relations* 50 (11), S. 1361–1381. DOI: 10.1023/A:1016907228621.
- Simon Baker (2015): Working effectively requires responsibility, commitment, and accountability. ENERGIZED WORK. Web. Online verfügbar unter <https://www.energizedwork.com/weblog/2015/03/working-effectively-requires-responsibility-commitment-and-accountability>, zuletzt geprüft am 20.09.2017.

- Skrondal, Anders; Rabe-Hesketh, Sophia: Structural Equation Modeling: Categorical Variables. In: Balakrishnan, Colton et al. (Hg.) 2014 – Wiley StatsRef, Bd. 66, S. 271. Online verfügbar unter https://personality-project.org/r/tutorials/summerschool.14/rosseel_sem_cat.pdf, zuletzt geprüft am 05.01.2019.
- SmartPLS GmbH: Product | SmartPLS. P.O. Box 1123, D-25474 Bönningstedt, Germany (Pinneberg Local Court HRB 11552). Online verfügbar unter <https://www.smartpls.com/>, zuletzt geprüft am 17.11.2018.
- Strivastava, Sanjay; John, Oliver P.; Gosling, Samuel D.; Potter, Jeff (2003): Development of personality in early and middle adulthood: Set like plaster or persistent change? In: *Journal of Personality and Social Psychology* 84 (5), S. 1041–1053. DOI: 10.1037/0022-3514.84.5.1041.
- Stampfl, Nora S. (2012): Die verspielte Gesellschaft. Gamification oder Leben im Zeitalter des Computerspiels. 1. Aufl. Hannover: Heise (Telepolis).
- Stankov, Lazar (2018): Low Correlations between Intelligence and Big Five Personality Traits: Need to Broaden the Domain of Personality. In: *J. Intell.* 6 (2), S. 26. DOI: 10.3390/jintelligence6020026.
- Stead, B. (1972): Berlo's Communication Process Model as Applied to the Behavioral Theories of Maslow, Herzberg, and McGregor. In: *The Academy of Management Journal* 3, S. 804.
- Stieglitz, Stefan (2009): Steuerung Virtueller Communities. Instrumente, Mechanismen, Wirkungszusammenhänge. Wiesbaden: Gabler Verlag / GWV Fachverlage GmbH, Wiesbaden (Gabler Edition Wissenschaft).
- Stieglitz, Stefan (2015): Gamification – Vorgehen und Anwendung. In: *HMD* 52 (6), S. 816–825. DOI: 10.1365/s40702-015-0185-6.
- Streck, H. (2012): Cultural Awareness rewards us: The impact of cultural differences on gamification. GAMIFEYE [online]. Online verfügbar unter <http://www.gamifeye.com/2012/12/04/cultural-awareness-rewards-us-the-impact-of-cultural-differences-on-gamification/>, zuletzt geprüft am Mai 2016.
- Strohschneider, Stefan (2001): Kultur - Denken - Strategie. Eine indische Suite. Bern: Huber (Aus dem Programm Huber : Psychologie Forschung).
- Sulea, Coralia; van Beek, Iona; Sarbescu, Paul; Virga, Delia; Schaufeli, Wilmar B. (2015): Engagement, boredom, and burnout among students: Basic need satisfaction matters more than personality traits. In: *Learning and Individual Differences* 42, S. 132–138. DOI: 10.1016/j.lindif.2015.08.018.
- Sully De Luque, Mary F.; Sommer, Steven M. (2000): The Impact of Culture on Feedback-Seeking Behavior: An Integrated Model and Propositions. In: *AMR* 25 (4), S. 829–849. DOI: 10.5465/amr.2000.3707736.
- SurveyMonkey Europe UC: SurveyMonkey: Das weltweit beliebteste kostenlose Tool für Online-Umfragen. Online verfügbar unter <https://de.surveymonkey.com/>, zuletzt geprüft am 24.11.2018.
- Sushil, S.; Verma, N. (2010): Questionnaire validation made easy. In: *European Journal of Scientific Research* (Volume 46, Issue 2, October 2010), S. 172–178.
- Tondello, Gustavo F.; Mora, Alberto; Nacke, Lennart E. (2017): Elements of Gameful Design Emerging from User Preferences. In: Ben Schouten, Panos Markopoulos, Zachary Touns, Paul Cairns und Tilde Bekker (Hg.): Proceedings of the Annual Symposium on Computer-Human Interaction in Play - CHI PLAY '17. the Annual Symposium. Amsterdam, The Netherlands, 15.10.2017 - 18.10.2017. New York, New York, USA: ACM Press, S. 129–142.
- Tondello, G. F., Mora, A., & Nacke, L. E. (Hg.) (2017): Elements of Gameful Design Emerging from User Preferences. Proceedings of the 2018 Annual Symposium on Computer-Human Interaction in Play : October 15-18, 2017, Amsterdam, Netherlands, USA. Unter Mitarbeit von Ben Schouten. the Annual Symposium. Amsterdam, The Netherlands, 10/15/2017 - 10/18/2017. ACM SIGCHI Annual Symposium on Computer-Human Interaction in Play; Association for Computing Machinery; Annual Symposium on Computer-Human Interaction in Play; CHI PLAY. New York, NY, USA: ACM Association for Computing Machinery.

- Triandis, Harry C.; Suh, Eunkook M. (2002): Cultural influences on personality. In: *Annual review of psychology* 53, S. 133–160. DOI: 10.1146/annurev.psych.53.100901.135200.
- Trivers, Robert L. (1971): The Evolution of Reciprocal Altruism. In: *The Quarterly Review of Biology* 46 (1), S. 35–57. DOI: 10.1086/406755.
- Tylor, Edward Burnett (2010): Primitive culture. Researches into the development of mythology, philosophy, religion, language, art, and custom. Cambridge, England: Cambridge University Press (Cambridge library collection).
- Übelacker (2006), S.: Security-Aware Organisational Cultures as a Starting Point for Mitigating Socio-Technical Risks.
- Ulrich, Peter; Hill, Wilhelm (1976): Wissenschaftstheoretische Grundlagen der Betriebswirtschaftslehre. In: *Wirtschaftswissenschaftliches Studium : Zeitschrift für Ausbildung und Hochschulkontakt*. In: 5. Jahrgang Nr. 8, S. 304.
- van der Heijden, H. (2004): User acceptance of hedonic information systems. In: *MIS Quarterly* (28), S. 695–704.
- Vassileva, Julita (2012): Motivating participation in social computing applications. A user modeling perspective. In: *User Model User-Adap Inter* 22 (1-2), S. 177–201. DOI: 10.1007/s11257-011-9109-5.
- Verint (2011): Ranking Questions vs. Rating Questions. Online verfügbar unter <http://blog.verint.com/ranking-questions-vs-rating-questions>, zuletzt geprüft am 21.04.2018.
- Volodina, Anna; Lindner, Christoph; Retelsdorf, Jan (2019): Personality traits and basic psychological need satisfaction: Their relationship to apprentices' life satisfaction and their satisfaction with vocational education and training. In: *International Journal of Educational Research* 93, S. 197–209. DOI: 10.1016/j.ijer.2018.11.003.
- Walz, Steffen P. (2015): *The Gameful World. Approaches, Issues, Applications*. Cambridge: The MIT Press. Online verfügbar unter <http://gbv.ebilib.com/patron/FullRecord.aspx?p=3339935>.
- Weaver, Charles N. (1975): Job Preferences of White Collar and Blue Collar Workers. In: *AMJ* 18 (1), S. 167–175. DOI: 10.5465/255637.
- Weiber, Rolf; Mühlhaus, Daniel (2010): *Strukturgleichungsmodellierung. Eine anwendungsorientierte Einführung in die Kausalanalyse mit Hilfe von AMOS, SmartPLS und SPSS ; [Extras im Web]*. Heidelberg: Springer (Springer-Lehrbuch).
- Werbach, Kevin; Hunter, Dan (2012): *For the Win. How Game Thinking Can Revolutionize Your Business*. Chicago: Wharton Digital Press. Online verfügbar unter <https://ebookcentral.proquest.com/lib/gbv/detail.action?docID=5482556>.
- White, R. W. (1959): Motivation reconsidered: the concept of competence. In: *Psychological Review* 66, S. 297–333.
- Wiegand, T.; Stieglitz, S. (2014): Serious fun - effects of gamification on knowledge exchange in enterprises. In: Erhard Plödereder, Lars Grunske, Eric Schneider, Dominik Ull und Gesellschaft für Informatik e. V., Bonn (Hg.): *GI Edition Proceedings Band 232 - Informatik 2014 - 44. Jahrestagung der Gesellschaft für Informatik. Big Data - Komplexität meistern 22. - 26. September 2014 in Stuttgart, Deutschland. neue Ausg.* Bonn: Köllen, S. 321–332. Online verfügbar unter <http://subs.emis.de/LNI/Proceedings/Proceedings232/321.pdf>.
- Wu, P. F. (2011): A mixed methods approach to technology acceptance research. In: *Journal of the AIS* 13 (3), S. 172–187.
- Yu-kai Chou (2014): *Octalysis: Complete Gamification Framework*. Online verfügbar unter <http://www.yukaichou.com/gamification-examples/octalysis-complete-gamification-framework/>, zuletzt geprüft am 22.02.2014.
- ZAJONC, R. B. (1965): SOCIAL FACILITATION. In: *Science (New York, N.Y.)* 149 (3681), S. 269–274.

Zaunmüller, Hannah (2005): Anreizsysteme für das Wissensmanagement in KMU. Gestaltung von Anreizsystemen für die Wissensbereitstellung der Mitarbeiter. 1. Aufl. Wiesbaden: Dt. Univ.-Verl. (Wirtschaftswissenschaft).

Zichermann, Gabe (2011): Intrinsic and Extrinsic Motivation in Gamification - Gamification Co. Online verfügbar unter <http://www.gamification.co/2011/10/27/intrinsic-and-extrinsic-motivation-in-gamification/>, zuletzt geprüft am 27.04.2014.

Zichermann, Gabe; Cunningham, Christopher (2011): Gamification by design. Implementing game mechanics in web and mobile apps. 1st. ed. Sebastopol, Calif: O'Reilly Media.

Zichermann, Gabe; Linder, Joselin (2010): Game-based marketing. Inspire customer loyalty through rewards, challenges, and contests. Hoboken, N.J: Wiley.

8 Appendix

8.1 Appendix A - Multivariate Quality Criteria

8.1.1 HN01 Purpose Goals Responsibility

Construct reliability and validity (HN01)	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
BIG5 Agreeableness	0.451	0.778	0.639
BIG5 Conscientiousness	0.548	0.802	0.673
BIG5 Extraversion	0.304	0.731	0.583
BIG5 Neuroticism	0.488	0.795	0.660
BIG5 Openness	0.436	0.745	0.610
Cultural Background	0.991	0.995	0.991
INTENTION TO USE GAMIFICATION	0.931	0.967	0.935
NEED FOR PURPOSE / GOALS / RESPONSIBILITY	0.905	0.939	0.836
PREFERENCE FOR GAME ELEMENTS PLAYCULTURE	0.875	0.923	0.800

Table 38 Construct reliability and validity HN01

Cross-loadings for indicators (HN01)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	Cultural Background	INTENTION TO USE GAMIFICATION	NEED FOR PURPOSE / GOALS / RESPONSIBILITY	PREFERENCE FOR GAME ELEMENTS PLAYCULTURE
BFI_ART_O	0.291	0.280	0.275	0.397	0.560	0.412	0.220	0.149	0.308
BFI_FAULT_A	0.709	0.299	0.365	0.397	0.226	0.241	0.214	0.197	0.256
BFI_IMA_O	0.338	0.253	0.443	0.302	0.952	0.311	0.304	0.402	0.442
BFI_LAZY_C	0.315	0.699	0.283	0.553	0.223	0.248	0.140	0.161	0.202
BFI_NERV_N	0.396	0.434	0.357	0.845	0.217	0.337	0.155	0.168	0.211
BFI_RELX_N	0.313	0.346	0.358	0.779	0.432	0.366	0.267	0.144	0.300
BFI_RES_E	0.391	0.391	0.627	0.527	0.294	0.404	0.244	0.172	0.339
BFI_SOC_E	0.366	0.130	0.879	0.231	0.413	0.319	0.275	0.281	0.376
BFI_TJOB_C	0.256	0.926	0.230	0.333	0.282	0.089	0.086	0.305	0.194
BFI_TRUST_A	0.881	0.242	0.406	0.329	0.370	0.355	0.266	0.295	0.333
COUNTRY_L	0.382	0.162	0.442	0.432	0.400	0.995	0.554	0.098	0.551
COUNTRY_Y	0.377	0.176	0.451	0.425	0.397	0.995	0.548	0.088	0.540
GA_WP_C	0.325	0.141	0.359	0.283	0.326	0.616	0.969	0.145	0.702
GA_WP_NC	0.257	0.096	0.288	0.205	0.318	0.450	0.965	0.132	0.657
GE_PC1	0.341	0.233	0.416	0.316	0.400	0.476	0.601	0.329	0.899
GE_PC2	0.316	0.229	0.395	0.285	0.448	0.478	0.654	0.346	0.910
GE_PC3C	0.341	0.161	0.429	0.229	0.437	0.516	0.628	0.280	0.874
NEED2_REL	0.466	0.302	0.370	0.289	0.498	0.186	0.195	0.921	0.377
NEED_PUR	0.154	0.345	0.203	0.105	0.250	-0.013	0.068	0.883	0.282
WE_EM	0.134	0.152	0.214	0.064	0.252	0.024	0.093	0.938	0.287

Table 39 Cross-loadings for indicators HN01

Fornell-Larcker criterion for constructs (HN01)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	Cultural Background	INTENTION TO USE GAMIFICATION	NEED FOR PURPOSE / GOALS / RESPONSIBILITY	PREFERENCE FOR GAME ELEMENTS PLAYCULTURE
BIG5 Agreeableness	0.800								
BIG5 Conscientiousness	0.326	0.821							
BIG5 Extraversion	0.479	0.293	0.763						
BIG5 Neuroticism	0.439	0.483	0.438	0.813					
BIG5 Openness	0.385	0.308	0.470	0.388	0.781				
Cultural Background	0.381	0.170	0.449	0.430	0.400	0.995			
INTENTION TO USE GAMIFICATION	0.302	0.123	0.336	0.254	0.333	0.554	0.967		
NEED FOR PURPOSE / GOALS / RESPONSIBILITY	0.315	0.301	0.306	0.193	0.394	0.093	0.143	0.914	
PREFERENCE FOR GAME ELEMENTS PLAYCULTURE	0.372	0.232	0.462	0.309	0.480	0.548	0.703	0.356	0.894

Table 40 Fornell-Larcker criterion for constructs HN01

Variance Inflation Factor collinearity check (HN01)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	Cultural Background	INTENTION TO USE GAMIFICATION	NEED FOR PURPOSE / GOALS / RESPONSIBILITY	PREFERENCE FOR GAME ELEMENTS PLAYCULTURE
BIG5 Agreeableness								1.465	
BIG5 Conscientiousness								1.351	
BIG5 Extraversion								1.557	
BIG5 Neuroticism								1.597	
BIG5 Openness								1.401	
Cultural Background									1.009
INTENTION TO USE GAMIFICATION									
NEED FOR PURPOSE / GOALS / RESPONSIBILITY									1.009
PREFERENCE FOR GAME ELEMENTS PLAYCULTURE							1.000		

Table 41 Variance Inflation Factor collinearity check HN01

Effect size f ² of a exogenous latent variable (HN01)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	Cultural Background	INTENTION TO USE GAMIFICATION	NEED FOR PURPOSE / GOALS / RESPONSIBILITY	PREFERENCE FOR GAME ELEMENTS PLAYCULTURE
BIG5 Agreeableness								0.019	
BIG5 Conscientiousness								0.036	
BIG5 Extraversion								0.008	
BIG5 Neuroticism								0.011	
BIG5 Openness								0.070	
Cultural Background									0.441
INTENTION TO USE GAMIFICATION									
NEED FOR PURPOSE / GOALS / RESPONSIBILITY									0.155
PREFERENCE FOR GAME ELEMENTS PLAYCULTURE							0.976		

Table 42 Effect size f² of an exogenous variable HN01

Predictive relevance Q ² (HN01)	SSO	SSE	Q ² (=1-SSE/SSO)
INTENTION TO USE GAMIFICATION	720000	402696	0.441
NEED FOR PURPOSE / GOALS / RESPONSIBILITY	1,080.000	919367	0.149
PREFERENCE FOR GAME ELEMENTS PLAYCULTURE	1,080.000	758680	0.298

Table 43 Predictive relevance Q² HN01

Total Effects Direct & Indirect Path coefficients (HN01)	INTENTION TO USE GAMIFICATION	NEED FOR PURPOSE / GOALS / RESPONSIBILITY	PREFERENCE FOR GAME ELEMENTS PLAYCULTURE
BIG5 Agreeableness	0.032	0.149	0.046
BIG5 Conscientiousness	0.042	0.196	0.060
BIG5 Extraversion	0.022	0.100	0.031
BIG5 Neuroticism	-0.025	-0.118	-0.036
BIG5 Openness	0.060	0.276	0.085
Cultural Background	0.365		0.519
INTENTION TO USE GAMIFICATION			
NEED FOR PURPOSE / GOALS / RESPONSIBILITY	0.216		0.308
PREFERENCE FOR GAME ELEMENTS PLAYCULTURE	0.703		

Bold values are relevant

Table 44 Total effects HN01

8.1.2 HN02 Social Belonging

Construct reliability and validity (HN02)	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
BIG5 Agreeableness	0.451	0.778	0.639
BIG5 Conscientiousness	0.548	0.815	0.689
BIG5 Extraversion	0.304	0.742	0.590
BIG5 Neuroticism	0.488	0.796	0.661
BIG5 Openness	0.436	0.755	0.617
CULTURAL BACKGROUND	0.991	0.995	0.991
INTENTION TO USE GAMIFICATION	0.931	0.967	0.935
NEED FOR SOCIAL BELONGING / EXCHANGE	0.854	0.911	0.774
PREFERENCE FOR GAME ELEMENTS SOCIAL EXCHANGE	0.832	0.899	0.747

Table 45 Construct reliability and validity HN02

Cross-loadings for indicators (HN02)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR SOCIAL BELONGING / EXCHANGE	PREFERENCE FOR GAME ELEMENTS SOCIAL EXCHANGE
BFI_ART_O	0.291	0.301	0.305	0.397	0.599	0.412	0.220	0.176	0.278
BFI_FAULT_A	0.706	0.335	0.391	0.392	0.234	0.241	0.214	0.241	0.179
BFI_IMA_O	0.338	0.243	0.422	0.307	0.936	0.311	0.304	0.399	0.325
BFI_LAZY_C	0.314	0.812	0.341	0.551	0.233	0.248	0.140	0.239	0.183
BFI_NERV_N	0.395	0.482	0.407	0.833	0.228	0.337	0.155	0.325	0.251
BFI_RELX_N	0.313	0.368	0.393	0.792	0.436	0.366	0.267	0.294	0.241
BFI_RES_E	0.390	0.425	0.762	0.527	0.303	0.404	0.244	0.524	0.271
BFI_SOC_E	0.366	0.128	0.773	0.232	0.408	0.320	0.275	0.535	0.392
BFI_TJOB_C	0.256	0.847	0.258	0.333	0.284	0.090	0.086	0.262	0.154
BFI_TRUST_A	0.883	0.240	0.406	0.331	0.370	0.355	0.266	0.365	0.263
COUNTRY_L	0.382	0.191	0.464	0.432	0.410	0.995	0.553	0.458	0.583
COUNTRY_Y	0.377	0.204	0.473	0.426	0.407	0.995	0.548	0.464	0.591
GA_WP_C	0.325	0.156	0.366	0.286	0.329	0.616	0.969	0.402	0.657
GA_WP_NC	0.257	0.102	0.285	0.207	0.318	0.450	0.965	0.315	0.616
GE_SI1	0.186	0.156	0.355	0.222	0.273	0.431	0.551	0.492	0.856
GE_SI2	0.267	0.190	0.345	0.249	0.335	0.452	0.518	0.491	0.852
GE_SI3C	0.275	0.179	0.415	0.307	0.354	0.627	0.629	0.487	0.885
NEED3_SE	0.402	0.297	0.752	0.390	0.405	0.388	0.297	0.857	0.435
NEED_SE	0.358	0.272	0.605	0.320	0.333	0.373	0.309	0.923	0.470
WE_RSI	0.251	0.222	0.431	0.286	0.298	0.465	0.381	0.857	0.599

Table 46 Cross-loadings for indicators HN02

Fornell-Larcker criterion for constructs (HN02)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR SOCIAL BELONGING / EXCHANGE	PREFERENCE FOR GAME ELEMENTS SOCIAL EXCHANGE
BIG5 Agreeableness	0.799								
BIG5 Conscientiousness	0.342	0.830							
BIG5 Extraversion	0.492	0.358	0.768						
BIG5 Neuroticism	0.437	0.526	0.492	0.813					
BIG5 Openness	0.389	0.313	0.464	0.402	0.786				
CULTURAL BACKGROUND	0.381	0.199	0.471	0.431	0.411	0.995			
INTENTION TO USE GAMIFICATION	0.302	0.134	0.338	0.256	0.334	0.553	0.967		
NEED FOR SOCIAL BELONGING / EXCHANGE	0.388	0.302	0.689	0.381	0.397	0.463	0.372	0.880	
PREFERENCE FOR GAME ELEMENTS SOCIAL EXCHANGE	0.282	0.202	0.433	0.303	0.373	0.590	0.659	0.566	0.865

Table 47 Fornell-Larcker criterion for constructs HN02

Variance Inflation Factor collinearity check (HN02)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR SOCIAL BELONGING / EXCHANGE	PREFERENCE FOR GAME ELEMENTS SOCIAL EXCHANGE
BIG5 Agreeableness								1.463	
BIG5 Conscientiousness								1.432	
BIG5 Extraversion								1.632	
BIG5 Neuroticism								1.714	
BIG5 Openness								1.385	
CULTURAL BACKGROUND									1.273
INTENTION TO USE GAMIFICATION									
NEED FOR SOCIAL BELONGING / EXCHANGE									1.273
PREFERENCE FOR GAME ELEMENTS SOCIAL EXCHANGE							1.000		

Table 48 Variance Inflation Factor collinearity check HN02

Effect size f ² of a exogenous latent variable (HN02)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR SOCIAL BELONGING / EXCHANGE	PREFERENCE FOR GAME ELEMENTS SOCIAL EXCHANGE
BIG5 Agreeableness								0.002	
BIG5 Conscientiousness								0.002	
BIG5 Extraversion								0.450	
BIG5 Neuroticism								0.000	
BIG5 Openness								0.009	
CULTURAL BACKGROUND									0.252
INTENTION TO USE GAMIFICATION									
NEED FOR SOCIAL BELONGING / EXCHANGE									0.201
PREFERENCE FOR GAME ELEMENTS SOCIAL EXCHANGE							0.767		

Table 49 Effect size f² of an exogenous variable HN02

Predictive relevance Q ² (HN02)	SSO	SSE	Q ² (=1-SSE/SSO)
INTENTION TO USE GAMIFICATION	720.000	442.989	0.385
NEED FOR SOCIAL BELONGING / EXCHANGE	1,080.000	710.500	0.342
PREFERENCE FOR GAME ELEMENTS SOCIAL EXCHANGE	1,080.000	733.944	0.320

Table 50 Predictive relevance Q² HN02

Total Effects Direct & Indirect Path coefficients (HN02)	INTENTION TO USE GAMIFICATION	NEED FOR SOCIAL BELONGING / EXCHANGE	PREFERENCE FOR GAME ELEMENTS SOCIAL EXCHANGE
BIG5 Agreeableness	0.009	0.036	0.014
BIG5 Conscientiousness	0.010	0.039	0.015
BIG5 Extraversion	0.151	0.615	0.229
BIG5 Neuroticism	0.002	0.010	0.004
BIG5 Openness	0.020	0.081	0.030
CULTURAL BACKGROUND	0.275		0.417
INTENTION TO USE GAMIFICATION			
NEED FOR SOCIAL BELONGING / EXCHANGE	0.245		0.373
PREFERENCE FOR GAME ELEMENTS SOCIAL EXCHANGE	0.659		

Bold values are relevant

Table 51 Total effects HN02

8.1.3 HN03 Image Recognition

Construct reliability and validity (HN03)	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
BIG5 Agreeableness	0.451	0.779	0.640
BIG5 Conscientiousness	0.548	0.805	0.676
BIG5 Extraversion	0.304	0.741	0.589
BIG5 Neuroticism	0.488	0.795	0.661
BIG5 Openness	0.436	0.775	0.635
CULTURAL BACKGROUND	0.991	0.995	0.991
INTENTION TO USE GAMIFICATION	0.931	0.967	0.935
NEED FOR IMAGE / RECOGNITION	0.801	0.872	0.633
PREFERENCE FOR GAME ELEMENTS IMAGE / RECOGNITION	0.833	0.878	0.545

Table 52 Construct reliability and validity HN03

Cross-loadings for indicators (HN03)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR IMAGE / RECOGNITION	PREFERENCE FOR GAME ELEMENTS DIRECT FEEDBACK & STATUS /
BFI_ART_O	0.292	0.283	0.299	0.398	0.717	0.412	0.220	0.309	0.280
BFI_FAULT_A	0.712	0.304	0.386	0.372	0.256	0.241	0.214	0.224	0.221
BFI_IMA_O	0.337	0.252	0.428	0.325	0.869	0.311	0.304	0.436	0.313
BFI_LAZY_C	0.316	0.715	0.329	0.537	0.261	0.248	0.140	0.164	0.176
BFI_NERV_N	0.397	0.441	0.396	0.782	0.260	0.337	0.155	0.209	0.212
BFI_RELX_N	0.312	0.349	0.386	0.842	0.444	0.366	0.267	0.242	0.306
BFI_RES_E	0.391	0.396	0.733	0.522	0.325	0.404	0.244	0.363	0.305
BFI_SOC_E	0.366	0.130	0.800	0.234	0.386	0.320	0.275	0.411	0.348
BFI_TJOB_C	0.256	0.918	0.252	0.331	0.287	0.090	0.086	0.289	0.147
BFI_TRUST_A	0.879	0.242	0.407	0.336	0.364	0.355	0.266	0.330	0.291
COUNTRY_L	0.381	0.166	0.460	0.434	0.437	0.995	0.554	0.374	0.609
COUNTRY_Y	0.377	0.180	0.470	0.428	0.434	0.995	0.548	0.381	0.620
GA_WP_C	0.325	0.143	0.365	0.295	0.333	0.615	0.969	0.386	0.688
GA_WP_NC	0.257	0.097	0.286	0.213	0.312	0.450	0.965	0.367	0.644
GE_FB1	0.241	0.172	0.434	0.325	0.340	0.543	0.569	0.409	0.772
GE_FB2	0.287	0.147	0.271	0.155	0.290	0.327	0.449	0.424	0.699
GE_FB3C	0.302	0.158	0.384	0.277	0.299	0.529	0.513	0.422	0.753
GE_S1	0.178	0.137	0.245	0.225	0.277	0.486	0.523	0.331	0.755
GE_S2	0.199	0.077	0.264	0.188	0.205	0.419	0.513	0.349	0.733
GE_S3	0.230	0.130	0.264	0.234	0.220	0.395	0.474	0.392	0.714
NEED_IMG	0.390	0.271	0.618	0.307	0.369	0.394	0.373	0.887	0.459
WE_IF	0.266	0.294	0.284	0.197	0.597	0.217	0.181	0.684	0.278
WE_IR	0.250	0.175	0.293	0.156	0.254	0.286	0.314	0.861	0.412
WE_PRIV	0.192	0.165	0.341	0.197	0.292	0.283	0.351	0.733	0.502

Table 53 Cross-loadings for indicators HN03

Fornell-Larcker criterion for constructs (HN03)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR IMAGE / RECOGNITION	PREFERENCE FOR GAME ELEMENTS DIRECT FEEDBACK & STATUS / PRIVILEGES
BIG5 Agreeableness	0.800								
BIG5 Conscientiousness	0.329	0.822							
BIG5 Extraversion	0.491	0.331	0.768						
BIG5 Neuroticism	0.432	0.481	0.480	0.813					
BIG5 Openness	0.395	0.329	0.465	0.441	0.797				
CULTURAL BACKGROUND	0.381	0.174	0.467	0.433	0.438	0.995			
INTENTION TO USE GAMIFICATION	0.302	0.125	0.338	0.264	0.334	0.554	0.967		
NEED FOR IMAGE / RECOGNITION	0.354	0.288	0.505	0.279	0.476	0.379	0.390	0.796	
PREFERENCE FOR GAME ELEMENTS IMAGE / RECOGNITION	0.324	0.187	0.426	0.322	0.371	0.617	0.689	0.524	0.738

Table 54 Fornell-Larcker criterion for constructs HN03

Variance Inflation Factor collinearity check (HN03)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR IMAGE / RECOGNITION	PREFERENCE FOR GAME ELEMENTS DIRECT FEEDBACK & STATUS / PRIVILEGES
BIG5 Agreeableness								1.460	
BIG5 Conscientiousness								1.355	
BIG5 Extraversion								1.601	
BIG5 Neuroticism								1.653	
BIG5 Openness								1.432	
CULTURAL BACKGROUND									1.168
INTENTION TO USE GAMIFICATION									
NEED FOR IMAGE / RECOGNITION									1.168
PREFERENCE FOR GAME ELEMENTS IMAGE / RECOGNITION							1.000		

Table 55 Variance Inflation Factor collinearity check HN03

Effect size f^2 of a exogenous latent variable (HN03)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR IMAGE / RECOGNITION	PREFERENCE FOR GAME ELEMENTS DIRECT FEEDBACK & STATUS / PRIVILEGES
BIG5 Agreeableness								0.006	
BIG5 Conscientiousness								0.011	
BIG5 Extraversion								0.113	
BIG5 Neuroticism								0.009	
BIG5 Openness								0.093	
CULTURAL BACKGROUND									0.392
INTENTION TO USE GAMIFICATION									
NEED FOR IMAGE / RECOGNITION									0.189
PREFERENCE FOR GAME ELEMENTS IMAGE / RECOGNITION							0.906		

Table 56 Effect size f^2 of an exogenous variable HN03

Predictive relevance Q^2 (HN03)	SSO	SSE	$Q^2 (=1-SSE/SSO)$
INTENTION TO USE GAMIFICATION	720.000	415.122	0.423
NEED FOR IMAGE / RECOGNITION	1,440.000	1,161.728	0.193
PREFERENCE FOR GAME ELEMENTS IMAGE / RECOGNITION	2,160.000	1,636.717	0.242

Table 57 Predictive relevance Q^2 HN03

Total Effects Direct & Indirect Path coefficients (HN03)	INTENTION TO USE GAMIFICATION	NEED FOR IMAGE / RECOGNITION	PREFERENCE FOR GAME ELEMENTS DIRECT FEEDBACK & STATUS / PRIVILEGES
BIG5 Agreeableness	0.018	0.078	0.027
BIG5 Conscientiousness	0.023	0.098	0.033
BIG5 Extraversion	0.080	0.344	0.117
BIG5 Neuroticism	-0.023	-0.098	-0.033
BIG5 Openness	0.069	0.296	0.100
CULTURAL BACKGROUND	0.337		0.488
INTENTION TO USE GAMIFICATION			
NEED FOR IMAGE / RECOGNITION	0.234		0.339
PREFERENCE FOR GAME ELEMENTS DIRECT FEEDBACK & STATUS /	0.689		

Bold values are relevant

Table 58 Total effects HN03

8.1.4 HN04 Influence Power

Construct reliability and validity (HN04)	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
BIG5 Agreeableness	0.451	0.783	0.644
BIG5 Conscientiousness	0.548	0.802	0.674
BIG5 Extraversion	0.304	0.742	0.590
BIG5 Neuroticism	0.488	0.795	0.660
BIG5 Openness	0.436	0.778	0.638
CULTURAL BACKGROUND	0.991	0.995	0.991
INTENTION TO USE GAMIFICATION	0.931	0.967	0.935
NEED FOR INFLUENCE / POWER	0.507	0.709	0.463
PREFERENCE FOR GAME ELEMENTS STATUS / PRIVILIGES	0.839	0.903	0.757

Table 59 Construct reliability and validity HN04

Cross-loadings for indicators (HN04)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR INFLUENCE / POWER	PREFERENCE FOR GAME ELEMENTS STATUS / PRIVILIGES
BFI_ART_O	0.297	0.281	0.306	0.398	0.750	0.412	0.219	0.298	0.190
BFI_FAULT_A	0.761	0.300	0.392	0.372	0.261	0.241	0.212	0.278	0.154
BFI_IMA_O	0.328	0.253	0.421	0.325	0.844	0.311	0.305	0.369	0.237
BFI_LAZY_C	0.331	0.701	0.343	0.537	0.268	0.248	0.138	0.103	0.116
BFI_NERV_N	0.413	0.434	0.409	0.781	0.269	0.337	0.154	0.196	0.135
BFI_RELX_N	0.307	0.346	0.394	0.843	0.444	0.366	0.265	0.227	0.259
BFI_RES_E	0.399	0.392	0.768	0.522	0.330	0.404	0.242	0.357	0.239
BFI_SOC_E	0.363	0.130	0.768	0.234	0.377	0.320	0.274	0.357	0.216
BFI_TJOB_C	0.256	0.925	0.259	0.331	0.287	0.090	0.086	0.195	0.109
BFI_TRUST_A	0.842	0.242	0.406	0.336	0.361	0.355	0.265	0.335	0.210
COUNTRY_L	0.377	0.163	0.464	0.434	0.444	0.995	0.550	0.262	0.494
COUNTRY_Y	0.373	0.177	0.474	0.428	0.441	0.995	0.545	0.259	0.501
GA_WP_C	0.324	0.141	0.366	0.295	0.333	0.615	0.967	0.306	0.555
GA_WP_NC	0.256	0.097	0.284	0.213	0.309	0.450	0.968	0.295	0.566
GE_S1	0.178	0.137	0.248	0.225	0.277	0.486	0.523	0.222	0.891
GE_S2	0.196	0.077	0.262	0.188	0.200	0.419	0.514	0.231	0.871
GE_S3	0.228	0.129	0.266	0.234	0.223	0.395	0.474	0.257	0.848
NEED3_CONTR	0.418	0.194	0.489	0.285	0.406	0.286	0.262	0.886	0.222
NEED_INF	-0.009	0.027	0.101	0.069	0.100	0.000	0.105	0.497	0.098
WE_PP	0.162	0.097	0.185	0.078	0.231	0.107	0.229	0.598	0.210

Table 60 Cross-loadings for indicators HN04

Fornell-Larcker criterion for constructs (HN04)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR INFLUENCE / POWER	PREFERENCE FOR GAME ELEMENTS STATUS / PRIVILIGES
BIG5 Agreeableness	0.803								
BIG5 Conscientiousness	0.333	0.821							
BIG5 Extraversion	0.496	0.340	0.768						
BIG5 Neuroticism	0.437	0.475	0.492	0.813					
BIG5 Openness	0.392	0.331	0.461	0.446	0.798				
CULTURAL BACKGROUND	0.377	0.171	0.471	0.433	0.444	0.995			
INTENTION TO USE GAMIFICATION	0.299	0.122	0.336	0.262	0.332	0.550	0.967		
NEED FOR INFLUENCE / POWER	0.384	0.192	0.465	0.261	0.420	0.262	0.310	0.681	
PREFERENCE FOR GAME ELEMENTS STATUS / PRIVILIGES	0.229	0.131	0.296	0.247	0.269	0.500	0.579	0.271	0.870

Table 61 Fornell-Larcker criterion for constructs HN04

Variance Inflation Factor collinearity check (HN04)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR INFLUENCE / POWER	PREFERENCE FOR GAME ELEMENTS STATUS / PRIVILEGES
BIG5 Agreeableness								1.467	
BIG5 Conscientiousness								1.349	
BIG5 Extraversion								1.618	
BIG5 Neuroticism								1.666	
BIG5 Openness								1.427	
CULTURAL BACKGROUND									1.074
INTENTION TO USE GAMIFICATION									
NEED FOR INFLUENCE / POWER									1.074
PREFERENCE FOR GAME ELEMENTS STATUS / PRIVILEGES							1.000		

Table 62 Variance Inflation Factor collinearity check HN04

Effect size f ² of a exogenous latent variable (HN04)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR INFLUENCE / POWER	PREFERENCE FOR GAME ELEMENTS STATUS / PRIVILEGES
BIG5 Agreeableness								0.028	
BIG5 Conscientiousness								0.000	
BIG5 Extraversion								0.081	
BIG5 Neuroticism								0.004	
BIG5 Openness								0.061	
CULTURAL BACKGROUND									0.271
INTENTION TO USE GAMIFICATION									
NEED FOR INFLUENCE / POWER									0.029
PREFERENCE FOR GAME ELEMENTS STATUS / PRIVILEGES							0.506		

Table 63 Effect size f² of an exogenous variable HN04

Predictive relevance Q ² (HN04)	SSO	SSE	Q ² (=1-SSE/SSO)
INTENTION TO USE GAMIFICATION	720.000	504.673	0.299
NEED FOR INFLUENCE / POWER	1,080.000	968.474	0.103
PREFERENCE FOR GAME ELEMENTS STATUS / PRIVILEGES	1,080.000	873.166	0.192

Table 64 Predictive relevance Q² HN04

Total Effects Direct & Indirect Path coefficients (HN04)	INTENTION TO USE GAMIFICATION	NEED FOR INFLUENCE / POWER	PREFERENCE FOR GAME ELEMENTS STATUS / PRIVILEGES
BIG5 Agreeableness	0.015	0.170	0.026
BIG5 Conscientiousness	-0.002	-0.019	-0.003
BIG5 Extraversion	0.027	0.305	0.046
BIG5 Neuroticism	-0.006	-0.066	-0.010
BIG5 Openness	0.022	0.249	0.037
CULTURAL BACKGROUND	0.267		0.461
INTENTION TO USE GAMIFICATION			
NEED FOR INFLUENCE / POWER	0.087		0.150
PREFERENCE FOR GAME ELEMENTS STATUS / PRIVILEGES	0.579		

Bold values are relevant

Table 65 Total effects HN04

8.1.5 HN05 Competition

Construct reliability and validity (HN05)	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
BIG5 Agreeableness	0.451	0.782	0.643
BIG5 Conscientiousness	0.548	0.812	0.685
BIG5 Extraversion	0.304	0.741	0.589
BIG5 Neuroticism	0.488	0.793	0.658
BIG5 Openness	0.436	0.780	0.639
CULTURAL BACKGROUND	0.991	0.995	0.991
INTENTION TO USE GAMIFICATION	0.931	0.966	0.935
NEED FOR COMPETITION	0.953	0.977	0.955
PREFERENCE FOR GAME ELEMENTS COMPETITION	0.888	0.915	0.643

Table 66 Construct reliability and validity HN05

Cross-loadings for indicators (HN05)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR COMPETITION	PREFERENCE FOR GAME ELEMENTS COMPETITION
BFI_ART_O	0.296	0.310	0.301	0.397	0.797	0.412	0.222	0.366	0.326
BFI_FAULT_A	0.748	0.355	0.388	0.359	0.269	0.241	0.215	0.359	0.268
BFI_IMA_O	0.331	0.229	0.426	0.334	0.802	0.311	0.304	0.369	0.346
BFI_LAZY_C	0.327	0.882	0.332	0.528	0.279	0.248	0.142	0.250	0.210
BFI_NERV_N	0.409	0.510	0.399	0.751	0.282	0.337	0.156	0.288	0.247
BFI_RELX_N	0.308	0.378	0.388	0.867	0.443	0.366	0.270	0.383	0.333
BFI_RES_E	0.397	0.442	0.742	0.518	0.337	0.404	0.247	0.372	0.349
BFI_SOC_E	0.364	0.124	0.793	0.235	0.361	0.319	0.276	0.410	0.370
BFI_TJOB_C	0.256	0.770	0.254	0.329	0.285	0.089	0.087	0.184	0.112
BFI_TRUST_A	0.853	0.234	0.407	0.337	0.354	0.355	0.268	0.456	0.321
COUNTRY_L	0.378	0.210	0.461	0.434	0.452	0.995	0.559	0.689	0.703
COUNTRY_Y	0.374	0.222	0.471	0.427	0.448	0.995	0.554	0.683	0.706
GA_WP_C	0.324	0.165	0.366	0.299	0.331	0.616	0.974	0.588	0.780
GA_WP_NC	0.256	0.105	0.286	0.216	0.303	0.450	0.960	0.457	0.636
GE_FB3C	0.303	0.174	0.383	0.279	0.306	0.529	0.518	0.546	0.733
GE_PC3C	0.339	0.174	0.427	0.235	0.434	0.516	0.630	0.554	0.777
GE_RL1	0.283	0.143	0.337	0.315	0.318	0.614	0.596	0.592	0.841
GE_RL2	0.249	0.104	0.299	0.224	0.272	0.481	0.523	0.477	0.754
GE_RL3C	0.322	0.165	0.406	0.358	0.322	0.636	0.599	0.636	0.866
GE_VC3C	0.278	0.202	0.393	0.318	0.364	0.611	0.676	0.592	0.829
NEED_COMP	0.602	0.291	0.519	0.433	0.460	0.668	0.522	0.979	0.681
WE_COMP	0.392	0.227	0.477	0.384	0.438	0.680	0.548	0.976	0.706

Table 67 Cross-loadings for indicators HN05

Fornell-Larcker criterion for constructs (HN05)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR COMPETITION	PREFERENCE FOR GAME ELEMENTS COMPETITION
BIG5 Agreeableness	0.802								
BIG5 Conscientiousness	0.356	0.828							
BIG5 Extraversion	0.494	0.358	0.768						
BIG5 Neuroticism	0.430	0.532	0.481	0.811					
BIG5 Openness	0.392	0.337	0.455	0.457	0.800				
CULTURAL BACKGROUND	0.378	0.217	0.468	0.432	0.452	0.995			
INTENTION TO USE GAMIFICATION	0.304	0.142	0.341	0.271	0.329	0.559	0.967		
NEED FOR COMPETITION	0.512	0.266	0.510	0.419	0.460	0.689	0.547	0.977	
PREFERENCE FOR GAME ELEMENTS COMPETITION	0.369	0.202	0.468	0.362	0.421	0.708	0.740	0.709	0.802

Table 68 Fornell-Larcker criterion for constructs HN05

Variance Inflation Factor collinearity check (HN05)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR COMPETITION	PREFERENCE FOR GAME ELEMENTS COMPETITION
BIG5 Agreeableness								1.465	
BIG5 Conscientiousness								1.451	
BIG5 Extraversion								1.594	
BIG5 Neuroticism								1.747	
BIG5 Openness								1.430	
CULTURAL BACKGROUND									1.905
INTENTION TO USE GAMIFICATION									
NEED FOR COMPETITION									1.905
PREFERENCE FOR GAME ELEMENTS COMPETITION							1.000		

Table 69 Variance Inflation Factor collinearity check HN05

Effect size f ² of a exogenous latent variable (HN05)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR COMPETITION	PREFERENCE FOR GAME ELEMENTS COMPETITION
BIG5 Agreeableness								0.089	
BIG5 Conscientiousness								0.003	
BIG5 Extraversion								0.060	
BIG5 Neuroticism								0.013	
BIG5 Openness								0.048	
CULTURAL BACKGROUND									0.225
INTENTION TO USE GAMIFICATION									
NEED FOR COMPETITION									0.230
PREFERENCE FOR GAME ELEMENTS COMPETITION							1.208		

Table 70 Effect size f² of an exogenous variable HN05

Predictive relevance Q ² (HN05)	SSO	SSE	Q ² (=1-SSE/SSO)
INTENTION TO USE GAMIFICATION	720.000	372.648	0.482
NEED FOR COMPETITION	720.000	466.741	0.352
PREFERENCE FOR GAME ELEMENTS COMPETITION	2,160.000	1,391.770	0.356

Table 71 Predictive relevance Q² HN05

Total Effects Direct & Indirect Path coefficients (HN05)	INTENTION TO USE GAMIFICATION	NEED FOR COMPETITION	PREFERENCE FOR GAME ELEMENTS COMPETITION
BIG5 Agreeableness	0.088	0.281	0.119
BIG5 Conscientiousness	-0.016	-0.051	-0.021
BIG5 Extraversion	0.075	0.240	0.101
BIG5 Neuroticism	0.036	0.116	0.049
BIG5 Openness	0.064	0.204	0.086
CULTURAL BACKGROUND	0.308		0.417
INTENTION TO USE GAMIFICATION			
NEED FOR COMPETITION	0.312		0.422
PREFERENCE FOR GAME ELEMENTS COMPETITION	0.740		

Bold values are relevant

Table 72 Total effects HN05

8.1.6 HN06 Achievement Reward

Construct reliability and validity (HN06)	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
BIG5 Agreeableness	0.451	0.782	0.644
BIG5 Conscientiousness	0.548	0.814	0.687
BIG5 Extraversion	0.304	0.741	0.589
BIG5 Neuroticism	0.488	0.796	0.661
BIG5 Openness	0.436	0.778	0.637
CULTURAL BACKGROUND	0.991	0.995	0.991
INTENTION TO USE GAMIFICATION	0.931	0.967	0.935
NEED FOR ACHIEVMENT/ REWARD	0.530	0.765	0.539
PREFERENCE FOR GAME ELEMENTS CHALLENGES, POINTS, MATERIAL REWARDS	0.834	0.879	0.548

Table 73 Construct reliability and validity HN06

Cross-loadings for indicators (HN06)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR ACHIEVMENT/ REWARD	PREFERENCE FOR GAME ELEMENTS CHALLENGES, POINTS, MATERIAL REWARDS
BFI_ART_O	0.296	0.297	0.298	0.398	0.749	0.412	0.219	0.310	0.224
BFI_FAULT_A	0.750	0.327	0.385	0.384	0.261	0.241	0.212	0.221	0.259
BFI_IMA_O	0.330	0.246	0.429	0.315	0.845	0.311	0.305	0.383	0.357
BFI_LAZY_C	0.328	0.787	0.326	0.546	0.268	0.248	0.138	0.311	0.193
BFI_NERV_N	0.409	0.472	0.394	0.812	0.269	0.337	0.154	0.268	0.184
BFI_RELX_N	0.308	0.364	0.384	0.814	0.444	0.366	0.265	0.269	0.269
BFI_RES_E	0.398	0.418	0.726	0.525	0.330	0.404	0.241	0.315	0.324
BFI_SOC_E	0.364	0.129	0.806	0.233	0.377	0.320	0.274	0.366	0.323
BFI_TJOB_C	0.256	0.869	0.251	0.333	0.287	0.090	0.085	0.387	0.173
BFI_TRUST_A	0.851	0.241	0.407	0.333	0.361	0.355	0.265	0.278	0.286
COUNTRY_L	0.378	0.185	0.459	0.433	0.444	0.995	0.549	0.242	0.497
COUNTRY_Y	0.374	0.198	0.469	0.427	0.441	0.995	0.544	0.249	0.504
GA_WP_C	0.324	0.153	0.365	0.290	0.333	0.615	0.966	0.245	0.684
GA_WP_NC	0.256	0.101	0.287	0.210	0.309	0.450	0.968	0.243	0.706
GE_C1	0.330	0.153	0.331	0.263	0.331	0.498	0.532	0.278	0.740
GE_C2	0.251	0.161	0.205	0.186	0.229	0.315	0.463	0.286	0.668
GE_MR1	0.161	0.129	0.322	0.153	0.260	0.336	0.487	0.324	0.720
GE_MR2	0.183	0.188	0.309	0.163	0.280	0.300	0.453	0.382	0.709
GE_P1	0.310	0.206	0.387	0.265	0.297	0.407	0.636	0.328	0.806
GE_P2	0.254	0.133	0.293	0.190	0.247	0.357	0.595	0.311	0.789
NEED2_ACHI	0.315	0.537	0.361	0.324	0.345	0.278	0.246	0.886	0.411
NEED3_ACHI	0.219	0.147	0.372	0.234	0.383	0.032	0.041	0.436	0.115
WE_RM	0.119	0.114	0.253	0.133	0.246	0.168	0.227	0.801	0.353

Table 74 Cross-loadings for indicators HN06

Fornell-Larcker criterion for constructs (HN06)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR ACHIEVMENT/ REWARD	PREFERENCE FOR GAME ELEMENTS CHALLENGES, POINTS, MATERIAL REWARDS
BIG5 Agreeableness	0.802								
BIG5 Conscientiousness	0.346	0.829							
BIG5 Extraversion	0.493	0.341	0.767						
BIG5 Neuroticism	0.441	0.514	0.479	0.813					
BIG5 Openness	0.393	0.335	0.462	0.439	0.798				
CULTURAL BACKGROUND	0.378	0.193	0.466	0.432	0.444	0.995			
INTENTION TO USE GAMIFICATION	0.299	0.131	0.336	0.257	0.332	0.549	0.967		
NEED FOR ACHIEVMENT/ REWARD	0.314	0.425	0.445	0.330	0.437	0.246	0.252	0.734	
PREFERENCE FOR GAME ELEMENTS CHALLENGES, POINTS, MATERIAL REWARDS	0.340	0.219	0.420	0.279	0.371	0.503	0.719	0.427	0.740

Table 75 Fornell-Larcker criterion for constructs HN06

Variance Inflation Factor collinearity check (HN06)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR ACHIEVMENT/ REWARD	PREFERENCE FOR GAME ELEMENTS CHALLENGES, POINTS, MATERIAL REWARDS
BIG5 Agreeableness								1.473	
BIG5 Conscientiousness								1.412	
BIG5 Extraversion								1.595	
BIG5 Neuroticism								1.706	
BIG5 Openness								1.423	
CULTURAL BACKGROUND									1.065
INTENTION TO USE GAMIFICATION									
NEED FOR ACHIEVMENT/ REWARD									1.065
PREFERENCE FOR GAME ELEMENTS CHALLENGES, POINTS, MATERIAL REWARDS							1.000		

Table 76 Variance Inflation Factor collinearity check HN06

Effect size f^2 of a exogenous latent variable (HN06)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR ACHIEVMENT/ REWARD	PREFERENCE FOR GAME ELEMENTS CHALLENGES, POINTS, MATERIAL REWARDS
BIG5 Agreeableness								0.000	
BIG5 Conscientiousness								0.079	
BIG5 Extraversion								0.060	
BIG5 Neuroticism								0.002	
BIG5 Openness								0.060	
CULTURAL BACKGROUND									0.259
INTENTION TO USE GAMIFICATION									
NEED FOR ACHIEVMENT/ REWARD									0.151
PREFERENCE FOR GAME ELEMENTS CHALLENGES, POINTS, MATERIAL REWARDS							1.069		

Table 77 Effect size f^2 of an exogenous variable HN06

Predictive relevance Q^2 (HN06)	SSO	SSE	$Q^2 (=1 - SSE/SSO)$
INTENTION TO USE GAMIFICATION	720.000	388.148	0.461
NEED FOR ACHIEVMENT/ REWARD	1,080.000	927.886	0.141
PREFERENCE FOR GAME ELEMENTS CHALLENGES, POINTS, MATERIAL REWARDS	2,160.000	1,776.526	0.178

Table 78 Predictive relevance Q^2 HN06

Total Effects Direct & Indirect Path coefficients (HN06)	INTENTION TO USE GAMIFICATION	NEED FOR ACHIEVMENT/ REWARD	PREFERENCE FOR GAME ELEMENTS CHALLENGES, POINTS, MATERIAL REWARDS
BIG5 Agreeableness	0.005	0.020	0.006
BIG5 Conscientiousness	0.064	0.275	0.089
BIG5 Extraversion	0.059	0.253	0.082
BIG5 Neuroticism	-0.011	-0.046	-0.015
BIG5 Openness	0.056	0.240	0.078
CULTURAL BACKGROUND	0.304		0.423
INTENTION TO USE GAMIFICATION			
NEED FOR ACHIEVMENT/ REWARD	0.232		0.323
PREFERENCE FOR GAME ELEMENTS CHALLENGES, POINTS, MATERIAL REWARDS	0.719		

Bold values are relevant

Table 79 Total effects HN06

8.1.7 HN07 Mastery Advancement

Construct reliability and validity (HN07)	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
BIG5 Agreeableness	0.451	0.756	0.620
BIG5 Conscientiousness	0.548	0.802	0.674
BIG5 Extraversion	0.304	0.737	0.587
BIG5 Neuroticism	0.488	0.794	0.659
BIG5 Openness	0.436	0.765	0.626
CULTURAL BACKGROUND	0.991	0.995	0.991
INTENTION TO USE GAMIFICATION	0.931	0.967	0.935
NEED FOR MASTERY / ADVANCEMENT	0.767	0.861	0.677
PREFERENCE FOR GAME ELEMENTS BADGES AND LEVEL	0.939	0.951	0.765

Table 80 Construct reliability and validity HN07

Cross-loadings for indicators (HN07)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR MASTERY / ADVANCEMENT	PREFERENCE FOR GAME ELEMENTS BADGES AND LEVELS
BFI_ART_O	0.274	0.281	0.287	0.397	0.651	0.412	0.219	0.163	0.158
BFI_FAULT_A	0.589	0.300	0.376	0.363	0.244	0.241	0.213	0.097	0.181
BFI_IMA_O	0.350	0.253	0.437	0.332	0.910	0.311	0.305	0.299	0.304
BFI_LAZY_C	0.277	0.701	0.304	0.530	0.246	0.248	0.139	0.218	0.146
BFI_NERV_N	0.353	0.434	0.375	0.759	0.242	0.337	0.154	0.137	0.162
BFI_RELX_N	0.319	0.346	0.372	0.861	0.441	0.366	0.266	0.175	0.247
BFI_RES_E	0.366	0.392	0.676	0.519	0.313	0.404	0.243	0.146	0.232
BFI_SOC_E	0.367	0.130	0.846	0.235	0.400	0.319	0.274	0.201	0.264
BFI_TJOB_C	0.251	0.925	0.241	0.330	0.286	0.089	0.086	0.410	0.073
BFI_TRUST_A	0.945	0.242	0.407	0.337	0.369	0.355	0.266	0.239	0.239
COUNTRY_L	0.384	0.163	0.451	0.434	0.423	0.995	0.552	0.121	0.495
COUNTRY_Y	0.378	0.177	0.461	0.427	0.420	0.995	0.547	0.119	0.491
GA_WP_C	0.321	0.141	0.363	0.298	0.332	0.616	0.968	0.181	0.691
GA_WP_NC	0.254	0.097	0.288	0.215	0.316	0.450	0.966	0.244	0.677
GE_B1	0.253	0.098	0.281	0.227	0.293	0.463	0.634	0.199	0.900
GE_B2	0.231	0.094	0.327	0.224	0.291	0.463	0.631	0.228	0.879
GE_B3C	0.256	0.092	0.304	0.221	0.302	0.476	0.656	0.202	0.897
GE_L1	0.215	0.093	0.259	0.216	0.249	0.378	0.585	0.220	0.860
GE_L2	0.179	0.128	0.233	0.216	0.232	0.365	0.576	0.239	0.845
GE_L3C	0.245	0.110	0.285	0.242	0.244	0.441	0.624	0.253	0.865
NEED2_MAS	0.240	0.562	0.220	0.266	0.287	0.122	0.167	0.918	0.214
WE_OL	0.127	0.126	0.130	0.032	0.195	0.050	0.174	0.874	0.196
WE_PP	0.181	0.097	0.197	0.077	0.255	0.107	0.229	0.653	0.230

Table 81 Cross-loadings for indicators HN07

Fornell-Larcker criterion for constructs (HN07)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR MASTERY / ADVANCEMENT	PREFERENCE FOR GAME ELEMENTS BADGES AND LEVELS
BIG5 Agreeableness	0.787								
BIG5 Conscientiousness	0.307	0.821							
BIG5 Extraversion	0.473	0.310	0.766						
BIG5 Neuroticism	0.409	0.472	0.457	0.812					
BIG5 Openness	0.395	0.321	0.469	0.434	0.791				
CULTURAL BACKGROUND	0.383	0.171	0.458	0.433	0.424	0.995			
INTENTION TO USE GAMIFICATION	0.297	0.123	0.337	0.266	0.335	0.552	0.967		
NEED FOR MASTERY / ADVANCEMENT	0.236	0.405	0.230	0.194	0.306	0.121	0.219	0.823	
PREFERENCE FOR GAME ELEMENTS BADGES AND	0.264	0.117	0.323	0.257	0.308	0.495	0.707	0.255	0.875

Table 82 Fornell-Larcker criterion for constructs HN07

Variance Inflation Factor collinearity check (HN07)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR MASTERY / ADVANCEMENT	PREFERENCE FOR GAME ELEMENTS BADGES AND LEVELS
BIG5 Agreeableness								1.421	
BIG5 Conscientiousness								1.333	
BIG5 Extraversion								1.562	
BIG5 Neuroticism								1.604	
BIG5 Openness								1.443	
CULTURAL BACKGROUND									1.015
INTENTION TO USE GAMIFICATION									
NEED FOR MASTERY / ADVANCEMENT									1.015
PREFERENCE FOR GAME ELEMENTS BADGES AND LEVELS							1.000		

Table 83 Variance Inflation Factor collinearity check HN07

Effect size f ² of an exogenous latent variable (HN07)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR MASTERY / ADVANCEMENT	PREFERENCE FOR GAME ELEMENTS BADGES AND LEVELS
BIG5 Agreeableness								0.005	
BIG5 Conscientiousness								0.122	
BIG5 Extraversion								0.002	
BIG5 Neuroticism								0.009	
BIG5 Openness								0.031	
CULTURAL BACKGROUND									0.305
INTENTION TO USE GAMIFICATION									
NEED FOR MASTERY / ADVANCEMENT									0.054
PREFERENCE FOR GAME ELEMENTS BADGES AND LEVELS							1.001		

Table 84 Effect size f² of an exogenous variable HN07

Predictive relevance Q ² (HN07)	SSO	SSE	Q ² (=1-SSE/SSO)
INTENTION TO USE GAMIFICATION	720.000	398.773	0.446
NEED FOR MASTERY / ADVANCEMENT	1,080.000	969.118	0.103
PREFERENCE FOR GAME ELEMENTS BADGES AND LEVELS	2,160.000	1,724.472	0.202

Table 85 Predictive relevance Q² HN07

Total Effects Direct & Indirect Path coefficients (HN07)	INTENTION TO USE GAMIFICATION	NEED FOR MASTERY / ADVANCEMENT	PREFERENCE FOR GAME ELEMENTS BADGES AND LEVEL
BIG5 Agreeableness	0.010	0.074	0.015
BIG5 Conscientiousness	0.050	0.359	0.071
BIG5 Extraversion	0.006	0.045	0.009
BIG5 Neuroticism	-0.015	-0.107	-0.021
BIG5 Openness	0.026	0.187	0.037
CULTURAL BACKGROUND	0.333		0.471
INTENTION TO USE GAMIFICATION			
NEED FOR MASTERY / ADVANCEMENT	0.140		0.198
PREFERENCE FOR GAME ELEMENTS BADGES AND LEVEL	0.707		

Bold values are relevant

Table 86 Total effects HN07

8.1.8 HN08 Self Expression

Construct reliability and validity (HN08)	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
BIG5 Agreeableness	0.451	0.768	0.630
BIG5 Conscientiousness	0.548	0.810	0.682
BIG5 Extraversion	0.304	0.712	0.571
BIG5 Neuroticism	0.488	0.791	0.656
BIG5 Openness	0.436	0.780	0.639
CULTURAL BACKGROUND	0.991	0.995	0.991
INTENTION TO USE GAMIFICATION	0.931	0.967	0.935
NEED FOR SELF EXPRESSION	1.000	1.000	1.000
PREFERENCE FOR GAME ELEMENTS VIRTUAL CHARACTER	0.914	0.946	0.853

Table 87 Construct reliability and validity HN08

Cross-loadings for indicators (HN08)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR SELF EXPRESSION	PREFERENCE FOR GAME ELEMENTS VIRTUAL CHARACTER
BFI_ART_O	0.302	0.312	0.330	0.393	0.819	0.412	0.221	0.093	0.281
BFI_FAULT_A	0.919	0.359	0.404	0.411	0.272	0.241	0.214	0.147	0.220
BFI_IMA_O	0.274	0.226	0.349	0.284	0.779	0.311	0.304	0.085	0.313
BFI_LAZY_C	0.372	0.896	0.412	0.561	0.283	0.248	0.141	0.159	0.193
BFI_NERV_N	0.456	0.515	0.459	0.882	0.287	0.337	0.155	0.289	0.202
BFI_RELX_N	0.267	0.379	0.421	0.731	0.441	0.366	0.268	0.200	0.304
BFI_RES_E	0.409	0.445	0.933	0.528	0.340	0.404	0.245	0.263	0.321
BFI_SOC_E	0.329	0.122	0.522	0.227	0.353	0.319	0.275	0.111	0.321
BFI_TJOB_C	0.242	0.750	0.283	0.332	0.284	0.089	0.086	0.107	0.105
BFI_TRUST_A	0.644	0.232	0.371	0.323	0.349	0.355	0.267	0.076	0.271
COUNTRY_L	0.338	0.213	0.461	0.427	0.454	0.995	0.556	0.057	0.665
COUNTRY_Y	0.337	0.225	0.470	0.420	0.451	0.995	0.551	0.046	0.663
GA_WP_C	0.302	0.166	0.347	0.273	0.330	0.616	0.971	0.061	0.765
GA_WP_NC	0.238	0.105	0.254	0.198	0.299	0.450	0.963	0.063	0.681
GE_VC1	0.301	0.165	0.373	0.297	0.351	0.652	0.732	0.017	0.935
GE_VC2	0.235	0.154	0.354	0.229	0.312	0.584	0.669	0.024	0.913
GE_VC3C	0.256	0.204	0.370	0.294	0.363	0.611	0.674	0.050	0.923
NEED2_SEXP	0.149	0.165	0.269	0.308	0.111	0.052	0.064	1.000	0.032

Table 88 Cross-loadings for indicators HN08

Fornell-Larcker criterion for constructs (HN08)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR SELF EXPRESSION	PREFERENCE FOR GAME ELEMENTS VIRTUAL CHARACTER
BIG5 Agreeableness	0.794								
BIG5 Conscientiousness	0.382	0.826							
BIG5 Extraversion	0.475	0.431	0.756						
BIG5 Neuroticism	0.462	0.560	0.541	0.810					
BIG5 Openness	0.361	0.338	0.424	0.427	0.799				
CULTURAL BACKGROUND	0.339	0.220	0.467	0.425	0.455	0.995			
INTENTION TO USE GAMIFICATION	0.281	0.142	0.313	0.246	0.326	0.556	0.967		
NEED FOR SELF EXPRESSION	0.149	0.165	0.269	0.308	0.111	0.052	0.064	1.000	
CHARACTER	0.287	0.189	0.396	0.297	0.371	0.667	0.750	0.032	0.924

Table 89 Fornell-Larcker criterion for constructs HN08

Variance Inflation Factor collinearity check (HN08)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR SELF EXPRESSION	PREFERENCE FOR GAME ELEMENTS VIRTUAL CHARACTER
BIG5 Agreeableness								1.444	
BIG5 Conscientiousness								1.539	
BIG5 Extraversion								1.649	
BIG5 Neuroticism								1.866	
BIG5 Openness								1.340	
CULTURAL BACKGROUND									1.003
INTENTION TO USE GAMIFICATION									
NEED FOR SELF EXPRESSION									1.003
PREFERENCE FOR GAME ELEMENTS VIRTUAL CHARACTER							1.000		

Table 90 Variance Inflation Factor collinearity check HN08

Effect size f ² of an exogenous latent variable (HN08)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR SELF EXPRESSION	PREFERENCE FOR GAME ELEMENTS VIRTUAL CHARACTER
BIG5 Agreeableness								0.000	
BIG5 Conscientiousness								0.001	
BIG5 Extraversion								0.020	
BIG5 Neuroticism								0.043	
BIG5 Openness								0.003	
CULTURAL BACKGROUND									0.801
INTENTION TO USE GAMIFICATION									
NEED FOR SELF EXPRESSION									0.000
PREFERENCE FOR GAME ELEMENTS VIRTUAL CHARACTER							1.285		

Table 91 Effect size f² of an exogenous variable HN08

Predictive relevance Q ² (HN08)	SSO	SSE	Q ² (=1-SSE/SSO)
INTENTION TO USE GAMIFICATION	720.000	359.918	0.500
NEED FOR SELF EXPRESSION	360.000	327.268	0.091
PREFERENCE FOR GAME ELEMENTS VIRTUAL CHARACTER	1,080.000	692.893	0.358

Table 92 Predictive relevance Q² HN08

Total Effects Direct & Indirect Path coefficients (HN08)	INTENTION TO USE GAMIFICATION	NEED FOR SELF EXPRESSION	PREFERENCE FOR GAME ELEMENTS VIRTUAL CHARACTER
BIG5 Agreeableness	0.000	-0.024	0.000
BIG5 Conscientiousness	0.000	-0.030	0.000
BIG5 Extraversion	0.000	0.173	0.000
BIG5 Neuroticism	0.000	0.267	-0.001
BIG5 Openness	0.000	-0.057	0.000
CULTURAL BACKGROUND	0.500		0.667
INTENTION TO USE GAMIFICATION			
NEED FOR SELF EXPRESSION	-0.002		-0.002
PREFERENCE FOR GAME ELEMENTS VIRTUAL CHARACTER	0.750		

Bold values are relevant

Table 93 Total effects HN08

8.1.9 HN09 Relevance Idealism

Construct reliability and validity (HN09)	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
BIG5 Agreeableness	0.451	0.780	0.641
BIG5 Conscientiousness	0.548	0.808	0.680
BIG5 Extraversion	0.304	0.733	0.584
BIG5 Neuroticism	0.488	0.796	0.661
BIG5 Openness	0.436	0.758	0.620
CULTURAL BACKGROUND	0.991	0.995	0.991
INTENTION TO USE GAMIFICATION	0.931	0.967	0.935
NEED FOR RELEVANCE IDEALISM	0.878	0.938	0.883
PREFERENCE FOR GAME ELEMENTS PLAY-CULTURE	0.875	0.923	0.800

Table 94 Construct reliability and validity HN09

Cross-loadings for indicators (HN09)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR RELEVANCE IDEALISM	PREFERENCE FOR GAME ELEMENTS PLAY-CULTURE
BFI_ART_O	0.293	0.288	0.279	0.397	0.612	0.412	0.220	0.199	0.308
BFI_FAULT_A	0.721	0.311	0.369	0.393	0.237	0.241	0.214	0.238	0.256
BFI_IMA_O	0.336	0.251	0.441	0.306	0.930	0.311	0.304	0.427	0.442
BFI_LAZY_C	0.319	0.737	0.290	0.551	0.236	0.248	0.140	0.161	0.202
BFI_NERV_N	0.400	0.450	0.363	0.836	0.231	0.337	0.155	0.188	0.211
BFI_RELX_N	0.311	0.354	0.363	0.789	0.438	0.366	0.267	0.168	0.300
BFI_RES_E	0.393	0.403	0.644	0.527	0.305	0.404	0.244	0.194	0.339
BFI_SOC_E	0.366	0.130	0.868	0.231	0.406	0.319	0.275	0.299	0.376
BFI_TJOB_C	0.256	0.904	0.234	0.333	0.285	0.089	0.086	0.254	0.194
BFI_TRUST_A	0.873	0.242	0.407	0.330	0.370	0.355	0.266	0.338	0.333
COUNTRY_L	0.381	0.172	0.446	0.432	0.413	0.995	0.554	0.141	0.551
COUNTRY_Y	0.376	0.186	0.455	0.425	0.411	0.995	0.548	0.129	0.540
GA_WP_C	0.325	0.146	0.360	0.285	0.330	0.616	0.969	0.168	0.702
GA_WP_NC	0.257	0.099	0.288	0.206	0.317	0.450	0.965	0.155	0.657
GE_PC1	0.341	0.237	0.418	0.318	0.403	0.476	0.601	0.330	0.898
GE_PC2	0.316	0.228	0.396	0.286	0.448	0.478	0.654	0.350	0.909
GE_PC3C	0.340	0.165	0.429	0.230	0.441	0.516	0.628	0.294	0.874
NEED2_REL	0.466	0.302	0.370	0.289	0.497	0.186	0.195	0.972	0.377
WE_EM	0.132	0.146	0.212	0.064	0.243	0.024	0.093	0.906	0.287

Table 95 Cross-loadings for indicators HN09

Fornell-Larcker criterion for constructs (HN09)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR RELEVANCE IDEALISM	PREFERENCE FOR GAME ELEMENTS PLAY-CULTURE
BIG5 Agreeableness	0.801								
BIG5 Conscientiousness	0.334	0.825							
BIG5 Extraversion	0.483	0.305	0.764						
BIG5 Neuroticism	0.440	0.497	0.446	0.813					
BIG5 Openness	0.389	0.317	0.470	0.404	0.787				
CULTURAL BACKGROUND	0.380	0.180	0.452	0.431	0.414	0.995			
INTENTION TO USE GAMIFICATION	0.302	0.127	0.337	0.255	0.335	0.554	0.967		
NEED FOR RELEVANCE IDEALISM	0.366	0.260	0.331	0.220	0.428	0.136	0.167	0.940	
PREFERENCE FOR GAME ELEMENTS PLAY-CULTURE	0.372	0.235	0.463	0.311	0.482	0.548	0.703	0.363	0.894

Table 96 Fornell-Larcker criterion for constructs HN09

Variance Inflation Factor collinearity check (HN09)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR RELEVANCE IDEALISM	PREFERENCE FOR GAME ELEMENTS PLAY-CULTURE
BIG5 Agreeableness								1.468	
BIG5 Conscientiousness								1.377	
BIG5 Extraversion								1.563	
BIG5 Neuroticism								1.633	
BIG5 Openness								1.412	
CULTURAL BACKGROUND									1.019
INTENTION TO USE GAMIFICATION									
NEED FOR RELEVANCE IDEALISM									1.019
PREFERENCE FOR GAME ELEMENTS PLAY-CULTURE							1.000		

Table 97 Variance Inflation Factor collinearity check HN09

Effect size f ² of an exogenous latent variable (HN09)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR RELEVANCE IDEALISM	PREFERENCE FOR GAME ELEMENTS PLAY-CULTURE
BIG5 Agreeableness								0.038	
BIG5 Conscientiousness								0.012	
BIG5 Extraversion								0.008	
BIG5 Neuroticism								0.007	
BIG5 Openness								0.088	
CULTURAL BACKGROUND									0.413
INTENTION TO USE GAMIFICATION									
NEED FOR RELEVANCE IDEALISM									0.139
PREFERENCE FOR GAME ELEMENTS PLAY-CULTURE							0.976		

Table 98 Effect size f² of an exogenous variable HN09

	SSO	SSE	Q ² (= 1- SSE/SSO)
INTENTION TO USE GAMIFICATION	720.000	402.669	0.441
NEED FOR RELEVANCE IDEALISM	720.000	600.115	0.167
PREFERENCE FOR GAME ELEMENTS PLAY-CULTURE	1,080.000	765.855	0.291

Table 99 Predictive relevance Q² HN09

Total Effects Direct & Indirect Path coefficients (HN09)	INTENTION TO USE GAMIFICATION	NEED FOR RELEVANCE IDEALISM	PREFERENCE FOR GAME ELEMENTS PLAY-CULTURE
BIG5 Agreeableness	0.042	0.204	0.060
BIG5 Conscientiousness	0.023	0.111	0.033
BIG5 Extraversion	0.020	0.096	0.028
BIG5 Neuroticism	-0.019	-0.091	-0.027
BIG5 Openness	0.063	0.305	0.090
CULTURAL BACKGROUND	0.357		0.508
INTENTION TO USE GAMIFICATION			
NEED FOR RELEVANCE IDEALISM	0.207		0.294
PREFERENCE FOR GAME ELEMENTS PLAY-CULTURE	0.703		

Bold values are relevant

Table 100 Total effects HN09

8.1.10 HN10 Autonomy

Construct reliability and validity (HN10)	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
BIG5 Agreeableness	0.451	0.773	0.635
BIG5 Conscientiousness	0.548	0.815	0.688
BIG5 Extraversion	0.304	0.738	0.587
BIG5 Neuroticism	0.488	0.793	0.659
BIG5 Openness	0.436	0.772	0.632
CULTURAL BACKGROUND	0.991	0.995	0.991
INTENTION TO USE GAMIFICATION	0.931	0.967	0.935
NEED FOR AUTONOMY	0.747	0.860	0.682
PREFERENCE FOR GAME ELEMENTS AUTONOMY	0.925	0.952	0.870

Table 101 Construct reliability and validity HN10

Cross-loadings for indicators (HN10)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR AUTONOMY	PREFERENCE FOR GAME ELEMENTS AUTONOMY
BFI_ART_O	0.287	0.298	0.288	0.397	0.696	0.412	0.217	0.334	0.159
BFI_FAULT_A	0.675	0.330	0.377	0.361	0.252	0.241	0.211	0.217	0.152
BFI_IMA_O	0.342	0.245	0.437	0.333	0.883	0.311	0.305	0.512	0.339
BFI_LAZY_C	0.305	0.797	0.306	0.529	0.256	0.248	0.136	0.167	0.156
BFI_NERV_N	0.384	0.476	0.377	0.755	0.255	0.337	0.153	0.170	0.182
BFI_RELX_N	0.315	0.366	0.373	0.864	0.444	0.366	0.263	0.221	0.117
BFI_RES_E	0.384	0.421	0.682	0.518	0.322	0.404	0.239	0.231	0.232
BFI_SOC_E	0.367	0.129	0.842	0.235	0.391	0.320	0.273	0.314	0.234
BFI_TJOB_C	0.255	0.861	0.242	0.330	0.287	0.090	0.085	0.199	0.171
BFI_TRUST_A	0.902	0.241	0.408	0.337	0.366	0.355	0.263	0.372	0.235
COUNTRY_L	0.383	0.187	0.452	0.434	0.433	0.995	0.545	0.336	0.311
COUNTRY_Y	0.378	0.200	0.462	0.427	0.430	0.995	0.540	0.334	0.316
GA_WP_C	0.324	0.154	0.363	0.299	0.333	0.615	0.963	0.349	0.423
GA_WP_NC	0.257	0.102	0.288	0.215	0.314	0.450	0.971	0.341	0.478
GE_AUT1	0.293	0.193	0.327	0.170	0.321	0.276	0.415	0.667	0.930
GE_AUT2	0.203	0.171	0.273	0.165	0.314	0.319	0.454	0.566	0.943
GE_AUT3	0.196	0.186	0.239	0.164	0.291	0.287	0.440	0.542	0.925
NEED2_AUTO	0.387	0.260	0.375	0.291	0.593	0.363	0.341	0.947	0.608
NEED3_FREED	0.225	0.105	0.166	0.135	0.448	0.191	0.218	0.550	0.214
WE_SD	0.320	0.157	0.311	0.154	0.327	0.256	0.310	0.920	0.663

Table 102 Cross-loadings for indicators HN10

Fornell-Larcker criterion for constructs (HN10)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR AUTONOMY	PREFERENCE FOR GAME ELEMENTS AUTONOMY
BIG5 Agreeableness	0.797								
BIG5 Conscientiousness	0.334	0.829							
BIG5 Extraversion	0.484	0.326	0.766						
BIG5 Neuroticism	0.422	0.506	0.459	0.812					
BIG5 Openness	0.396	0.328	0.467	0.443	0.795				
CULTURAL BACKGROUND	0.382	0.195	0.459	0.432	0.434	0.995			
INTENTION TO USE GAMIFICATION	0.298	0.130	0.334	0.263	0.334	0.545	0.967		
NEED FOR AUTONOMY	0.384	0.222	0.360	0.243	0.546	0.337	0.356	0.826	
PREFERENCE FOR GAME ELEMENTS AUTONOMY	0.249	0.197	0.302	0.178	0.331	0.315	0.467	0.637	0.933

Table 103 Fornell-Larcker criterion for constructs HN10

Variance Inflation Factor collinearity check (HN10)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR AUTONOMY	PREFERENCE FOR GAME ELEMENTS AUTONOMY
BIG5 Agreeableness								1.450	
BIG5 Conscientiousness								1.394	
BIG5 Extraversion								1.569	
BIG5 Neuroticism								1.669	
BIG5 Openness								1.442	
CULTURAL BACKGROUND									1.128
INTENTION TO USE GAMIFICATION									
NEED FOR AUTONOMY									1.128
PREFERENCE FOR GAME ELEMENTS AUTONOMY							1.000		

Table 104 Variance Inflation Factor collinearity check HN10

Effect size f ² of an exogenous latent variable (HN10)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR AUTONOMY	PREFERENCE FOR GAME ELEMENTS AUTONOMY
BIG5 Agreeableness								0.038	
BIG5 Conscientiousness								0.001	
BIG5 Extraversion								0.007	
BIG5 Neuroticism								0.008	
BIG5 Openness								0.226	
CULTURAL BACKGROUND									0.020
INTENTION TO USE GAMIFICATION									
NEED FOR AUTONOMY									0.546
PREFERENCE FOR GAME ELEMENTS AUTONOMY							0.280		

Table 105 Effect size f² of an exogenous variable HN10

Predictive relevance Q ² (HN10)	SSO	SSE	Q ² (=1-SSE/SSO)
INTENTION TO USE GAMIFICATION	720.000	581.470	0.192
NEED FOR AUTONOMY	1,080.000	849.221	0.214
PREFERENCE FOR GAME ELEMENTS AUTONOMY	1,080.000	713.599	0.339

Table 106 Predictive relevance Q² HN10

Total Effects Direct & Indirect Path coefficients (HN10)	INTENTION TO USE GAMIFICATION	NEED FOR AUTONOMY	PREFERENCE FOR GAME ELEMENTS AUTONOMY
BIG5 Agreeableness	0.053	0.191	0.114
BIG5 Conscientiousness	0.007	0.026	0.015
BIG5 Extraversion	0.024	0.086	0.052
BIG5 Neuroticism	-0.027	-0.095	-0.057
BIG5 Openness	0.130	0.464	0.278
CULTURAL BACKGROUND	0.053		0.113
INTENTION TO USE GAMIFICATION			
NEED FOR AUTONOMY	0.280		0.599
PREFERENCE FOR GAME ELEMENTS AUTONOMY	0.467		

Bold values are relevant

Table 107 Total effects HN10

8.1.11 HN11 Structure Security Stability Order

Construct reliability and validity (HN11)	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
BIG5 Agreeableness	0.451	0.773	0.635
BIG5 Conscientiousness	0.548	0.816	0.689
BIG5 Extraversion	0.304	0.738	0.587
BIG5 Neuroticism	0.488	0.795	0.660
BIG5 Openness	0.436	0.774	0.634
CULTURAL BACKGROUND	0.991	0.995	0.991
INTENTION TO USE GAMIFICATION	0.931	0.967	0.935
NEED FOR STRUCTURE SECURITY STABILITY ORDER	0.867	0.935	0.879
PREFERENCE FOR GAME ELEMENTS POINTS / TRANSPARENT RULES	1.000	1.000	1.000

Table 108 Construct reliability and validity HN11

Cross-loadings for indicators (HN11)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR STRUCTURE SECURITY STABILITY ORDER	PREFERENCE FOR GAME ELEMENTS POINTS / TRANSPARENT RULES
BFI_ART_O	0.287	0.302	0.289	0.398	0.706	0.412	0.218	0.299	0.203
BFI_FAULT_A	0.674	0.337	0.378	0.369	0.254	0.241	0.212	0.124	0.197
BFI_IMA_O	0.342	0.242	0.436	0.327	0.877	0.311	0.305	0.440	0.274
BFI_LAZY_C	0.304	0.818	0.309	0.535	0.258	0.248	0.138	0.308	0.132
BFI_NERV_N	0.384	0.485	0.380	0.774	0.257	0.337	0.153	0.192	0.143
BFI_RELX_N	0.315	0.369	0.374	0.849	0.444	0.366	0.264	0.229	0.139
BFI_RES_E	0.384	0.427	0.687	0.521	0.323	0.404	0.241	0.168	0.133
BFI_SOC_E	0.367	0.128	0.838	0.235	0.388	0.319	0.274	0.224	0.193
BFI_TJOB_C	0.255	0.842	0.243	0.331	0.287	0.089	0.085	0.329	0.056
BFI_TRUST_A	0.903	0.240	0.408	0.336	0.365	0.355	0.264	0.213	0.201
COUNTRY_L	0.383	0.193	0.453	0.434	0.435	0.995	0.548	0.191	0.439
COUNTRY_Y	0.378	0.206	0.463	0.428	0.432	0.995	0.543	0.187	0.437
GA_WP_C	0.324	0.157	0.363	0.296	0.333	0.616	0.965	0.158	0.610
GA_WP_NC	0.257	0.102	0.288	0.214	0.313	0.450	0.969	0.184	0.645
GE_TR	0.244	0.112	0.216	0.173	0.304	0.440	0.649	0.208	1.000
NEED3_STRUC	0.266	0.482	0.300	0.336	0.497	0.211	0.176	0.963	0.199
WE_CT	0.119	0.178	0.157	0.108	0.371	0.130	0.153	0.911	0.191

Table 109 Cross-loadings for indicators HN11

Fornell-Larcker criterion for constructs (HN11)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR STRUCTURE SECURITY STABILITY ORDER	PREFERENCE FOR GAME ELEMENTS POINTS / TRANSPARENT RULES
BIG5 Agreeableness	0.797								
BIG5 Conscientiousness	0.336	0.830							
BIG5 Extraversion	0.484	0.331	0.766						
BIG5 Neuroticism	0.425	0.518	0.462	0.812					
BIG5 Openness	0.396	0.329	0.466	0.441	0.796				
CULTURAL BACKGROUND	0.382	0.200	0.460	0.433	0.436	0.995			
INTENTION TO USE GAMIFICATION	0.299	0.133	0.336	0.262	0.334	0.548	0.967		
NEED FOR STRUCTURE SECURITY STABILITY ORDER	0.220	0.384	0.258	0.260	0.475	0.190	0.177	0.937	
PREFERENCE FOR GAME ELEMENTS POINTS / TRANSPARENT RULES	0.244	0.112	0.216	0.173	0.304	0.440	0.649	0.208	1.000

Table 110 Fornell-Larcker criterion for constructs HN11

Variance Inflation Factor collinearity check (HN11)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR STRUCTURE SECURITY STABILITY ORDER	PREFERENCE FOR GAME ELEMENTS POINTS / TRANSPARENT RULES
BIG5 Agreeableness								1.451	
BIG5 Conscientiousness								1.414	
BIG5 Extraversion								1.572	
BIG5 Neuroticism								1.692	
BIG5 Openness								1.437	
CULTURAL BACKGROUND									1.038
INTENTION TO USE GAMIFICATION									
NEED FOR STRUCTURE SECURITY STABILITY ORDER									1.038
PREFERENCE FOR GAME ELEMENTS POINTS / TRANSPARENT RULES							1.000		

Table 111 Variance Inflation Factor collinearity check HN11

Effect size f^2 of an exogenous latent variable (HN11)	BIG5 Agreeableness	BIG5 Conscientiousness	BIG5 Extraversion	BIG5 Neuroticism	BIG5 Openness	CULTURAL BACKGROUND	INTENTION TO USE GAMIFICATION	NEED FOR STRUCTURE SECURITY STABILITY ORDER	PREFERENCE FOR GAME ELEMENTS POINTS / TRANSPARENT RULES
BIG5 Agreeableness								0.000	
BIG5 Conscientiousness								0.080	
BIG5 Extraversion								0.000	
BIG5 Neuroticism								0.004	
BIG5 Openness								0.165	
CULTURAL BACKGROUND									0.211
INTENTION TO USE GAMIFICATION									
NEED FOR STRUCTURE SECURITY STABILITY ORDER									0.020
PREFERENCE FOR GAME ELEMENTS POINTS / TRANSPARENT RULES							0.729		

Table 112 Effect size f^2 of an exogenous variable HN11

Predictive relevance Q^2 (HN11)	SSO	SSE	$Q^2 (=1 - SSE/SSO)$
INTENTION TO USE GAMIFICATION	720.000	450.314	0.375
NEED FOR STRUCTURE SECURITY STABILITY ORDER	720.000	562.296	0.219
PREFERENCE FOR GAME ELEMENTS POINTS / TRANSPARENT RULES	360.000	289.589	0.196

Table 113 Predictive relevance Q^2 HN11

Total Effects Direct & Indirect Path coefficients (HN11)	INTENTION TO USE GAMIFICATION	NEED FOR STRUCTURE SECURITY STABILITY ORDER	PREFERENCE FOR GAME ELEMENT TRANSPARENT RULES
BIG5 Agreeableness	-0.001	-0.015	-0.002
BIG5 Conscientiousness	0.024	0.285	0.037
BIG5 Extraversion	0.001	0.011	0.001
BIG5 Neuroticism	-0.006	-0.066	-0.009
BIG5 Openness	0.034	0.411	0.053
CULTURAL BACKGROUND	0.270		0.416
INTENTION TO USE GAMIFICATION			
NEED FOR STRUCTURE SECURITY STABILITY ORDER	0.084		0.129
PREFERENCE FOR GAME ELEMENT TRANSPARENT RULES	0.649		

Bold values are relevant

Table 114 Total effects HN11

8.2 Appendix B - Questionnaire Quantitative Study

Pos	Variable	Question_EN	Question_DE	Type	Scale EN	Skala DE	Comments	Source
1	AGE	What is your age?	Wie alt sind Sie?	integer value			Years	-
2	SEX	Are you male or female?	Sind Sie männlich oder weiblich?	list	m:f	m:w		-
3	EDU	What is the highest level of school you have completed or the highest degree you have received?	Was ist Ihr höchster erlangter Bildungsabschluss?	list	Less than high school degree;High school degree or equivalent (e.g. GED);Some college but no degree;Associate degree;Bachelor degree;Graduate degree	Ich habe keinen Schulabschluss (Hauptschule, Realschule oder Gymnasium);Schulabschluss (Hauptschule, Realschule oder Gymnasium);Student, aber (noch) nicht abgeschlossen;Abgeschlossene Berufsausbildung;Abgeschlossenes Hochschulstudium (Bachelor);Abgeschlossenes Hochschulstudium (Diplom, Master) oder höher (Promotion etc.)		-
4	COUNTRY_L	In what country do you live?	In welchem Land leben Sie momentan?	list	Germany,India,Other(Specify)	Deutschland,Indien,Anderes Land(bitte angeben)	Germany=1; India =2;	[Po15]
5	COUNTRY_Y	In what country did you spend most of your youth?	In welchem Land haben Sie Ihre Jugend überwiegend verbracht?	list	Germany,India,Other(Specify)	Deutschland,Indien,Anderes Land(bitte angeben)	Germany=1; India =2;	[Po15]
6	EMPLOYED	Which of the following categories best describes your employment status?	Arbeiten Sie momentan in einem Unternehmen/Behörde?	list	Employed, working full-time;Employed, working part-time;Not employed, looking for work;Not employed, NOT looking for work;Retired;Disabled, not able to work	Ja, ich arbeite Vollzeit;Ja, ich arbeite Teilzeit;Nein, ich bin arbeitssuchend;Nein;Rentner;Nicht arbeitsfähig		-
7	C_CAT	Which of the following best describes the principal industry of your organisation?	Welcher Kategorie gehört Ihre Firma an?	list	Manufacturing & Production / Service / Trading & Merchandise / Public / I am currently not employed /Other	Produktion & Fertigung; Dienstleistung; Handel; Öffentlich; Ich habe derzeit keine Beschäftigung; Sonstiges (bitte angeben)		-
8	C_N_EMP	How many employees currently work at the location where you work (please estimate)?	Wie viele Mitarbeiter arbeiten in Ihrem Unternehmen (geschätzt)?	integer value	number			-
9	C_AGE	How long has your company been in business? (years)	Wie lange existiert Ihre Firma bereits? (in Jahren)	list	<5 / 6 - 25 / 26-50 / >50 / >100			-
10	C_DEP	Which of the following best describes your current job function?	In welchem Bereich arbeiten Sie?	list	White collar / Blue collar (see definitions below)	Büroarbeiter / (Fabrik-)Arbeiter / (siehe Definitionen unten)		-

11	C_JOBLEVEL	Which of the following best describes your current job level?	Welche Position besetzen Sie in Ihrem Unternehmen?	list	Owner, Executive, C-Level / Senior Management / Middle Management / Intermediate / Entry Level			-
12	C_TEAMSIZE	How many people work in your team? How many people work in your team? (If you work in multiple teams please estimate your average team size)	Aus wie vielen Mitgliedern besteht ihr Team? (Sollten Sie in mehreren Teams arbeiten nennen Sie bitte die Durchschnittsteamgröße)	integer value	number			-
13	VGAMES	In the past 7 days, roughly how many hours have you spent playing video games (e.g. gaming consoles, mobile phones, computers, etc.)?	Wie viele Stunden haben Sie ungefähr in den letzten 7 Tagen Computerspiele gespielt? (z.B. Spielkonsolen, Smartphone-Spiele, PC-Spiele, etc.)	list	None; 1-3; 4-6; 7-9; 10 or more			[SM15]
14	WE	Imagine your perfect working environment. How much importance do you assign to each individual job characteristic?	Stellen Sie sich Ihr bevorzugtes Arbeitsumfeld vor. Wie wichtig sind Ihnen die folgenden Merkmale?	Likert	Scale: Not important Slightly important Moderately important Important Very important	Skala: Nicht wichtig Etwas wichtig Relativ wichtig Wichtig Sehr wichtig		[SU14]
15	WE_SD	Possibility to influence when and which projects I'm working on	Die Möglichkeit selbst zu bestimmen wann und an welchen Projekten ich arbeite	Likert	1-5		Self-Determination: ADAPTED FROM: Possibility to work on my own projects	[SU14]
16	WE_FUN	Fun	Spaß während der Arbeit	Likert	1-5		Playculture	[Sc15]
17	WE_IF	Instant feedback from coworkers and superiors	Direktes Feedback von Kollegen und Vorgesetzten	Likert	1-5		Direct Feedback	[SU14]
18	WE_COMP	Competition among teams and co-workers	Wettbewerb zwischen Teams und Kollegen	Likert	1-5		Leaderboards	[SU14]
19	WE_IR	Immediate recognition for well-done projects / tasks	Unverzügliche Anerkennung guter Leistungen	Likert	1-5		Points / Level: ADAPTED: Added / tasks	[SU14]
20	WE_OL	Ongoing learning and further training possibilities	Weiterbildungsmöglichkeiten	Likert	1-5		Challenges / Badges	[SU14]
21	WE_RM	Adequate bonus payments for above average performance.	Adäquate Bonuszahlungen für überdurchschnittliche Leistungen	Likert	1-5		Monetary Rewards	-
22	WE_RSI	To spend time with my favorite colleagues outside the office.	In der Freizeit mit meinen Lieblings-Kollegen etwas unternehmen	Likert	1-5		Social Incentives: ADAPTED FROM: I have a best friend at work.	[Ja06]

23	WE_EM	To work on something full of meaning and purpose.	An etwas Sinn- und Bedeutungsvollem arbeiten	Likert	1-5		Epic Meaning: ADAPTED FROM: I find the work that I do full of meaning and purpose. (DE1)	[Sc03]
24	WE_PRIV	Personal privileges at work for above average performance. (Examples: amenities or special access rights)	Persönliche Privilegien für überdurchschnittliche Leistungen (z.B. Zusatzleistungen oder spezielle Zugangsrechte)	Likert	1-5		Privileges	-
25	WE_CT	Clear rules and transparency at my workplace	Klare Regeln und Transparenz an meinem Arbeitsplatz	Likert	1-5		Rules / Transparency	-
26	WE_PP	Promotion prospects	Berufliche Aufstiegschancen	Likert	1-5		Challenges / Badges	[Sc15]
27	WE_KE	Friendly knowledge exchange with co-workers	Kollegialer Wissensaustausch	Likert	1-5		META / ADAPTED FROM: freundschaftlicher Austausch mit Kollegen	[Sc15]
28	WE_TS	Teaching & sharing your knowledge with co-workers	Die Möglichkeit, eigenes Wissen an Kollegen weiterzugeben	Likert	1-5		META	[Sc15]
29	NEED	A) Please sort (drag n' drop) these items with regard to your individual priorities. The items represent needs and values people try to fulfill or follow in their jobs. Order: 1=TOP=most important / 5=BOTTOM=least important	A) Bitte sortieren Sie diese Liste (via drag n' drop) gemäß Ihren eigenen Prioritäten. Jeder Eintrag steht für ein Bedürfnis, das Menschen in Ihrem Arbeitsumfeld erfahren. Reihenfolge: 1 = OBEN = Am Wichtigsten / 5 = UNTEN = Am Unwichtigsten	Order	1-5			-
30	NEED_PUR	Purpose / Goals / Responsibility (e.g. working towards a meaningful goal in a responsible position)	Sinn / Ziele / Verantwortung (z.B. an etwas Bedeutungsvollem mit einem klaren Ziel und eigener Verantwortung zu arbeiten)	Order	1-5			-
31	NEED_SE	Social Exchange / Social Belonging (e.g. co-workers which care about you as a person or friend)	Sozialer-Austausch und Zugehörigkeit (z.B. Kollegen die sich für Sie als Mensch oder Freund interessieren)	Order	1-5			-

32	NEED_IMG	Image / Recognition (e.g. being lauded or receiving positive feedback for good performance)	Image / Anerkennung (z.B. Lob für gute Leistungen erhalten)	Order	1-5			-
33	NEED_INF	Influence / Power (e.g. making your opinion count)	Einfluss / Macht (z.B. Einfluss auf Entscheidungen zu nehmen)	Order	1-5			-
34	NEED_COMP	Competition / Status (e.g. comparing colleagues based on common performance measures)	Wettbewerb / Status (z.B. sich mit Kollegen messen auf Basis von Kennzahlen)	Order	1-5			-
35	C_SAT	How satisfied are you with your company as a place to work?	Wie gefällt Ihnen Ihr Unternehmen als Arbeitgeber?	Likert	Scale: strongly satisfied and strongly dissatisfied.	Sehr zufrieden, Zufrieden, Mittelmäßig, Weniger zufrieden, Gar nicht zufrieden		[SU14]
47	ENG	To what extent do you agree with the following statements?	Inwieweit stimmen Sie den folgenden Aussagen zu?	Likert	SA = Strongly agree; A = Agree; N = Neutral; D = Disagree; SD = Strongly disagree	Stimme voll und ganz zu, Stimme eher zu, Habe dazu keine feste Meinung, Stimme eher nicht zu, Stimme überhaupt nicht zu		[SU14]
48	ENG_TGBQ	I am often so involved in my work that the day goes by very quickly	Ich bin oft so in meine Arbeit vertieft, dass der Arbeitstag sehr schnell vergeht	Likert	1-5			[SU14]
49	ENG_EXC	I get excited about going to work	Ich freue mich auf die Arbeit zu gehen	Likert	1-5			[SU14]
50	ENG_INV	I feel completely involved in my work	Ich gehe voll und ganz in meiner Arbeit auf	Likert	1-5			[SU14]
51	NEED2	B) Please sort (drag n' drop) these items with regard to your individual priorities. The item represents needs and values people try to fulfill or follow in their jobs. Order: 1=TOP=most important / 5=BOTTOM=least important	B) Bitte sortieren Sie diese Liste (via drag n' drop) gemäß Ihren eigenen Prioritäten. Jeder Eintrag steht für ein Bedürfnis, dass Menschen in Ihrem Arbeitsumfeld erfahren. Reihenfolge: 1 = OBEN = Am Wichtigsten / 5 = UNTEN = Am Unwichtigsten	Order	1-5			-
52	NEED2_ACHI	Achievement / Reward (e.g. receive recognition and/or rewards for good performance)	Erfolg und Belohnung (z.B. Anerkennung und/oder Belohnung für gute Leistungen)	Order	1-5			-

53	NEED2_MAS	Mastery / Advancement (e.g. learn & grow)	Besser werden und weiterkommen (z.B. durch Fortbildung)	Order	1-5			-
54	NEED2_SEXP	Self-Expression (e.g. express your thoughts, feelings & intentions)	Selbstaussdruck (z.B. eigene Vorstellungen und Intentionen ausdrücken)	Order	1-5			-
55	NEED2_REL	Relevance / Idealism (e.g. working on something bigger with a huge relevance or idealistic goal)	Relevanz / Idealismus (z.B. An etwas Größeren arbeiten, dass eine hohe Relevanz oder idealistische Zielsetzung hat)	Order	1-5			-
56	NEED2_AUTO	Autonomy / Independence (e.g. make your own decisions / work independently)	Unabhängigkeit (z.B. bei der Arbeit eigene Entscheidungen treffen)	Order	1-5			-
57	SC	Think about colleagues at work - How do you judge the following statements?	Denken Sie an Ihre Arbeitskollegen - Wie bewerten Sie die folgenden Aussagen?	Likert	SA = Strongly agree; A = Agree; N = Neutral; D = Disagree; SD = Strongly disagree	Stimme voll und ganz zu, Stimme eher zu, Habe dazu keine feste Meinung, Stimme eher nicht zu, Stimme überhaupt nicht zu		[Ho13]
58	SC_TR_SHOULD	In general trust and personal ties should exist between co-workers.	Im Allgemeinen sollten Vertrauen und persönliche Bindungen zwischen den Kollegen existieren.	Likert	1-5		ADAPTED FROM: SK2+SK5	[Ho13]
59	SC_AT	My colleagues feel attached to each other.	Meine Kollegen fühlen sich einander verbunden.	Likert	1-5		ADAPTED FROM: SK1	[Ho13]
60	SC_SR	My colleagues create sustainable relationships.	Zwischen meinen Kollegen entstehenden nachhaltige Beziehungen.	Likert	1-5		ADAPTED FROM: SK3	[Ho13]
61	SC_GG	Our team has common goals.	Unser Team hat gemeinsame Ziele.	Likert	1-5		ADAPTED FROM: SK4	[Ho13]
62	SC_IT	My colleagues identify themselves with our team.	Meine Kollegen identifizieren sich mit unserem Team.	Likert	1-5		ADAPTED FROM: SK6	[Ho13]
63	BFI	I am someone who...	Ich	Likert	Strongly disagree Disagree a little Neither agree nor disagree Agree a little Agree strongly	Sehr unzutreffend Eher unzutreffend Weder noch Eher zutreffend Sehr zutreffend		[RA05]
64	BFI_RES_E	Is reserved.	Bin eher zurückhaltend, reserviert.	Likert	1-5			[RA05]
65	BFI_FAULT_A	Tends to find fault with others.	Neige dazu, andere zu kritisieren.	Likert	1-5			[RA05]
66	BFI_TJOB_C	Does a thorough job.	Erledige Aufgaben gründlich.	Likert	1-5			[RA05]

67	BFI_TRUST_A	Is generally trusting.	Schenke anderen leicht Vertrauen, glaube an das Gute im Menschen.	Likert	1-5			[RA05]
68	BFI_LAZY_C	Tends to be lazy.	Bin bequem, neige zur Faulheit.	Likert	1-5			[RA05]
69	BFI_RELX_N	Is relaxed, handles stress well.	Bin entspannt, lasse mich durch Stress nicht aus der Ruhe bringen.	Likert	1-5			[RA05]
70	BFI_IMA_O	Has an active imagination	Habe eine aktive Vorstellungskraft, bin phantasievoll.	Likert	1-5			[RA05]
71	BFI_SOC_E	Is outgoing, sociable.	Gehe aus mir heraus, bin gesellig.	Likert	1-5			[RA05]
72	BFI_NERV_N	Gets nervous easily.	Werde leicht nervös und unsicher.	Likert	1-5			[RA05]
73	BFI_ART_O	Has few artistic interests	Habe nur wenig künstlerisches Interesse	Likert	1-5			[RA05]
74	NEED3	C) Please sort (drag n' drop) these items with regard to your individual priorities. The item represents needs and values people try to fulfill or follow in their jobs. Order: 1=TOP=most important / 5=BOTTOM=least important	C) Bitte sortieren Sie diese Liste (via drag n' drop) gemäß Ihren eigenen Prioritäten. Jeder Eintrag steht für ein Bedürfnis, das Menschen in Ihrem Arbeitsumfeld erfahren. Reihenfolge: 1 = OBEN = Am Wichtigsten / 5 = UNTEN = Am Unwichtigsten	Order	1-5		ADAPTED	[SU14]
75	NEED3_ACHI	Achievement of goals	Ziele zu erreichen	Order	1-5		ADAPTED	[SU14]
76	NEED3_STRUC	Structure and guidance	Klare Struktur und Führung	Order	1-5		ADAPTED	[SU14]
77	NEED3_FREED	Freedom to explore	Die Freiheit erkunden zu können	Order	1-5		ADAPTED	[SU14]
78	NEED3_CONTR	Control of others	Hierarchische Personalverantwortung	Order	1-5		ADAPTED	[SU14]
79	NEED3_SE	Connect with others	Partizipative Zusammenarbeit	Order	1-5		ADAPTED	[SU14]
80	KM	Knowledge Management - How do you judge the following statements?	Wissensmanagement - Inwieweit stimmen Sie den folgenden Aussagen zu?	Likert	SA = Strongly agree; A = Agree; N =Neutral; D = Disagree; SD = Strongly disagree	Stimme voll und ganz zu, Stimme eher zu, Habe dazu keine feste Meinung, Stimme eher nicht zu, Stimme überhaupt nicht zu		

81	KM_LOWA	Knowledge exchange with colleagues is an important driver for my working efficiency.	Wissensaustausch mit Kollegen ist ein wichtiger Faktor für meine Arbeitseffizienz.	Likert	1-5		Low awareness of value	-
82	KM_LOCOM	There are many knowledge fairs/exchanges within my organisation to spawn new colleague to colleague.	Es gibt genügend innerbetriebliche Veranstaltungen zum Wissensaustausch von Kollegen zu Kollegen.	Likert	1-5		Lack of communication	[SSS14]
83	KM_COCUL	Our company encourages a culture of knowledge sharing (i.e. rewarding employees who have new knowledge, ideas, and/or suggestions).	Unsere Firma fördert eine Kultur des Wissensaustausches.	Likert	1-5		Corporate culture	[HHH14]
84	KM_LOENC	Our company actively encourages the growth of networks among employees.	Unsere Firma fördert aktiv die Entstehung von Netzwerken zwischen Mitarbeitern.	Likert	1-5		Lack of encouragement	[SSS14]
85	KM_LOTIME	During my work I have enough time to take care of knowledge exchange and learning.	Während meiner Arbeit habe ich genug Zeit zum Wissensaustausch und zum Lernen.	Likert	1-5		Lack of time / resources	-
86	KM_LOMS	Management encourages knowledge exchange within the organisation.	Das Management fördert den Wissensaustausch im Unternehmen.	Likert	1-5		Lack of management support	-
87	KM_LOIS	Our corporate information systems facilitate information and knowledge sharing sufficiently.	Computeranwendungen im Unternehmen unterstützen den Informations- und Wissensaustausch hinreichend.	Likert	1-5		ADAPTED / Lack of appropriate infrastructure	[HHH14]
88	KM_LOT	A climate of openness and trust permeates the organisation.	Das Klima im Unternehmen ist geprägt von Offenheit und Vertrauen.	Likert	1-5		Lack of trust	[SSS14]
89	KM_LOP	There are clearly defined processes and rules, which specify how knowledge must be managed.	In unserer Firma gibt es klare Prozesse, die den Umgang mit und Austausch von Wissen regeln.	Likert	1-5		Lack of KM processes / goals	[SSS14]
90	KM_DCO	Collaboration with colleagues from other cultures is often more difficult (e.g. misunderstandings).	Zusammenarbeit mit Kollegen aus anderen Kulturkreisen ist oft schwieriger (z.B. aufgrund von	Likert	1-5		Different values & beliefs (culture)	-

			Missverständnissen).					
91	KM_S_P2P	A high proportion of our internal knowledge sharing is achieved through direct people-to-people contact.	Ein großer Teil unseres firmen-internen Wissenstransfers findet direkt von Kollege zu Kollege statt.	Likert	1-5		GENERAL	[SSS14]
92	KM_S_DOC	A high proportion of our internal knowledge sharing is achieved through documents and databases.	Ein großer Teil unseres firmen-internen Wissenstransfers findet über Dokumente und Datenbanken statt.	Likert	1-5		GENERAL	[SSS14]
93	KM_LOIIS	The organisation has a range of well-organized and integrated techniques for transferring knowledge, meetings, e-mail, bulletin boards, on-line forums and databases.	Die in unserem Unternehmen verwendeten Applikation zum Wissensaustausch sind gut organisiert und in die Prozesse integriert. (z.B. Protokolle, Mails, Datenbanken, Foren)	Likert	1-5		Lack of integration of IS	[SSS14]
94	KM_SAT_CO	Members of our company are satisfied with the degree of mutual cooperation.	Die Mitarbeiter unseres Unternehmens sind zufrieden mit der kollegialen Zusammenarbeit.	Likert	1-5		GENERAL	[HHH14]
95	GA_EXP	Are you familiar with the concept of "Gamification"?	Sind sie mit dem Konzept "Gamification" vertraut?	List	No, I don't know gamification / I'm not sure / Yes, I do know gamification	Nein, ich kenne Gamification nicht. / Ich bin mir nicht sicher. / Ja, ich kenne Gamification		[Sc15]
96	GA_EXP_TXT	Gamification explained: Gamification primarily refers to a process of making systems, services and activities more enjoyable and motivating. Gamification commonly employs game design elements which are used in so called non-game contexts in attempts to improve user engagement, organizational productivity, flow, learning, [...] among others. Gamification techniques strive to leverage people's natural desires for socializing, learning, mastery, com-	Als Gamification oder Spielifizierung bezeichnet man die Anwendung spieltypischer Elemente und Prozesse in spielfremdem Kontext. Zu diesen spieltypischen Elementen gehören unter anderem Punkte, Highscores, Fortschrittsbalken, Ranglisten oder Auszeichnungen.	TEXT				Wikipedia

		petition, achievement, status, self-expression, altruism, or closure. Early gamification strategies use rewards for players who accomplish desired tasks or competition to engage players. Types of rewards include points, achievement badges or levels [...] (Wikipedia 2016)						
98	GA_USE	Does your company currently use gamification elements at your workplace?	Nutzen Sie an Ihrem Arbeitsplatz derzeit Gamification Elemente?	list	Scale: yes / no / don't know (goto ...)	Skala: Ja / Nein / Keine Antwort		[SU14]
99	GA_ELE	Which gamification elements are applied within your organisation?	Welche dieser Gamification Elemente nutzen Sie an Ihrem Arbeitsplatz?	list			ADAPTED FROM: Die Einführung (ggf. Erweiterung) welcher Elemente der Gamification könnten Sie sich für Ihre Organisation vorstellen?	[Sc15]
100	GA_ELE_PO	Points / levels	Punkte/Level					
101	GA_ELE_CH	Challenges / badges	Herausforderungen / Abzeichen					
102	GA_ELE_LB	Leaderboards	Ranglisten					
103	GA_ELE_MR	Monetary rewards	Bonuszahlungen als Belohnung					
104	GA_ELE_SI	Social Incentives as reward	Soziale Anreize als Belohnung					
105	GA_ELE_AUTO	Autonomy / Independence as reward	Selbstbestimmung als Belohnung					
106	GA_ELE_PRIV	Privileges	Privilegien als Belohnung					
107	GA_ELE_DFB	Direct feedback	Direktes Feedback					
108	GA_ELE_FT	Fantasy themes	Fantasie Themen					
109	GA_ELE_TR	Transparent rules for gamification system	Transparente Regeln für Gamification Systeme					
110	GA_ELE_NONE	None	Keine					
111	GA_ELE_OTHER	Other (please specify)	Sonstige					
112	GA_USEF	Do you think the applied gamification methods are useful to achieve what is expected of you at work?	Finden Sie die verwendeten Gamification Elemente hilfreich, um bei der Arbeit das zu erreichen,	list	Scale: yes / no / partly / don't know (goto ...)	Skala: Ja / Nein / Teilweise / Keine Antwort	ADDED: partly / +Plural	[SU14]

			was von Ihnen erwartet wird?					
113	GA_INTR	How does gamification at work affect your intrinsic motivation? (explanation see above)	Wie wirkt sich Gamification auf Ihre intrinsische Motivation aus? (Begriffserklärung siehe oben)	list	There is a positive effect./ There is a negative effect. / There is no effect.	Es gibt einen positiven Effekt / Es gibt einen negativen Effekt / Es gibt keinen Effekt		-
114	GA_INTR_POS	Positive	Es gibt einen positiven Effekt.					-
115	GA_INTR_NEG	Negative	Es gibt einen negativen Effekt.					-
116	GA_INTR_NONE	No effect	Es gibt keinen Effekt.					-
117	GA_INTR_OTHER	Other (please specify)	Sonstiges					-
118	GA_EXTR	How does gamification at work affect your extrinsic motivation? (explanation see above)	Wie wirkt sich Gamification auf Ihre extrinsische Motivation aus? (Begriffserklärung siehe oben)	list	There is a positive effect./ There is a negative effect. / There is no effect.	Es gibt einen positiven Effekt / Es gibt einen negativen Effekt / Es gibt keinen Effekt		-
119	GA_EXTR_POS	Positive	Es gibt einen positiven Effekt.					-
120	GA_EXTR_NEG	Negative	Es gibt einen negativen Effekt.					-
121	GA_EXTR_NONE	No effect	Es gibt keinen Effekt.					-
122	GA_EXTR_OTHER	Other (please specify)	Sonstiges					-
123	GA_VOL	Is gamification at your workplace voluntary?	Ist die Nutzung von Gamification an Ihrem Arbeitsplatz freiwillig?	list	Yes, I can choose whether I want to use gamification. / No, gamification is mandatory.	Ja, ich kann wählen, ob ich Gamification nutzen möchte.;Nein, Gamification ist verpflichtend.		-
124	GA_DS1	DOWNSIDE 1	NACHTEIL 1	Likert	1-5			-
125	GA_DS2	DOWNSIDE 2	NACHTEIL 2	Likert	1-5			-
126	GA_DS3	DOWNSIDE 3	NACHTEIL 3	Likert	1-5			-
127	GA_DS4	DOWNSIDE 4	NACHTEIL 4	Likert	1-5			-
128	GA_DS5	DOWNSIDE 5	NACHTEIL 5	Likert	1-5			-
129	GA_DSTOTAL	Overall the advantages of gamification outweigh the disadvantages (downsides) of gamification.	Insgesamt betrachtet überwiegen die Vorteile von Gamification die Nachteile.	Likert	SA = Strongly agree; A = Agree; N =Neutral; D = Disagree; SD = Strongly disagree	Stimme voll und ganz zu, Stimme eher zu, Habe dazu keine feste Meinung, Stimme eher nicht zu, Stimme überhaupt nicht zu		-
130	GE	To which extent would you agree if the following game elements would be introduced to your workplace?	In welchem Ausmaß würden Sie zustimmen, wenn die folgenden	Likert	Not at all suitable; Fairly suitable;Neutral; Very Suitable; Extremely suitable; I don't care	Lehne vollständig ab; lehne ab; Teils-teils; Stimme zu; Stimme vollständig zu; (Ist mir egal)		-

			Spielemente an Ihrem Arbeitsplatz eingeführt würden?					
131	GE_P1	You are able to collect points during work (e.g. constructive contributions in meetings)	Sie können bei der Arbeit Punkte sammeln (z.B. für konstruktive Beiträge im Meeting).	Points	Point systems reward users for completing actions, whereby a numeric value is added to their overall point total (Burke and Hiltbrand, 2011).		Point system	[Bu10]
132	GE_P2	Points for the employees will be received by completion of single or multiple desired activities.	Punkte erhalten Angestellte bei der Vollendung von einzelnen oder mehreren erwünschten Aktivitäten.	Points				[Bu10]
133	GE_P3C	Achieved points will be visible for some colleagues to allow comparisons among themselves.	Die erreichten Punkte sind für manche Kollegen sichtbar und erlauben den Vergleich untereinander.	Points				[Bu10]
134	GE_L1	You are able to continuously reach higher levels. Level up's can be achieved by continuous positive outcomes which match targeted goals.	Sie können auf der Arbeit immer höhere Stufen (Level) erreichen. Die Stufe erhöht sich durch kontinuierliche Arbeitserfolge, die den gesetzten Zielen entsprechen.	Levels	"Levels indicate the proficiency of the player in the overall gaming experience over time [...]" .		User levels	[Gn12]
135	GE_L2	Over time, the level of an employee represents his work experience and his professional success.	Im Verlaufe der Zeit symbolisiert die Stufe (Level) eines Angestellten seine Arbeitserfahrung und seinen Berufserfolg.	Levels				[Gn12]
136	GE_L3C	Reached levels will be visible for some colleagues to allow comparisons among themselves.	Die erreichten Stufen (Level) sind für manche Kollegen sichtbar und erlauben den Vergleich untereinander.	Levels				[Gn12]
137	GE_B1	You are able to attain achievements (badges) in terms of graphics or expressions (e.g. "5-Star Troubleshooter") for the completion of goals.	Sie können Abzeichen (Badges) in Form von Grafiken oder Worten (z.B. "5-Sterne Problemlöser") für die Erreichung von Zielen erhalten.	Badges	A reward for completing a clear and desirable goal .		Achievement	[Li11]

138	GE_B2	Badges are primarily being awarded for voluntary goals, which are achieved beyond the employee's main activity.	Abzeichen (Badges) werden vor allem für freiwillige Ziele verliehen, die außerhalb der Hauptaktivität des Angestellten erreicht werden.	Badges				[Li11]
139	GE_B3C	Badges represent the performed accomplishments which are visible for colleagues.	Abzeichen (Badges) repräsentieren die erbrachten Leistungen und sind für Kollegen sichtbar.	Badges	"Badges consist of optional rewards and goals whose fulfilment is stored outside the scope of the core activities of a service" .		Badges	[Ha13]
140	GE_C1	Your tasks will be presented as challenges, which you have to cope with (e.g. Finish 10 tasks within the next 8 hours)	Ihre Arbeitsaufgaben werden als Herausforderungen formuliert, die Sie bewältigen müssen. (z.B. Erledigen Sie 10 Aufgaben innerhalb der nächsten 8 Stunden)	Challenges / Goals	Goals of the underlying activity should be adapted as challenges for the user .		Goals	[Pa11]
141	GE_C2	The challenges for an employee are rated by difficulty, so that the employee is always engaged to his highest abilities and therefore continuously improves.	Die Herausforderungen eines Angestellten sind nach ihrer Schwierigkeit abgestuft, so dass der Angestellte stets seinen Fähigkeiten entsprechend gefordert wird und sich seine Fähigkeiten kontinuierlich verbessern.	Challenges / Goals	"A game helps players to continuously increase their skills by progressive disclosure of both knowledge and challenge [...]. This will help ensure that the challenges in the game match the player's skill levels [...]" .		Progressive disclosure	[Li11]
142	GE_C3	Certain tasks need to be handled under time pressure by the employees. This can be accomplished by countdowns for instance.	Bestimmte Aufgaben muss der Angestellte unter Zeitdruck bewältigen. Dies kann beispielsweise durch Countdowns dargestellt werden.	Challenges / Goals	Creating time pressure on activities, e.g. through counters or hour-glasses .		Time pressure	[Li11]
143	GE_S1	By achieving objectives, you receive status symbols such as an own office or a better parking option.	Bei Zielerreichung erhalten Sie Statussymbole, wie zum Beispiel ein eigenes Büro oder einen besseren Parkplatz.	Status	"Most humans have a need for status, recognition, fame, prestige, attention and, ultimately, the esteem and respect of others" (Bunchball, Inc, 2010, p. 10). "[...] Status can be earned by the user in isolation, by performing certain actions" .		Status	[Bu10]

144	GE_S2	For desired activities employees are rewarded with privileges, such as the participation in exclusive events or access to exclusive areas.	Für erwünschte Aktivitäten werden Angestellte mit Privilegien belohnt, wie zum Beispiel die Teilnahme an exklusiven Veranstaltungen oder der Zutritt zu exklusiven Bereichen.	Status					[Bu10]
145	GE_S3	For desired activities employees are assigned to managerial functions, which scale them up in the corporate hierarchy.	Für erwünschte Aktivitäten bekommen Angestellte Führungsaufgaben, die sie in der Firmenhierarchie heraufsetzen.	Status					[Bu10]
146	GE_RL1	Leaderboards compare colleagues concerning their performance (e.g. "Top 5 Employee of the month").	Ranglisten vergleichen Angestellte nach ihren Leistungen. (z.B. "Top 5 Mitarbeiter des Monats")	Leaderboards					[Bu10]
147	GE_RL2	Leaderboards show your ranking compared to other colleagues without the visibility of the names.	Ranglisten zeigen Ihre Position im Vergleich zu anderen Kollegen, ohne dass die Namen der Kollegen sichtbar sind.	Leaderboards	"[...] Leaderboards are used to track and display desired actions, using competition to drive valuable behaviour" .		Leaderboards		[Bu10]
148	GE_RL3C	Leaderboards show your ranking compared to other colleagues - Each name on the leaderboard will be visible.	Ranglisten zeigen Ihre Position im Vergleich zu anderen Kollegen - Alle Namen auf der Rangliste sind für Kollegen sichtbar.	Leaderboards					[Bu10]
149	GE_AUT1	You can spend parts of your time organizing the activities after personal preferences (for example to develop own ideas).	Sie können einen Teil Ihrer Arbeitszeit damit verbringen, ihre Tätigkeiten frei zu gestalten, um zum Beispiel eigene Ideen zu verwirklichen.	Autonomy					[Bu10]
150	GE_AUT2	For desired activities employees are rewarded with liberties such as freedom of choice regarding the content of work.	Für erwünschte Aktivitäten werden Angestellte mit Freiheiten belohnt, wie zum Beispiel die freie Wahl von Arbeitsinhalten.	Autonomy	Self-expression results from having a desire to express autonomy, identity or originality, or to mark one's personality as unique .		Self-expression		[Bu10]

151	GE_AUT3	For desired tasks employees get a greater amount of self-determination (e.g. extra vacation or flexible working hours).	Für erwünschte Aktivitäten erhalten Angestellte ein größeres Maß an Selbstbestimmung. (z.B. extra Urlaub oder flexiblere Arbeitszeiten)	Autonomy				[Bu10]
152	GE_MR1	For desired activities you are rewarded with corporate goods. For instance, you are able to get a company vehicle or a better smartphone.	Für erwünschte Aktivitäten werden Sie mit Firmengütern belohnt. Sie erhalten zum Beispiel ein Firmenwagen oder ein besseres Smartphone.	Material Rewards	The ownership dynamic represents a positive, sustained connection to an entity that leads to a feeling of shared ownership .		Ownership	[Bu11]
153	GE_MR2	For desired activities employees are rewarded with bonus payments.	Für erwünschte Aktivitäten erhalten Angestellte Bonuszahlungen als Belohnung.	Material Rewards	Bonuses are rewarded for having completed a series of challenges or core functions .		Bonus	[Bu11]
154	GE_MR3C	Bonus payments will be visible for some colleagues.	Bonuszahlungen sind für einige Kollegen sichtbar.	Material Rewards				[Bu11]
155	GE_SII	You receive social appeals as a reward (e.g. excursions with chosen colleagues to special places)	Sie erhalten soziale Anreize als Belohnung (z.B. Freizeitausflüge mit ausgewählten Kollegen zu besonderen Orten)	Social Incentives	Describes an effect where individual users achieve better results at simple tasks in the presence of other people or when working in groups .		Social facilitation	[ZA65]
156	GE_SI2	Some work activities are organized in a way that they can only be accomplished by cooperating with each other.	Einige Arbeitsaktivitäten sind so organisiert, dass sie von Angestellten nur in Zusammenarbeit mit Ihren Kollegen erledigt werden können.	Social Incentives	The community collaboration game dynamic rallies an entire community to work together to solve a riddle, resolve a problem, or overcome a challenge” Burke and Hiltbrand, 2011, p. 13). Reputation 4 Reputation is based on the opinion of other users about the user or her contribution” (Vassileva, 2012, p. 4183).		Collaboration	[Va12]
157	GE_SI3C	Some work activities are of competitive nature, so that employees compete with their colleagues.	Einige Arbeitsaktivitäten sind wettbewerbsorientiert organisiert, sodass Angestellte sie in Konkurrenz mit Ihren Kollegen erledigen.	Social Incentives	Competitions enable users to challenge each other .		Competition	[Bu10]
158	GE_FB1	The working environment features sound effects and background music.	Die Arbeitsumgebung ist mit Soundeffekten	Feedback	Implementing sound effects and / or background music .		Audible feedback	[Li11]

		These give the employee a feedback for his operational principles.	und Hintergrundmusik untermalt. Diese geben dem Mitarbeiter ein Feedback für seine Arbeitsweise.					
159	GE_FB2	After certain work packages you receive direct feedback (e.g. from principles or colleagues) which rates your behavior positively or negatively.	Sie erhalten nach bestimmten Arbeitspaketen ein direktes Feedback (z.B. von Ihren Vorgesetzten oder Ihren Kollegen), welches Ihr Verhalten positiv oder negativ bewertet.	Feedback	Immediate feedback is used to keep the player aware of his progress or failures in realtime.		Feedback	[Pa11]
160	GE_FB3C	Received feedback will be documented and kept visible for colleagues.	Gegebenes Feedback wird dokumentiert und kann von Kollegen gegenseitig eingesehen werden.	Feedback				[Pa11]
161	GE_PC1	Work activities are organized in the context of fantasy stories that are interesting or exciting for you.	Arbeitsaktivitäten werden im Rahmen von Phantasiegeschichten organisiert, die für Sie interessant oder spannend sind.	Playculture	Fantasy evokes images of objects or situations that aren't actually present. This can make the experience more emotionally appealing to users” .		Fantasy	[Li11]
162	GE_PC2	Work activities are organized in the form of topical stories that have relevance for the employee or consider the circumstances of his life.	Arbeitsaktivitäten werden im Rahmen von thematischen Geschichten organisiert, die eine Bedeutung für den Angestellten haben oder seine Lebensumstände berücksichtigen.	Playculture	“[...] For meaningful gamification, it is important to take into consideration the background that the user brings to the activity and the organizational context into which the specific activity is placed. [...] The game elements need to come out of aspects of the underlying activity that are meaningful to the user” .		Meaning	[Ni12]
163	GE_PC3C	The goals of the work activities are complemented by virtual objectives which have to be achieved by the employees to make progress in a fantasy story. The progress in the fantasy story will be visible for colleagues.	Die Ziele der Arbeitsaktivitäten werden durch virtuelle Ziele ergänzt, die der Angestellte erreichen muss, um in einer Phantasiegeschichte Fortschritt zu machen. Der Fortschritt in der Phantasiegeschichte ist für	Playculture				[Ni12]

			Kollegen nachvollziehbar.					
164	GE_VC1	You take the role of a virtual character (e.g. your favorite character which you virtually and temporarily play during work).	Sie schlüpfen in die Rolle eines virtuellen Charakters. (z.B. Ihrer Lieblingsfigur und spielen diesen virtuell zeitweise auf der Arbeit)	Virtual Character	A virtual character (i.e. an avatar) represents the employee .		Virtual character	[Pa11]
165	GE_VC2	Cooperative work activities are carried out by multiple workers, who participate with their virtual character in a roleplaying game.	Kooperative Arbeitsaktivitäten werden von mehreren Angestellten erledigt, die jeweils mit ihrem virtuellen Charakter an einem Rollenspiel teilnehmen.	Virtual Character				[Pa11]
166	GE_VC3C	Your virtual character competes with other characters. Within the roleplaying you compete with your colleagues.	Ihr virtueller Charakter steht im Wettbewerb zu anderen Charakteren. Innerhalb des Rollenspiels konkurrieren Sie mit ihren Kollegen.	Virtual Character				[Pa11]
167	GE_US1	The communication within your company is supported by highly user-friendly software.	Die Kommunikation in Ihrem Unternehmen läuft über besonders benutzerfreundliche Software.	Usability	“This includes an attractive user interface with stimulating visuals and exciting interaction concepts, as well as a high degree of usability” .		Interaction concepts	[Gn12]
168	GE_US2	Communication software contains appealing graphical user interfaces.	Kommunikations-Software enthält ansprechende grafische Benutzeroberflächen.	Usability				[Gn12]
169	GE_US3	The communication for the company's employees is supported by software which is characterized by exciting interaction concepts.	Angestellte werden bei der Kommunikation im Unternehmen durch Software unterstützt, die sich durch spannende Interaktionskonzepte auszeichnet.	Usability				[Gn12]
170	GE_TR	Transparent rules for gamification system (e.g. clear transparency on which actions will lead to which consequences/outcomes, thereby reducing	Transparente Regeln für Gamification Systeme (z.B. Mehr Transparenz welche Handlungen im Unternehmen zu welchen	Transparency				[Sc15]

		subjectivity in judgements)	Konsequenzen/Ergebnissen führen und somit subjektive Bewertungen verringern)					
171	GA_WP	Gamification - How do you judge the following statements?	Gamification - Inwieweit stimmen Sie den folgenden Aussagen zu?	Likert	(SA = Strongly agree; A = Agree; N =Neutral; D = Disagree; SD = Strongly disagree)			-
172	GA_WP_NC	I would like to work with gamification in the future.	Ich könnte mir für die Zukunft vorstellen, ein System zu nutzen, das den Ansatz von Gamification verfolgt.	Likert	1-5			[HK13]
173	GA_WP_C	I would recommend gamification to my friends.	I würde Gamification meinen Freunden empfehlen.	Likert	1-5			[HK13]

8.3 Appendix C - Respondi AG ESOMAR Surveying Quality Standards

Respondi AG – Huhnsgrasse 34b – 50676 Cologne Germany – www.respondi.com

Quality remarks / Qualitätsrichtlinien: Das respondi Online Panel ist ein reines Marktforschungspanel und wird für keine anderen Zwecke genutzt. Die Mitgliedschaft und Teilnahme ist freiwillig und folgt einem Double-Opt-in-Registrierungsprozess. Das Panel wird zentral von einem professionellen Panelteam aktiv verwaltet. In einem aufwändigen Scoring- und Kontrollverfahren wird das Panel einem permanenten Qualitätscontrolling unterzogen. In unseren Rekrutierungsverfahren über eigene Meinungsportale stehen intrinsische Motivationen im Vordergrund. Somit wird einer Verzerrung der Stichprobe hinsichtlich einer Professionalisierung der Teilnehmer entgegengewirkt. Zu jedem Mitglied liegen umfangreiche Informationen zur Soziodemographie, Internetnutzung, Interessen, Konsumverhalten, Gesundheit, Mediennutzung, Investitionen und Mobilität als Selektionskriterien vor. Gemäß den deutschen Datenschutzregeln werden persönliche Daten und Umfragedaten voneinander getrennt abgespeichert.

UNSERE ANTWORTEN AUF DIE 28 ESOMAR-FRAGEN ZUR BESTIMMUNG DER QUALITÄT VON ONLINE SAMPLES UND ONLINE PANELS (as of December 2018)

UNTERNEHMENSPROFIL

1. What experience does your company have in providing online samples for market research? Context: This answer might help you to form an opinion about the relevant experience of the sample provider. How long has the sample provider been providing this service and do they have for example a market research, direct marketing or more technological background? Are the samples solely provided for third party research, or does the company also conduct proprietary work using their panels? Die respondi AG führt seit ihrer Gründung in 2005 jährlich über 1.000 Online-Studien über ihr eigenes Online-Access-Panel durch. Zu unseren Kunden zählen nationale und internationale Marktforschungsinstitute, Agenturen, Unternehmen und Forschungseinrichtungen. Die Stichproben in diesen Projekten reichen von sehr speziellen Zielgruppen mit Fallzahlen ab 10 Teilnehmern für qualitative Studien bis hin zu großen quantitativen Tracking-Studien mit mehr als 25.000 Teilnehmern. Unsere Erhebungsmethoden und Befragungstechniken entwickeln wir in Kooperation mit der Abteilung Survey Design and Methodology des deutschen Leibniz-Instituts für Sozialwissenschaften (gesis) kontinuierlich weiter. Durch diese Erfahrung sind wir in der Lage, unsere Kunden kompetent und auf der Höhe der Zeit zum Einsatz von Online-Stichproben zu beraten.

STICHPROBENQUELLEN UND REKRUTIERUNG

2. Please describe and explain the type(s) of online sample sources from which you get respondents. Are these databases? Actively managed research panels? Direct marketing lists? Social networks? Web intercept (also known as river) samples? Context: The description of the types of sources a provider uses for delivering an online sample will provide insight into the quality of the sample. Die respondi AG unterhält aktuell eigene, aktiv gepflegte Online-Access-Panels in zehn europäischen Ländern. Technische Grundlage ist eine leistungsfähige Softwarelösung, mit der wir unsere Panels managen. Durch eine einzigartige Kombination aus verschiedenen Online- und Offline-Rekrutierungsmethoden bilden wir Stichproben in unseren Panels ab. Die Mitglieder dieser Panels werben wir durch eigene Kampagnen an.

3. If you provide samples from more than one source: How are the different sample sources blended together to ensure validity? How can this be replicated over time to provide reliability? How do you deal

with the possibility of duplication of respondents across sources? Context: The variation in data coming from different sources has been well documented. Overlap between different panel providers can be significant in some cases and de-duplication removes this source of error, and frustration for respondents. In 84% aller Befragungen stammen die Teilnehmer aus eigenen Online-Access-Panels, in denen wir kontinuierlich die Qualität und Identität der Teilnehmer überprüfen. In Fällen, in denen wir nicht auf eigene Quellen zugreifen, arbeiten wir nur mit ausgewählten marktforschungsnahen Anbietern zusammen, die über eigene Panels verfügen und ihren Teilnehmern keine Survey-after-survey Optionen anbieten. Um Dubletten zwischen eigener und fremder Quelle zu unterbinden, arbeiten wir mit der externen Software relevant-ID. Dieser digitale Fingerabdruck verhindert eine Mehrfachteilnahme gleicher Personen. Darüber hinaus achten wir darauf, dass in jeder Stichprobe die Quellen gleichverteilt nach sozio- und psychografischen Merkmalen eingesetzt werden.

4. Are your sample source(s) used solely for market research? If not, what other purposes are they used for? Context: Combining respondents from sources set up primarily for different purposes (like direct marketing for example) may cause undesirable survey effects. Die Stichproben bei respondi werden ausschließlich für Markt- und Sozialforschungszwecke verwendet.

5. How do you source groups that may be hard to reach on the internet? Context: Ensuring the inclusion of hard-to-reach groups on the internet (like ethnic minority groups, young people, seniors etc.) may increase population coverage and improve the quality of the sample provided. Um die Reichweite der respondi-Panels möglichst groß zu gestalten, setzt respondi auf eine Vielzahl von Rekrutierungsquellen: eigene Meinungsportale, Online-Kampagnen, Kooperationen, Suchmaschinenmarketing und Offline-Rekrutierung über Partnerinstitute aus der Marktforschung. Über diese vielfältigen Quellen können wir die unterschiedlichsten Zielgruppen ansprechen und rekrutieren.

6. If, on a particular project, you need to supplement your sample(s) with sample(s) from other providers, how do you select those partners? Is it your policy to notify a client in advance when using a third party provider? Context: Many providers work with third parties. This means that the quality of the sample is also dependent on the quality of sample providers that the buyer did not select. Transparency is essential in this situation. Overlap between different providers can be significant in some cases and deduplication removes this source of error, and frustration for respondents. Providers who observe process standards like the ISO standards are required to give you this information. In aktuell 16 Prozent aller Stichproben greift respondi auf fremde Quellen zu. Dies gilt insbesondere für Länder, in denen respondi keine eigenen Panels betreibt. Greifen wir auf das Angebot anderer Quellen zurück, wird der Kunde stets vorab informiert. Bevorzugt arbeiten wir mit nationalen Panel-Anbietern. Diese Partner werden von uns auf Qualität und Zuverlässigkeit überprüft und ausgewählt. Um die Antwortqualität bei Multi-Panel-Befragungen gleichbleibend hoch zu halten, gleichen wir die Panelisten-Identitäten anonymisiert ab, um eine Überschneidung der Stichproben zu vermeiden.

SAMPLING UND PROJEKTMANAGEMENT

7. What steps do you take to achieve a representative sample of the target population? Context: The sampling processes (i.e. how individuals are selected or allocated from the sample sources) used are the main factor in sample provision. A systematic approach based on market research fundamentals may increase sample quality. Basierend auf soziodemografischen Informationen wird eine zufällige Stichprobe aus der Grundgesamtheit des Online-Access-Panels gezogen. Mithilfe von Gruppenfiltern bilden

wir hierzu Gruppen bzw. Subpanels. Filterkriterien können beispielsweise Stammdaten, Performanz Kriterien, Felddaten und Projektdaten sein. Die so definierte Gruppe kann bereits als Stichprobe für das Projekt genutzt werden. Im weiteren Verlauf der Stichprobenziehung nutzen wir ein Schichtungs- bzw. Quotenmodul. Hier können exakte Quoten überbeliebig viele Stammdatenkriterien nach absoluten oder relativen Werten gesetzt werden. Zum Versand der Einladungen können wir Zeitzonen, Regionen etc. definieren. Eine Statistik zur Panel-Belegung ermöglicht uns eine Übersicht der Teilnehmer über die Anzahl der Stichprobenmitgliedschaften.

8. *Do you employ a survey router? Context: A survey router is a software system that allocates willing respondents to surveys for which they are likely to qualify. Respondents will have been directed to the router for different reasons, perhaps after not qualifying for another survey in which they had been directly invited to participate, or maybe as a result of a general invitation from the router itself. There is no consensus at present about whether and how the use of a router affects the responses that individuals give to survey questions.* Die respondi AG arbeitet aktuell ohne Routing-Software.

9. *If you use a router: Please describe the allocation process within your router. How do you decide which surveys might be considered for a respondent? On what priority basis are respondents allocated to surveys? Context: Biases of varying severity may arise from the prioritisation in choices of surveys to present to respondents and the method of allocation.* Die respondi AG arbeitet aktuell ohne Routing-Software.

10. *If you use a router: What measures do you take to guard against, or mitigate, any bias arising from employing a router? How do you measure and report any bias? Context: If Person A is allocated to Survey X on the basis of some characteristic then they may not be allowed to also do Survey Y. The sample for Survey Y is potentially biased by the absence of people like Person A.* Die respondi AG arbeitet aktuell ohne Routing-Software.

11. *If you use a router: Who in your company sets the parameters of the router? Is it a dedicated team or individual project managers? Context: It may be necessary to try to replicate your project in the future with as many of the parameters as possible set to the same values. How difficult or easy will this be?* Die respondi AG arbeitet aktuell ohne Routing-Software.

12. *What profiling data is held on respondents? How is it done? How does this differ across sample sources? How is it kept up-to-date? If no relevant profiling data is held, how are low incidence projects dealt with? Context: The usefulness to your project of pre-profiled information will depend on the precise question asked and may also depend on when it was asked. If real time profiling is used, what control do you have over what question is actually asked?* Bereits in der Stammdatenbefragung, die bei der Registrierung verpflichtend durchgeführt wird, werden ca. 100 Basisinformationen zu jedem Mitglied erhoben. Bis zu weitere 600 Profildaten liegen über jedes Panelmitglied vor. Darüber hinaus werden sowohl der Eintrittsweg des Teilnehmers, als auch alle Daten aktueller und vergangener Projekte gespeichert. Die Stammdaten werden mindestens alle 12 Monate aktualisiert und laufend erweitert.

13. *Please describe your survey invitation process. What is the proposition that people are offered to take part in individual surveys? What information about the project itself is given in the process? Apart from direct invitations to specific surveys (or to a router), what other means of invitation to surveys are respondents exposed to? You should note that not all invitations to participate take the form of emails. Context: The type of proposition (and associated rewards) could influence the type of people who agree to take part in specific projects and can therefore influence sample quality. The level of detail given about*

the project may also influence response. Wir gestalten den Rekrutierungsprozess transparent und fair. Jeder neue Teilnehmer wird im Vorfeld detailliert über die Regeln der Teilnahme informiert. Die Teilnahme bei respondi ist freiwillig und kann zu jedem beliebigen Zeitpunkt von beiden Seiten beendet werden. Alle persönlichen Daten des jeweiligen Teilnehmers werden beim Austritt aus dem Panel umgehend gelöscht. Die Panel-Mitglieder werden per E-Mail zur Teilnahme an den jeweiligen Befragungen eingeladen. Dabei werden sie über die voraussichtliche Dauer der Befragung, den Teilnahmezeitraum und die Belohnung unterrichtet. Jeder Teilnehmer darf sich nur einmal für das Panel registrieren. Einige Befragungen wenden sich nur an Panel-Teilnehmer mit bestimmten Merkmalen, wie Autofahrer, Schüler oder Berufstätige. Dafür werden die Teilnehmer themenspezifisch ausgewählt. Das bedeutet, dass nicht alle Mitglieder bei allen Befragungen mitmachen können und deshalb auch generell kein Anspruch auf die Teilnahme an bestimmten Projekten besteht. Alle Mitglieder werden für die Teilnahme bei respondi belohnt. Sie erhalten für ihre Antworten Bonuspunkte. Die von den Panel-Teilnehmern gemachten Angaben werden nach den strikten Regeln des europäischen Datenschutzes behandelt. Die Auswertungen der Untersuchungsergebnisse erfolgen in anonymisierter Form: Antworten in den jeweiligen Befragungen werden niemals in Verbindung mit Namen oder Adressen von Panel-Mitgliedern ausgewertet. Die Daten werden nicht an Dritte weitergegeben. Die Angaben werden lediglich zu Zwecken der Markt- und Sozialforschung genutzt. Die Panel-Mitglieder erhalten keine Werbe- oder sonstigen Spam-Mails.

14. Please describe the incentives that respondents are offered for taking part in your surveys. How does this differ by sample source, by interview length, by respondent characteristics? Context: The reward or incentive system may impact on the reasons why people participate in a specific project and these effects can cause bias to the sample. Die Panel-Mitglieder erhalten für ihre Teilnahme Punkte (mingle-Punkte). Für ein zehnmütiges Interview wird eine Belohnung von mindestens 50 Punkten ausgeschüttet. Diese 50 Punkte entsprechen dem Gegenwert von 50 Cent. Teilnehmer, die für die Befragung nicht in Betracht kommen, also ausgescreent werden, erhalten bis zu 10 mingle-Punkte. Ab einer Auszahlungsgrenze (aktuell 5, 10 oder 20 Euro) kann der Betrag als Bargeld überwiesen oder in einen Einkaufsgutschein umgewandelt werden. Alternativ kann der Panelist den Betrag an eine ausgewählte Organisation spenden.

15. What information about a project do you need in order to give an accurate estimate of feasibility using your own resources? Context: The "size" of any panel or source may not necessarily be an accurate indicator that your specific project can be completed or completed within your desired time frame. Um eine Studie im Vorfeld auf Machbarkeit zu überprüfen benötigt respondi Informationen zur Zielgruppe (Wer soll befragt werden?), zur Erhebung (Was und wie soll erhoben werden?) zur Länge der Erhebung und zur Länge der Feldzeit.

16. Do you measure respondent satisfaction? Is this information made available to clients? Context: Respondent satisfaction may be an indicator of willingness to take future surveys. Respondent reactions to your survey from self-reported feedback or from an analysis of suspend points might be very valuable to help understand survey results. Wir erstellen monatlich einen Zufriedenheitsindex mithilfe eines repräsentativen Querschnitts der Panelisten - er misst Zufriedenheit, Motivation und Bindung der Teilnehmer. Darüber hinaus hat jeder Panelteilnehmer im Anschluss an eine Befragung die Möglichkeit, ein direktes Panelisten-Feedback zu geben.

17. What information do you provide to debrief your client after the project has finished? Context: One should expect a full sample provider debrief report, including gross sample, start rate, participation rate,

drop-out rate, the invitation/contact text, a description of the field work process, and so on. Sample providers should be able to list the standard reports and metrics that they make available. Nach Projektende erhält jeder Kunde einen automatisch generierten Feldbericht mit allen relevanten Informationen zum Projektverlauf wie Teilnehmeranzahl, Screen-outs, Drop-outs, Feldzeit, Zugriffszeiten etc. Während des Projektes erhält jeder Kunde einen Reporting-Zugang zu einem Feld- und Ergebnisreport, der eine grafische Darstellung der Ergebnisse sowie das Lesen offener Antworten in Echtzeit ermöglicht.

DATENQUALITÄT UND VALIDIERUNG

18. Who is responsible for data quality checks? If it is you, do you have in place procedures to reduce or eliminate undesired within survey behaviours, such as (a) random responding, (b) Illogical or inconsistent responding, (c) overuse of item non-response (e.g. "Don't Know") or (d) speeding (too rapid survey completion)? Please describe these procedures. Context: The use of such procedures may increase the reliability and validity of the survey data. Wir sehen uns in der Verantwortung, Daten von hoher Qualität mit validem und reliablem Ergebnis zu liefern. Die permanenten Qualitäts-Kontrollen beginnen bereits bei Eintritt eines Teilnehmers ins Panel: Wir entfernen konsequent Dubletten und Teilnehmer mit inkonsistenten Antworten. Diese strikten Kontrollen setzen wir bei jeder einzelnen Befragung fort – dies gilt selbstverständlich auch für Teilnehmer aus externen Quellen. Wir führen Varianzchecks durch, um Antwortmuster (a) zu filtern. Gegen inkonsistente Antworten (b) vergleichen wir Antworten innerhalb einer Befragung und mit Antworten aus vergangenen Befragungen bzw. mit Stammdaten. Lückenhafte Antworten (c) werden vermieden, in dem alle Fragen Pflichtangaben sind. Offene Fragen werden manuell überprüft, ob sie gewissenhaft beantwortet wurden. Ein Befragter gilt als Durchklicker (d), wenn er weniger als die Hälfte der Durchschnittszeit zur Beantwortung benötigt. Diese so genannten Speeder sowie als Cheater und Straight-Liner identifizierten Teilnehmer schließen wir aus dem Datensatz aus und laden sie nicht mehr zu Befragungen ein.

19. How often can the same individual be contacted to take part in a survey within a specified period whether they respond to the contact or not? How does this vary across your sample sources? Context: Over solicitation may have an impact on respondent engagement or on self-selection and non-response bias. Jedes Mitglied von respondi erhält die Möglichkeit, durchschnittlich an zwei Befragungen pro Woche teilzunehmen. Jeder Teilnehmer wird dadurch im Schnitt zweimal in einer Woche von uns mit einer Einladungs-E-Mail kontaktiert. Abhängig von der Feldzeit einer Befragung versenden wir in einem Abstand von mindestens zwei Tagen eine Erinnerungs-E-Mail je Umfrage, sofern die Teilnehmer noch nicht teilgenommen haben. Wir versenden bis zu zwei Erinnerungs-E-Mails je Umfrage. Teilnehmer von respondi, die an keinen Befragungen teilnehmen, werden frühestens nach sechs Befragungs-Einladungen hintereinander und spätestens nach 12 Monaten Inaktivität aus dem Panel entfernt.

20. How often can the same individual take part in a survey within a specified period? How does this vary across your sample sources? How do you manage this within categories and/or time periods? Context: Frequency of survey participation may increase the risk of undesirable conditioning effects or other potential biases. Im Schnitt erhält jedes Mitglied die Möglichkeit, wöchentlich zwei Befragungen erfolgreich zu durchlaufen. Wir setzen dazu die Stamm- und Profildaten unserer Teilnehmer ein, um einen hohen Qualifizierungsgrad zu erreichen und Screen Outs bzw. Quota Fulls zu vermeiden. Mit unserem Tracking-System erfassen wir absolute und relative Teilnahmewerte und steuern so den Einladungsrythmus. Zu den Tracking-Daten zählen Einladungshäufigkeit, Rücklauf, Drop-out-Rate und Anzahl beendeter Interviews.

21. *Do you maintain individual level data such as recent participation history, date of entry, source, etc., on your survey respondents? Are you able to supply your client with a project analysis of such individual level data? Context: This type of data per respondent including how the total population is defined and how the sample was selected and drawn, may increase the possibilities for analysis of data quality.* Wir dokumentieren die Entwicklungsschritte eines jeden Panel-Teilnehmers über seinen gesamten Panel-Lebenszyklus hinweg. Bei jedem Panelisten wird der Eintrittsweg sowie das Eintrittsdatum verzeichnet. Zahlreiche Tracking-Variablen zeichnen alle relevanten Teilnehmerwerte der Befragungsfeldphasen auf. Gleichzeitig werden die Mitglieder in einem internen Bewertungssystem mithilfe dieser Tracking-Variablen nach ihrem Antwortverhalten und ihrer Teilnahmebereitschaft bewertet und in so genannte Paneltypen eingeteilt. Dieses besondere Panel-Scoring identifiziert qualitativ schwächere und unzuverlässige Teilnehmer und dient zugleich als Frühwarnsystem für unzufriedene Mitglieder.

22. *Do you have a confirmation of respondent identity procedure? Do you have procedures to detect fraudulent respondents? Please describe these procedures as they are implemented at sample source registration and/or at the point of entry to a survey or router. If you offer B2B samples what are the procedures there, if any? Context: Confirmation of identity can increase quality by decreasing multiple entries, fraudulent panellists etc.* Bereits im Registrierungsprozess unterbindet ein Systemcheck eine Doppelregistrierung mit derselben E-Mail-Adresse. Der digitale Fingerprint relevantID markiert während des Anmeldevorgangs Teilnehmer mit identischer IP-Adresse und Browser-Konfiguration und setzt diese automatisch inaktiv. Mit Plausibilitätschecks inaktivieren wir zudem Teilnehmer, die während der Registrierungsbefragung (Stammdatenbefragung) inkonsistente Antworten geben. Dieser Prozess wird von uns ständig überwacht und optimiert. Außerdem erheben wir Bankkontodaten, um falsche Identitäten zu erkennen. Wir gleichen Profi- und Umfragedaten regelmäßig ab und kontrollieren auch alle weiteren Teilnehmerdaten, wie auch die Antwortqualität der einzelnen Panelisten bei Befragungen.

RICHTLINIEN UND COMPLIANCE

23. *Please describe the 'opt-in for market research' processes for all your online sample sources. Context: The opt-in process indicates the respondents' relationship with the sample source provider. The market generally makes a distinction between single and double opt-in. Double opt-in refers to the process by which a check is made to confirm that the person joining a panel or database wishes to be a member and understands what to expect (in advance of participating in an actual survey for a paying client).* respondi nutzt das sogenannte Double-opt-in-Verfahren. Nach der Registrierung erhält jedes Neumitglied eine Bestätigungsmail mit einer Einladung zur Stammdatenbefragung. Auf der Startseite dieser Erstbefragung muss der Panelist Regeln und Datenschutzbestimmungen aktiv zustimmen. Panelisten, die nicht an der Stammdatenbefragung teilnehmen, werden nicht zu Befragungen eingeladen und nach einer Frist von vier Wochen vollständig aus dem Panel gelöscht.

24. *Please provide a link to your Privacy Policy. How is your Privacy Policy provided to your respondents? Context: Not complying with local and international privacy laws might mean the sample provider is operating illegally. An example privacy policy is given in the ESOMAR Guideline for Online Research.* Panelisten-Informationen werden nach strikten Regeln des Datenschutzes behandelt. Befragungen werden immer anonym durchgeführt. Unter keinen Umständen werden persönliche Daten an Dritte weitergegeben. Die Mitglieder von respondi haben die Garantie, dass ihre Daten lediglich für Zwecke der Markt- und Sozialforschung genutzt werden und sie keine Werbemails oder Spam erhalten. Gemäß den Vorgaben

der deutschen Datenschutzgesetze werden alle Daten eines Teilnehmers auf Wunsch bzw. beim selbsttätigen Austritt vollständig gelöscht. respondi ist Mitglied der Deutschen Gesellschaft für Online-Forschung (DGOF), des Bundesverbands Deutscher Markt- und Sozialforscher (BVM) und korporatives Mitglied bei ESOMAR. Wir unterliegen entsprechend strengen Standesrichtlinien. Diesen fühlen wir uns verpflichtet.

25. Please describe the measures you take to ensure data protection and data security. Context: The sample provider usually stores sensitive and confidential information on panelists and clients in databases. These data need to be properly secured and backed-up, as does any confidential information provided by the client. The sample provider should be able to provide you with the latest date at which their security has been evaluated by a credible third-party. Die Teilnehmer- und Befragungsdaten befinden sich auf den Servern eines ISO-zertifizierten Rechenzentrums (IT-Sicherheitszertifikat ISO27001) in Deutschland. Die Server sind gegen Datenverlust durch ein tägliches Back-Up geschützt, werden 24 Stunden täglich überwacht und gepflegt. Eine Speicherung von Daten auf elektronischen Datenträgern findet nicht statt. Die gehosteten Daten sind vor unberechtigter Veränderung geschützt. Zugang zu den Daten haben ausschließlich autorisierte und zu Beginn ihres Arbeitsverhältnisses in den Datenschutz eingewiesene Personen. Der Zugang zu den Daten erfolgt über ein persönliches Passwort, das regelmäßig erneuert wird. Adress- und personenbezogene Daten werden in verschiedenen Datenbanken getrennt von den Befragungsergebnissen gespeichert. Personenbezogene Daten werden nur anonymisiert durch Einsatz eines Pseudonyms weitergegeben. Eine Weitergabe von Teilnehmer-Adressdaten, sofern für ein Forschungsprojekt notwendig, ist nur bei erfolgter Zustimmung der Teilnehmer möglich. Diese Zustimmung muss für jedes neue Forschungsprojekt neu eingeholt werden.

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