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**DESCRIBING AND MEASURING
THE IMPACTS OF GAMIFICATION CONSIDERING
PERSONALITY TYPES**

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Gamification is a research area that refers to the implementation of game elements in non-game contexts. It can be utilized in many different areas such as education, business organizations, healthcare, or environmental protection. This dissertation binds the context of pedagogy with gamified tools. In the context of both, the education and the business disciplines, gamification can lead to higher performance in terms of motivation, engagement, or satisfaction.

The topic of gamification was chosen by personal interest. The intention was to understand the logic of using a gamification process and to explore the possibilities of whether this method can provide benefits for different purposes. It was also unclear whether it induces the expected results in terms of increasing motivation or engagement of the users. The reason behind analyzing this topic was that I intended to understand what kind of game elements can be used in different circumstances, how can we construct a gamification system and what kind of positive or negative results can gamification produce.

The research started in 2017 with a mapping study methodology examining gamification in the educational context. It was followed by a similar analysis but in the context of for-profit organizations. The third article was related to the investigation of the common research areas of gamification and entrepreneurial universities. Finally, an empirical analysis was constructed to examine the effects of gamification in economics and business education, where specific questions were considered as uncovered topics of literature (Hamari et al. 2014; Nacke and Deterding 2017; Tondello et al. 2016).

The main problem in gamification research is that it does not always yield positive effects on the motivation and performance of the participants. These controversial outcomes indicate that there is a difference between the attitudes toward gamification among personal types. Possibly certain game elements and gamification design do not induce positive behavior for different participants. When analyzed in a homogenous way, researchers may lose insight into which game elements were not positive for the participants. That justifies this research and the

need for differentiating the individuals. The main contribution for the literature is that the results can identify whether there is a difference between certain player types in terms of how they behave toward gamification in a non-game context.

Table 1. Summary about the articles presented in the doctoral thesis

Articles	Gamification in education (P1)	Gamification in for-profit organisations: a mapping study (P2)	Gamification in Entrepreneurial Education: Highlighting Major Concerns through a Systematic Mapping Study (P3)	Implementing gamified teaching: exploring the effects of gamification and personal types in an economics course (P4)
Current state	Before 2 nd round resubmission (Oxford review of education)	Accepted for publication (Business: Theory and practice)	Published (Decision Science Institute Proceedings)	Under review (International Review of Economics Education)
Context	Education	Business	Entrepreneurial education	Education in economics
Methodology	Mapping study	Mapping study	Mapping study	T-test with unpaired samples; Multivariate analysis
Main contribution	present the existing research trends and to recognize the research gaps	present the existing research trends and to recognize the research gaps	identify the research gaps based on the synthesis of the two research topics	effects of gamification, analysis of player types,

Source: own design based on the articles.

The organizing principle of the subsequently following articles was to achieve the main goal of the thesis. The main goal of the thesis is to reveal research gaps in the scientific literature of gamification and to provide contribution within the detected research gaps with empirical tests. The general research question (RQ) of the thesis is the following: What is the primary research gap in the topic of gamification and is there a way that it can be addressed? Based on research trends discovered in (P1-3), an empirical test was prepared in (P4) to contribute to the literature.

Since most of the gamification-related articles in the literature are written in the context of education, the first step was to examine the literature within this topic through a mapping study (P1). This approach was sufficient to address the first part of the thesis as the main research question was related to detecting the main trends of this research area. It turned out that a significant research gap in gamification in education is the measurement of personalized gamification. Personality types are often defined as limiting factors in the literature.

This can be defined as a research gap. The next two articles (P2, P3) examine gamification in the context of business discipline and entrepreneurial university to provide the same contribution. They reveal this research gap in the literature, and they give a thorough view for the readers whether the conclusions from the first article are unique only for the educational context or is it a significant, untapped research trend in the field of gamification.

Based on the results of the first three articles the main research gap of gamification was revealed which is the measurement of personalized gamification. There is a need to consider personality types when analyzing the effects of gamification. To be more precise in the gamification context there is a need to use player types rather than personality types as those can be more focused and specialized in examining the effects of gamification. This is the field within gamification where this thesis contributes to the literature as it uses empirical tests to validate the differences between player types in

terms of their engagement, motivation, entertainment, and perceived relevance of the course.

To have a clear picture of gamification it is necessary to examine the literature. That was the main goal of the first two articles of the thesis, which used a mapping study methodology. The main contribution of such a methodology is that for researchers it is a useful effort as a first step in the research. It can be used to identify the specific elements to be implemented through a gamified system in the context of different industries. The map helps to identify the possible areas that have not yet been examined.

The research process of the first two articles was similar as both comprised the mapping study methodology based on Petersen et al. (2008). The purpose of the two articles was to collect all the essential and relevant articles that potentially fit into the research theme. The studies applied a rigorous collection and selection of the articles to obtain a comprehensive view of the current state of the literature in educational and for-profit organizational

contexts. The mapping study methodology that includes the screening process of the studies were the following:

1. Definition of the research questions in order to define the most suitable keywords for the search.
2. Definition of the keywords of the search and the inclusion and exclusion criteria for the screening process
3. Conducting the search in different high reputation databases that are international and which contain a wide variety of topics.
4. The screening process comprised multiple steps including the analysis of the titles, abstracts, and the whole text.
5. The final selection of the articles was obtained.
6. The research dimensions were defined and based on that the articles could be analyzed, and they could be differentiated by the defined categories.

As most of the articles in gamification literature are written in the context of the education discipline, it was a logical first step to get to know the literature through analyzing this field first. The purpose of that study was

to collect empirical articles on the topic of gamification in the education discipline and to categorize them based on different aspects. The aspects were determined based on existing literature. The research used a mapping study methodology which is similar to a literature review but with a slightly different purpose. With the mapping study methodology, the main goal was to reveal what the trends are in the literature in the context of education and to summarize how gamification can be implemented, what game elements were used, and what kind of variables were examined by former studies. The articles were collected from a broad range of databases and they were screened based on inclusion and exclusion criteria. In that way, 36 empirical articles were analyzed that related to the topic of gamification in the education discipline. This study contributes to the literature in the way it collects empirical articles and provides insight into the aspects examined.

In order to reveal the research topics of gamification in education, a Latent Semantic Analysis (LSA) methodology was used. The text analysis was conducted

on the collected articles obtained by the mapping study methodology.

The first of the articles included in this thesis reveals the literature of gamification in education and helps in formulating the empirical analysis presented by the fourth article. To execute such an analysis in higher education courses it is also necessary to examine gamification in a context that can extend the contributions of the first article. The second article reveals the current trends of the literature of gamification in for-profit organizations. The purpose of this investigation was to find inputs for the empirical analysis of the fourth paper, where factors of gamification are implemented and measured in the context of an economy and business-related courses with the additional dimension of player types. As in the first article, a mapping study methodology was used in order to determine the possible implementation of gamified systems in for-profit organizations. One of the contributions of the study was the construction of two figures that contain two maps, where the existing

research trends can be identified based on the results. This was extended by a multiple correspondence analysis to provide a thorough insight of gamification research based on four dimensions which were the orientation, whether it is employee or customer-focused; the industry; the type of implementation; and the general outcome of the results.

As gamification is a creative tool of enhancing student performance in more interactive circumstances, it is reasonable to analyze the connection between educational gamification and a phenomenon of entrepreneurial education, which has quite rich and complex literature. To find out the relations between the two research areas a third article was written where a mapping study methodology was used as well. The purpose of the third study was to detect all the common directions that these two research areas have. One of the research questions of this article is to detect the tools which were in focus in the literature. The other is related to the actors of gamification in entrepreneurial educational atmospheres. The article aims also to identify

the research gaps based on the synthesis of the two research topics.

The fourth paper contains the representation of the empirical analysis of the thesis. After the screening of literature, a business-related higher education course was gamified, and a control group was examined for one semester. The gamified group contained the implemented gamification process while the control group represented the traditional way of the teaching process. The effects are measured by a survey in which factors from a questionnaire, grades, participation rates were in the focus.

This study evaluates the effects of gamification at two levels that indicate two different research dimensions. The first one is related to the effects of gamification on the performance, participation of the students, as well as psychological factors such as motivation, engagement, entertainment, and perceived relevance of the courses by the students. For this, the indicators of the gamified group was compared to the indicators of the control group with unpaired t-tests. The second dimension is justified as

every individual has different personality types and each participant in a gamified process can be grouped into different player types. The novel element in the evaluation is the player types in order to be able to analyze whether there are differences in the gamification effects due to different player types. This topic is one of the most important research directions in the literature (Hamari et al. 2014; Nacke and Deterding 2017; Tondello et al. 2016). The negative effects of certain gamified projects can be attributed to the possibility that the implemented game elements and design were not appropriate for that set of individuals. To reach a better understanding of how player types can have an important role in a gamification design it is necessary to analyze the effects of gamification in that context as well. The contribution of this dimension is that it shows the effects of gamification with a certain set of game elements and reveals whether there are significant differences between the player types in terms of the examined variables. A validated questionnaire was used which was created by Tondello et al. 2016 to reveal the player types of the

individuals. Then a multivariate analysis was executed by examining the pairwise correlations. The goal was to determine the differences between the player types on the effects of gamification in terms of engagement, motivation, entertainment and perceived relevance of the course.

In order to reach the goal of the thesis, the research question was divided into four different summarizing questions that can be seen in Table 2. The research question for the last article could be determined based on the results of the three research articles that were conducted before. According to them, the main research gap in the field of gamification is to analyze the topic of personalized gamification. The thesis provides a transdisciplinary synthesis of education and business administration disciplines. It helps to define how to organize education to be more valuable and more attractive. Gamification has the potential to achieve this goal but only when considering the personality types during the implementation and evaluation. Table 2 is listing the focus of the research questions raised by the studies.

Table 2. Summary of the research questions presented in the doctoral thesis

	Questions/hypotheses presented in papers	Summarizing questions
PI Gamification in Education	<p>(Q1) In which education level are there relevant empirical studies regarding gamification? (Q2) What are the teaching subjects where gamification was applied? (Q3) Do the empirical studies examined online courses, blended learning, or courses without online support? (Q4) What kind of gamification elements do the empirical studies examine? (Q5) What are the general results of the articles toward gamification, positive negative or mixed? (Q6) What are the variables that were examined in the articles? (Q7) How did they solve technically the implementation of an online gamification system?</p>	<p>(SQ1) What are the main trends of gamification in educational context, based on different aspects?</p>

<p>P2</p> <p>Gamification in for-profit organisations: a mapping</p>	<p>(Q1) In which industries is gamification applied? (Q2) What is the orientation of the application: Is gamification related to the customer environment or the employee environment in previous studies? (Q3) Which forms of implementing gamification were analysed by former studies? (Q4) What type of gamification elements are deployed by the researchers in previous studies? (Q5) In prior studies, how gamification affected the outputs of the companies' operation? (Q6) What are the variables that are likely to be enhanced through gamification when organisations implement it?</p>	<p>(SQ2) What are the main trends of gamification in for-profit organisations context, based on different aspects?</p>
<p>P3</p> <p>Gamification in</p>	<p>(Q1) Based on the categorization of this paper, what kind of tools are in the focus of the studies? (Q2) Who are the actors of gamification in entrepreneurial universities, how do they contribute to the usage of gamification tools? (Q3) Based on the synthesis of the paper, which research gaps can be identified?</p>	<p>(SQ3) Are there common research directions between gamification and entrepreneurial universities?</p>

<p>P4 Implementing gamified teaching: exploring the effects of gamification and personal types in</p>	<p>(H1) Gamification has a significantly positive impact on the engagement of the students in the gamified course (H2) Gamification does not have a significantly positive impact on the motivation of the students in the gamified course. (H3) Gamification has a significantly positive impact on the entertainment of the student in the gamified course (H4) Gamification has a significantly positive impact on the perceived relevance of the students in the gamified course. (H5) Gamification has a significantly positive impact on the final test results of the students in the gamified course. (H6) Gamification has a positive impact on the participation of the students in a gamified course. (H7) Gamification positively influences the relationship between player types and the variables (motivation, engagement, entertainment, relevance). (H8) There is a significant difference between the player types in terms of their correlation with the variables (motivation, engagement, entertainment, relevance)</p>	<p>(SQ4) What type of differences can be discovered comparing the evaluation of gamified and non-gamified participations, and player types?</p>
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Source: own design based on the articles.

The thesis provided two significant results. First, it reveals the current trends of gamification literature and the research gaps. This is essential in the Covid 19 pandemic situation where gamification has an increasing role in enhancing the quality and enjoyment of education. The other result is related to the player types which helps designers and professionals to implement the most suitable gamification method for the target audience.

The thesis contributed to the literature of gamification in different ways. First, the current trends and research directions were analyzed and introduced in the context of education and for-profit organizations. It used a mapping study methodology and collected several empirical articles which were classified based on different criteria. The main contribution of this method is that it provided a collection of empirical articles that were grouped into categories as well. For researchers, those results are useful in a way that they make the first phase of the research process easier. These collections and maps can indicate where the research gaps are, what kind of variables have already been analyzed in the literature,

and what kind of game elements were used in different industries or educational contexts. The thesis examined whether gamification has a positive impact in terms of different variables such as learning, motivation, or engagement. This was extended with the analysis of the dimension of player types as a new trend of gamification research with unexplored areas.

The first article used a mapping study methodology and collected and grouped the final selection of articles based on several classifying criteria. Besides, a Latent Semantic Analysis methodology was executed to provide insights about the research trends of gamification and the main topics that are discussed in the collected articles. Six main topics were identified which helped to formulate the main subjects in the area of gamification research and to determine the directions for further analysis.

Regarding the results linked to the research question, we can observe that there are many primary studies related to gamification in education that focuses on higher education (P1Q1). The rate of undergraduate courses is also high. To have a clearer picture of the effects of

gamification more empirical studies are needed in different levels of education as well. The most prevalent subject of the analyzed courses was ICT (P1Q2). To obtain more reliable results it is necessary to focus not only on ICT courses but on courses that have different topics. It is important because the characteristics of the individuals may vary according to what kind of courses, they attend. Blended learning was the most used type of gamified course; however, research should also focus on full-online courses that apply gamified methods since there is a lot of potential in this type of learning in terms of flexibility (P1Q3). Courses without e-learning should also be more examined since there are still many places where there are no technical tools and opportunities to apply it. An own application or tool was the most widespread implementation of gamification among researchers followed by third-party software (P1Q7). Gamification designers need to implement the necessary amount and type of game elements since the use of meaningless game elements such as point collection alone will not foster the desired effect. Linking game

elements with the personality types is essential since certain game elements may not result the same effect on the different characters.

The purpose of the other articles was to examine gamification in the context of for-profit organizations. A mapping study was again applicable for investigating the main research trends and directions in the literature. The search from the databases contained 639 articles which were reduced to 41 empirical studies after the screening process. Two figures of maps were constructed to reveal the research gaps. One of the findings was that the number of empirical articles on that topic grew faster in recent years than in the topic of gamification overall. This shows that in the beginning, gamification-related articles were mostly theory-based and contained an elaboration of a framework that led to empirical papers in the subsequent years. This finding was very similar to the other study related to gamification in education. This shows the progress of this research area as more frameworks and theories can be tested in the empirical studies. A multiple correspondence analysis also

supported the research by examining the outcome of the studies, the type of implementation, the industry, and the orientation. It revealed that gamification induced a positive effect mainly in customer-based environments and in those industries where the service processes can be well-determined. This study also supported the results of the first article that personalized gamification needs to be examined more in the literature.

If we view the distribution of the articles based on the industries, they examined gamification, we can conclude that it is not restricted to only a few business areas (P2Q1). In fact, we can state that with careful planning and design process gamification can be applied in different areas of businesses. Individual sets of researchers who reported more than one empirical study focused only on one business area and analyzed similar variables in their examination.

Another conclusion is that gamification needs to be well-elaborated and designed for the specific environment to achieve the expected results in the variables. It is not a possible way to design unified solutions with the same

game elements and gamified processes since there can be a lot of differences in the characteristics of the target group.

Researchers placed a higher focus on customer-related gamification processes than on employees (P2Q2). This priority can be explained by the fact that in the short-term gamification that targets customers may result a greater benefit for a company compared to the implementation in employee-related processes.

Regarding the platform where gamification was applied, we can state that researchers used web pages to analyze the effects of gamification (P2Q3). Customer environment was another setting where gamification has been applied in several studies. This can refer to the gamification of a shopping process or an on-site experience of gamification. Another emerging platform is the gamification of mobile applications. The number of studies that examined the effects of gamified applications grew the most which is not an unexpected phenomenon regarding the fact that it is might be the easiest and most straightforward to use by the customers. If gamification

was applied to enhance the experience of employees, it was mostly implemented in employee training to make them more interesting and to help the motivation and engagement of the workers.

Badges, rewards, and leaderboards were the most used gamification elements in the analyzed studies (P2Q4). It was consistent with the previous study in the context of education where the three most applied elements were badges, leaderboards, and points (P1Q4). We can state that there is no such difference between the two contexts in terms of the game elements as they can be used most easily. There is a big number of possible game elements that can be applied in a gamified process. That is why it is an important task for gamification designers to select the optimal amount of game elements. For this and to exclude the possible overlaps between the names of the gamification elements they should be divided into the hierarchies of dynamics, mechanics, and components. Researchers named some of the game elements differently. It was the same problem in the context of education as well. To overcome this, it is still needed in

further research to set a framework to categorize the game elements that might mean the same but called differently.

The other purpose of whether gamification had an overall positive influence on the analyzed variables in the collected studies is supported by the research (P2Q5). Similar results were achieved in the context of education (P1Q5). Indeed, gamification resulted a higher engagement, knowledge, brand loyalty, and user experience for the customers and employees (P2Q6). Comparing with the other study that investigated gamification in education the analyzed variables were similar. In the educational context, the most widely examined variable was the learning outcome and knowledge increase followed by attitude, motivation, and engagement (P1Q6). As the purposes of the two research areas are different it is understandable that for a business environment learning outcome is not applicable in a gamified customer environment. There are still some gaps in the literature which was showed by the map. There are gamification-related research in the fields of

banking and marketing but there are many other fields that can be investigated further. It is also needed to measure the effects of game elements in work environments. Many popular game elements are yet to be examined in the context of web-page design.

The three main purposes of the third paper analyzed the connection between the topics of gamification and entrepreneurial universities. A mapping study was again used as this methodology can provide the most appropriate results to find out the links between the two research areas. After collecting the necessary number of articles, the analysis first focused on the tools used in the empirical studies. The examined variables by the articles were also collected and based on this data and the applied tools a map was constructed to indicate the current research trends and gaps in the literature. The other question was related to the actors of gamification in entrepreneurial universities and to find out how they contribute to the usage of the gamification tools. Research gaps were also identified based on the results.

Gamification is mostly applied in entrepreneurial teaching in the context of open innovation or technology-based entrepreneurship (P3Q1). There is a relatively small overlap between these two emerging research areas. The effects of gamification in entrepreneurial higher education are smaller compared to the examined effects on perceptions of the actors or the experience in them.

The actors that represent in the collected studies are mostly students and application or software users, however, faculty members are underrepresented (P3Q2). Institutional aspects were also underrepresented compared to the perception, experience of the actors (P3Q3).

The first three articles helped to elaborate an empirical research and to find out where the research gaps are and how can gamification be examined. Besides descriptive statistics, additional statistical methodologies were also executed to support the research such as LSA and correspondence analysis. It provided a good basis of which game elements can be included and therefore

analyzed in the empirical research. The variables that were examined in previous empirical studies also helped to determine what aspects need to be analyzed. The last article included in the thesis contained the empirical part of the study. It is related to two research dimensions. The first research question investigated whether gamification has a positive effect on different variables. The second was related to the effects of player types in a gamified system.

In order to investigate the research questions, it was necessary to implement gamification in higher education courses. According to the previous studies points, rankings, challenges, badges, and levels were implemented as game elements. To evaluate the effects of gamification the examined variables contained engagement, motivation, entertainment, and the perceived relevance of the students. The data was collected through a questionnaire. Knowledge increase was measured based on the final test results at the end of the course while participation was also assessed.

According to the results, gamification showed a positive influence on the engagement, entertainment, and perceived relevance of the students (P4H1H3H4). However, regarding motivation, it did not result a significant positive impact (P4H2). Gamification had a positive effect on the knowledge increase of the students as well (P4H5). The participation in the gamified course was also higher than in the control group (P4H6).

Regarding the effects of player types, we can state that in the control group there were no correlations between the variables analyzed and the player types while in the gamified group there were mostly significant positive correlations between them (P4H7). The only exception was the disruptor player type. Gamification positively changed the relationships between player types and the analyzed variables while in the case of disruptor this correlation does not exist in either group (P4H8). These results underline the importance of analyzing the player types before the implementation of a gamified system. Certain game elements and game design do not please the needs of all individuals. According to the results of this

research, we can state that the used elements and the gamified system are not able to positively influence the motivation, engagement, entertainment, and perceived relevance of the course in the case of the disruptor player type. This result is contributing to the literature as it emphasizes the differences between the player types. It proposes that different gamification methods need to be implemented when a certain gamification context contains a majority of a specific player type. This explains the phenomenon of not always having the positive results that are expected from gamification. In the case of the disruptor player type, the results would have been probably positive if game elements that contain luck or those that change the status quo were implemented. A future research direction can be to identify and match the game elements to the player types and to define which gamification affordances need to be implemented in a certain player type mix environment. Another research direction would be to evaluate the individuals based on player types and to develop a gamification process according to the results. The effects caused by gamification could be compared

with the results of a control group where gamification is not personalized.

After the Covid 19 pandemic outbreak online education received additional importance more than ever before. While formerly it was an opportunity nowadays it became mandatory for all the educational institutions to be able to organize teaching online. It means that the concurrence became stronger, and those institutions will have a significant advantage who will be able to make online education more engaging and entertaining. Personalized gamification became more and more important, especially in the pandemic situation. There is a need to design more engaging gamification processes for different individuals. This thesis provided a significant contribution to the gamification literature by applying player types. The results can be used by educational institutions, application developers and designers and by those professionals who make decisions related to education. The transdisciplinarity of the research is realized since it examines the development of pedagogy in the business administration context. It

evaluates a method that is one of the most suitable tools for increasing the attractiveness of education in the pandemic situation. The results of the thesis contribute to the conscious implementation and the effective operation of gamification.

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